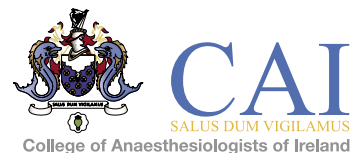
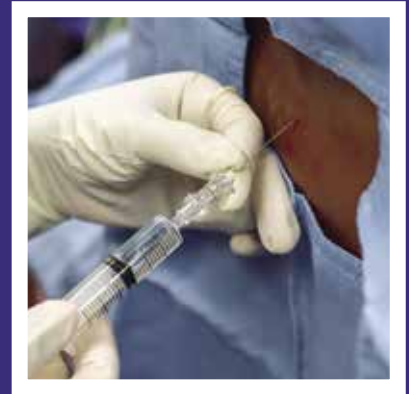


# Model of Care for Anaesthesiology

*National Clinical Programme for  
Anaesthesia*



### FOREWORD

#### OF THE PRESIDENT OF THE COLLEGE OF ANAESTHESIOLOGISTS OF IRELAND

The College of Anaesthesiologists of Ireland (CAI) is dedicated to educating and training current and future generations of doctors in Anaesthesiology, Intensive Care and Pain Medicine to have the skills to provide patients with the best care possible.

We appreciate the trust bestowed on doctors and strive to ensure that people in Ireland and across the world can continue to expect the highest possible standard of care.

We have delivered teaching and training to doctors since the Section of Anaesthesia of the Royal Academy of Medicine was formed in 1946, leading to the formation of the Faculty of Anaesthetists in RCSI in 1959 through to the foundation of the College of Anaesthetists of Ireland in 1998.

The College of Anaesthesiologists of Ireland has a long tradition of promoting excellence in patient safety in the fields of anaesthesiology, intensive care and pain medicine.

The College motto is “Salus Dom Vilgilamus” which translates as safety while we watch. This speaks to the core value of patient safety which is at the heart of who we are as a speciality and what we strive to achieve as a College.

In 2019 the CAI produced its first strategic plan. This plan will be the template for development and provide a roadmap for the College from 2019 – 2024. Over the next five years the College has committed to focus on five strategic aims. The first strategic aim is to promote excellence in patient safety and quality of care.

The CAI has a long and close relationship with the National Clinical Programme for Anaesthesiology (NCPA). The National Clinical programmes were introduced to bring clinical leadership into the heart of the decision making process. The ultimate aim of the NCPA involves patient safety, quality of care and access to services. At the heart of this Model of Care document is the 2 plus 2 model of emergency cover (that is two consultants and two trainees on call). The model documents the minimum requirements for the safe provision of unscheduled care in hospitals that provide Anaesthesia, Critical Care, trauma and co-located obstetrics. This 2 plus 2 model when delivered will immeasurably improve not alone the quality of care to our patients but ultimately will improve patient safety. This aligns to our core value of patient safety and our primary strategic aim as a College.

I commend the authors of this vision in this model of care document. This document sets the template for the safe provision of anaesthesiology for the next decade. Their vision will both inform the future of our specialty and ultimately make the patient journey safer. I look forward to its implementation.

**Dr. Brian Kinirons**

*President, College of Anaesthesiologists of Ireland*



### FOREWORD

#### CONVENOR OF THE IRISH STANDING COMMITTEE OF THE ASSOCIATION OF ANAESTHETISTS OF GREAT BRITAIN & IRELAND

The Association of Anaesthetists of Great Britain & Ireland (AAGBI) was founded in 1932 and has 11,000 members, including almost 400 Irish consultant anaesthetists and trainee anaesthetists.

The AAGBI promotes and advances education, safety and research in anaesthesiology, as well as professional aspects of the specialty and the welfare of the individual anaesthesiologist. The Association's motto is 'In Somno Securitas' (safe in sleep).

The AAGBI achieves its aims of promoting safety, education and research through its extensive education programmes (including the Annual Congress, Winter Scientific Meeting, and Core Topics days) by revising and issuing guidelines and giving advice to members. It provides support and well-being programmes for individual members in addition to promoting research and education through its official journal, *Anaesthesia*. It supports and provides funding for national audits. It is actively involved in medical politics at a national and international level, representing the views and concerns of its members in all aspects of professional activity.

In Ireland, the Irish Standing Committee (ISC) represents the 400-strong Irish membership on the AAGBI Council. ISC members are drawn from a range of hospitals across Ireland. Throughout its long history, the ISC has endeavoured to promote the aims of the AAGBI at a local level, while actively working on issues that are of particular interest or concern to its Irish members. The ISC actively participates in writing AAGBI Guidelines, especially where there is a particular Irish relevance. The Convenor of the ISC is a co-opted member of the Council of the College of Anaesthesiologists of Ireland and the National Clinical Programme for Anaesthesia. Through these and other national bodies, the ISC plays a central role in highlighting issues that affect its members. It also engages in other areas of professional interest, e.g. areas relating to independent practice, and it encourages AAGBI members to approach it on matters of local concern. Together with the AAGBI, the ISC is available to provide advice and support to the Association's Irish members.

The ISC has contributed extensively to the working group on the Model of Care for Anaesthesiology. Throughout the development process, Anaesthesiologists across Ireland have received regular updates on proposals and progress, and have had opportunities to discuss and provide feedback on all aspects of the document.

The ISC believes that the Model of Care for Anaesthesiology will greatly influence the development of the specialty of Anaesthesiology over the next 10 years to the benefit of individual Anaesthesiologists, hospital systems and, most importantly, to patients who require a safe and high-quality service.

**Dr. Kevin Bailey,**

*Convenor, Irish Standing Committee of the Association of Anaesthetists of Great Britain & Ireland*

### FOREWORD

#### OF CLINICAL LEAD, NATIONAL CLINICAL PROGRAMME FOR ANAESTHESIA

In June 2016, an expert panel was established to work with National Doctors Training and Planning (NDTP) to plan future workforce requirements in the disciplines of Anaesthesiology and Intensive Care Medicine. At an initial panel meeting, the need for the development of a Model of Care for Anaesthesiology was highlighted. This would build on the work already carried out by the College of Anaesthesiologists of Ireland (CAI) and the National Clinical Programme for Anaesthesia (NCPA) and was published in the document entitled *Providing Quality, Safe and Comprehensive Anaesthesia Services in Ireland – A Review of Manpower Challenges*, published in 2014.<sup>1</sup> The NCPA agreed to coordinate this process. This work was strongly supported by the CAI and the Irish Standing Committee (ISC) of the Association of Anaesthetists of Great Britain & Ireland (AAGBI). The working group on the Model of Care for Anaesthesiology comprised a broadly representative group of Anaesthesiologists drawn from different subspecialties and different types of hospitals, together with the Nurse Lead from the NCPA.

It was hugely gratifying to facilitate and be part of a group of colleagues who gave freely of their time and contributed enormous effort to this project. All members of the group were highly motivated and brought years of diverse experience to the project. Monthly meetings featuring extensive discussion and debate, coupled with feedback received from Anaesthesiology departments all over Ireland and a forum discussion morning held in the College of Anaesthesiologists of Ireland (CAI) in September 2017, ultimately ensured the achievement of a high level of consensus on the Model of Care for Anaesthesiology. We would like to extend our gratitude to colleagues who contributed to this project. We anticipate that this document will have a major and very positive input to the Irish healthcare system.

A model of care broadly defines the way healthcare should be delivered. Simply put, it aims to ensure that people get the right care at the right time by the right team in the right place. The Model of Care for Anaesthesiology is intended to be a guide to the standards and services required in order to deliver safe, internationally acceptable levels of anaesthesia care throughout Ireland, irrespective of whether the patient is being cared for in a Model 2, 3 or 4 hospital setting. In order to provide this level of care, the Anaesthesiology team needs to work in close collaboration with colleagues from many other disciplines.

This multidisciplinary team approach should be based on a foundation of appropriate structures of clinical governance in order to achieve the goals of better patient safety, better patient experience of care and better collegial support. This strong and effective clinical governance is required at a local hospital level, across the Hospital Groups and at a national level.

The NDTP unit, incorporating medical education and training, workforce planning and the consultant post-approval process, was established in November 2014. Its vision is that patient care and patient outcomes will be maximised as a result of an aligned and appropriately skilled medical workforce. This involves projecting and proposing the following on an annual basis:

- The number of medical trainees required for each specialty
- Commissioning and funding the training required to meet these needs
- Ensuring that the training content and delivery is responsive to the changing needs of the Irish healthcare system

- Supporting the retention of these doctors upon completion of their training
- Identifying the future medical workforce requirements in each specialty and managing the consultant post-approval process in a timely and efficient manner.

In medical workforce planning there is an opportunity to match postgraduate specialist medical training (both trainee intake and training content) to future workforce projections. This requires NDTP to liaise closely with the Health Service Executive (HSE) service delivery departments and in particular the Acute Operations Division, the Mental Health Division, the Primary Care Division and the National Clinical Programmes under the Clinical Strategy & Programmes Division (CSPD).

The objective is to ensure that at all times the Irish health service is provided with the appropriate number of specialists who possess the required skills and competencies to deliver high-quality and safe care and to ensure that their training is matched to the model of healthcare delivery in Ireland, regardless of location.

The National Clinical Programmes (NCPs) represent a strategic initiative between the HSE and the Irish postgraduate training bodies. The NCPs aim to develop standardised models of care across medical specialties and healthcare disciplines.

The NCPs share three core objectives:

- To improve the quality of patient care
- To improve access to services, and
- To improve cost-effectiveness.

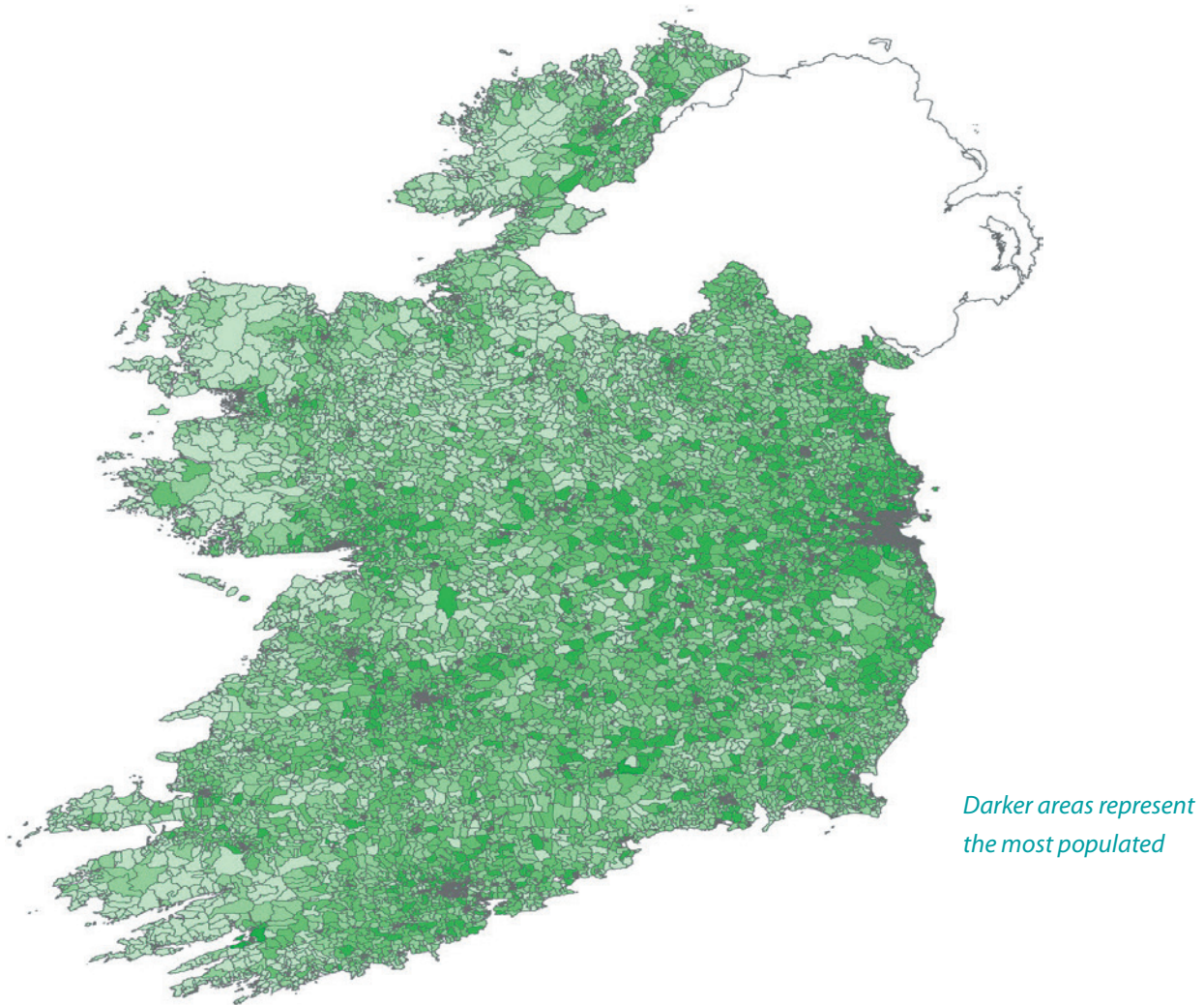
NCP models of care act as strategic plans underpinning clinical service delivery and incorporate evidence-based recommendations which have been shown to be associated with improved patient outcomes.

NDTP will use the NCPA Model of Care for Anaesthesiology to analyse the medical staffing required (with regard to number, specialty and skill set/competencies) to implement a National Strategy for Anaesthesiology.

The NCPA recognises the inherent difficulties in this project. Ireland's present population distribution is illustrated in Figure 1. This distribution continues to change and presents new challenges as we try to meet the expectations of an ageing population with increasing comorbidities, as well as the expectations of patients who may be living great distances from urban centres.

**Dr. Jeremy Smith,**  
*Clinical Lead, National Clinical Programme for Anaesthesia*





*Figure 1 - Distribution of population in the Republic of Ireland*

**Source** - Central Statistics Office (CSO) small area map indicating where people live in the Republic of Ireland, based on Census results

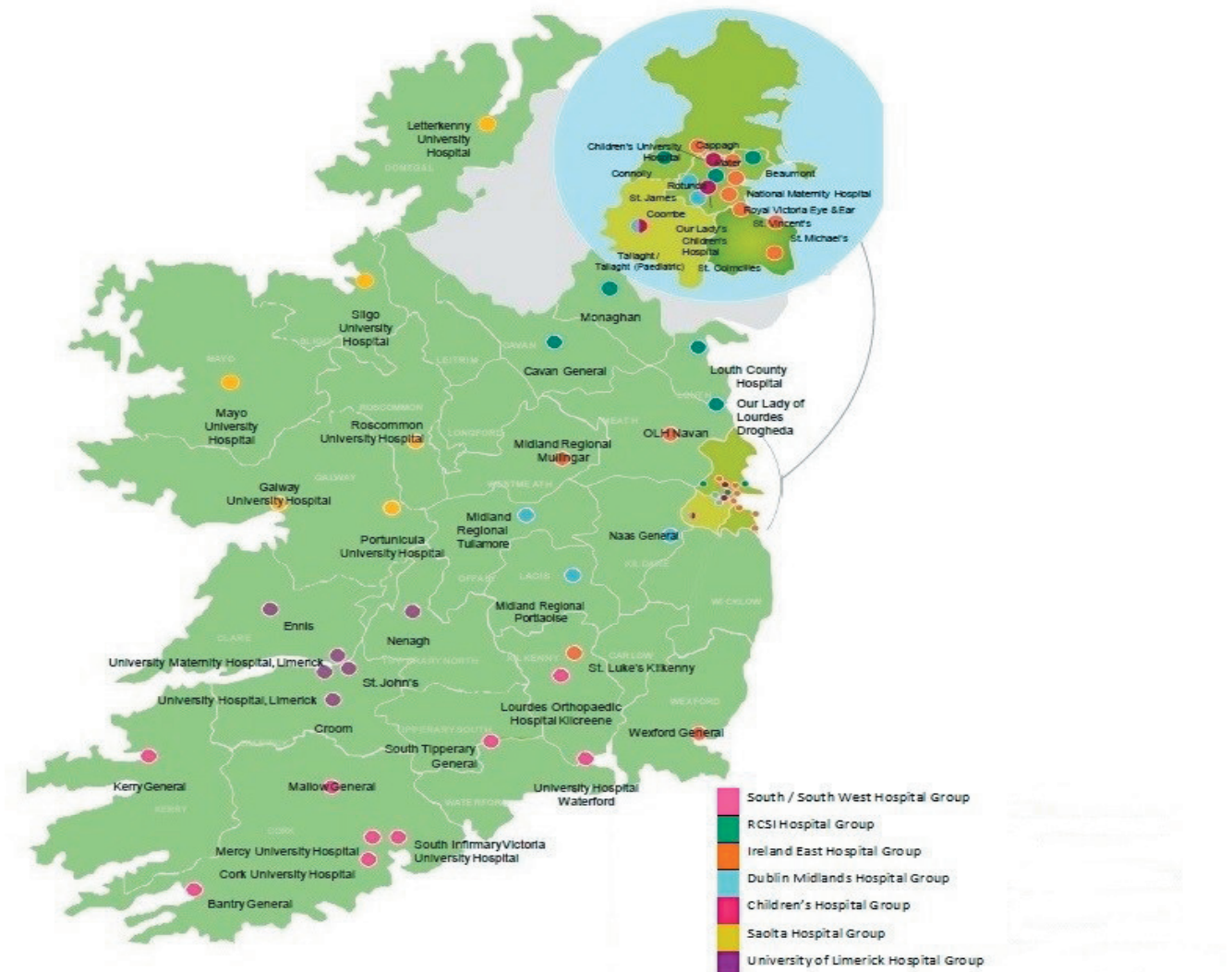
As some treatments become more complex, there is a realisation that specialised services, as well as the training opportunity they provide, cannot be available in every hospital and county. Such specialised services need to be consolidated in a smaller number of centres where we can secure the best outcomes and provide specialty training of greater quality. Most healthcare will, however, take place in the community and in more general hospital settings and we must not lose sight of the need to train and prepare doctors for these environments.

It is becoming increasingly difficult to attract doctors (consultants, non-consultant hospital doctors (NCHDs) and general practitioners (GPs)) to locations outside of Ireland's major cities where hospitals typically operate at a lower level of complexity.

We propose to address this challenge by working in cooperation with partners both within and outside the HSE to create an environment where doctors regard these work opportunities as viable and attractive career choices and we aim to ensure that their training provides them with the appropriate skills.

## MODEL OF CARE FOR ANAESTHESIOLOGY

The recent introduction of Hospital Groups (Figure 2) and Community Healthcare Organisations (CHOs) has major implications for our work. As these new Hospital Group and CHO structures mature and refine their respective models for service delivery, opportunities will arise for many consultant posts to have joint linkages with both a major centre and a more peripheral location within the same Hospital Group.



**Figure 2 - Hospital Groups in the Republic of Ireland (Hospital Groups Finance, HSE)**

Although Ireland is currently producing more medical graduates than at any previous time in its history, there is still a disproportionate reliance on international medical graduates (IMGs) and the use of short-term locum doctors.

This is, in part, a result of the need for national compliance with the European Working Time Directive (EWTB).

The use of short-term locums also has implications for the provision of medical services to rural communities. The Medical Council has highlighted issues of patient safety associated with an over-reliance on IMGs and locums.



## MODEL OF CARE FOR ANAESTHESIOLOGY

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In June 2013, the International Medical Graduate Training Initiative (IMGTI) was launched to provide a route for overseas doctors wishing to undergo structured postgraduate medical training within the public health service in Ireland. The initiative is overseen and governed by the HSE and the postgraduate medical training bodies in Ireland on a collaborative basis through the Forum of Irish Postgraduate Medical Training Bodies.

The initiative enables the overseas trainees to gain access to clinical experiences and training, with a view to enhancing and improving the individual's own medical training and learning in the short term. In the medium to long term, the health services in the trainees' countries will be enhanced when they return home.

The operation of this training initiative enables Ireland to deliver on its commitments contained in the *WHO Global Code of Practice on the International Recruitment of Health Personnel*.<sup>2</sup>

The NCPA will work to promote the role of trainees and non-training NCHDs in Anaesthesiology as major stakeholders in the development of the Model of Care for Anaesthesiology. In this time of unprecedented recruitment and retention challenges in the Irish healthcare service, the views of our NCHDs are relevant and important, and must be taken into consideration.

## Contents

Foreword of the President of the College of Anaesthesiologists of Ireland .....	1	5.2. The working day .....	41
Foreword of Convenor of the Irish Standing Committee of the Association of Anaesthetists of Great Britain & Ireland .....	3	5.3. Model 4 hospitals .....	42
Foreword of Clinical Lead, National Clinical Programme for Anaesthesia .....	4	5.4. Model 3 hospitals and obstetrics .....	42
1. EXECUTIVE SUMMARY .....	12	5.5. Model 3 hospitals and trauma units .....	43
1.1. Role of the Anaesthesiologist .....	12	5.6. Model 3 hospitals and intensive care units ..	43
1.2. Unscheduled 24-hour care .....	12	5.7. Model 2 hospitals .....	44
1.3. 2 plus 2 model of Anaesthesia/Critical Care cover for unscheduled care .....	13	5.8. Transport medicine .....	44
1.4. Administration and governance .....	13	5.9. Conclusion .....	45
1.5. Model 2 hospitals .....	14	6. NATIONAL AMBULANCE SERVICE CRITICAL CARE RETRIEVAL SERVICES .....	46
1.6. Non-training NCHD posts .....	14	6.1. Overview .....	46
1.7. Consultant posts .....	14	6.2. Organisation of retrieval and transfer medicine services in Ireland .....	46
1.8. Other recommendations .....	15	6.3. Development of governance for specialist transfer and retrieval services .....	46
2. SPECIALTY OF ANAESTHESIOLOGY IN IRELAND .....	16	6.4. National Neonatal Transport Programme (children weighing <5 kg or from birth to six weeks corrected gestational age) .....	47
2.1. History .....	16	6.5. Irish Paediatric Acute Transport Service: (children weighing >3.5 kg and aged 16 years or younger) .....	47
2.2. Anaesthesiology training in Ireland .....	17	6.6. Mobile Intensive Care Ambulance Service: patients aged 16 years or older .....	48
2.3. Service provision .....	18	6.7. Locally sourced transport teams (LSTTs) .....	49
2.4. Current situation .....	20	6.8. Clinical governance of critical care patient transfers .....	49
3. CURRENT WORKFORCE .....	26	6.9. Ambulance provision by the NAS .....	51
3.1. Consultants .....	26	6.10. Aeromedical transport .....	52
3.2. NCHDs .....	27	6.11. Manpower projections for transfer and retrieval medicine .....	53
3.3. Model 2 .....	28	6.12. Education, training and research in retrieval .....	54
3.4. Model 3 .....	28	6.13. Specialist team training .....	54
3.5. Model 4 .....	30	6.14. Accreditation of education in transfer and retrieval medicine/nursing/paramedicine .....	55
4. STANDARDS REQUIRED FOR THE PROVISION OF ANAESTHESIOLOGY .....	31	6.15. Locally sourced team training – outreach education .....	55
4.1. Elective work .....	31	6.16. National standardisation of equipment .....	56
4.2. Out-of-hours/unscheduled care .....	33	6.17. Transport documentation .....	56
4.3. Departmental structures and governance ..	38	6.18. Standards and standard operating procedures .....	56
4.4. Electronic records .....	39	6.19. Transport metrics and audit .....	57
5. MODEL FOR UNSCHEDULED 24-HOUR CARE .....	40	6.20. Indemnity .....	57
5.1. Emergency services .....	40		

## MODEL OF CARE FOR ANAESTHESIOLOGY

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7.	PROVISION OF PAIN MEDICINE SERVICES ...	58	12.	QUALITY IMPROVEMENT IN ANAESTHESIOLOGY .....	85
7.1.	Acute pain management .....	58	12.1.	What is quality improvement? .....	85
7.2.	Chronic Pain - Consultant manpower requirements (quantity and qualifications) .	59	12.2.	What is quality assurance? .....	85
7.3.	Models of Care for Chronic Pain .....	59	12.3.	The model for improvement .....	86
8.	ASSISTANCE FOR THE ANAESTHESIOLOGIST .....	60	12.4.	Identifying areas for quality improvement. .	87
8.1.	The need for dedicated assistance for the anaesthesiologist .....	60	12.5.	Theatre Quality Improvement Programme .	88
8.2.	Post-anaesthetic care unit .....	60	13.	THE ROLE OF THE COLLEGE OF ANAESTHESIOLOGISTS OF IRELAND IN EDUCATION – Continuing Education and Professional Development (2018–2021) as the Model of Care Evolves .....	89
8.3.	Nursing .....	62	14.	ANAESTHESIOLOGY AND THE ELECTRONIC HEALTH RECORD .....	90
8.4.	Operating department practitioners .....	66	14.1.	Introduction .....	90
8.5.	Healthcare assistants/support workers .....	66	14.2.	Scope .....	90
9.	SERVICES FOR PATIENTS WITH MALIGNANT HYPERTHERMIA .....	67	14.3.	Options .....	92
9.1.	Introduction .....	67	14.4.	Procurement .....	93
9.2.	MH SERVICES IN IRELAND .....	67	15.	PLANNING AND PROVISION OF FACILITIES FOR ANAESTHESIOLOGY .....	94
9.3.	Cork University Hospital Malignant Hyperthermia Patient Pathways .....	69	15.1.	Holding bay .....	94
9.4.	Cork University Hospital Malignant Hyperthermia Unit – Work Description .....	72	15.2.	Anaesthetic room .....	94
9.5.	Future directions .....	72	15.3.	Operating theatre .....	95
9.5.1.	Model 1 – Comprehensive National MH Unit .....	73	15.4.	Recovery room .....	97
9.5.2.	Model 2 – CUH as ‘signpost centre’ for MH in Ireland .....	73	15.5.	Monitoring .....	97
9.5.3.	Model 3 – Transfer MH investigation to National Centre for Medical Genetics .....	74	16.	Useful Information & Links .....	98
9.5.4.	Model 4 – Discontinue MH services in Ireland .....	74	17.	ACKNOWLEDGEMENTS .....	100
9.6.	CONCLUSIONS .....	75	18.	REFERENCES .....	102
10.	NATIONAL POISONS INFORMATION SERVICE .....	76			
11.	HYPERBARIC MEDICINE SERVICES .....	77			

### GLOSSARY OF TERMS

AAGBI	Association of Anaesthetists of Great Britain & Ireland
ACP	Advanced Care Plan
ASA	American Society of Anaesthesiologists
AVLOS	Average Length Of Stay
CAI	College of Anaesthesiologists of Ireland
CEO	Chief Executive Officer
CNM	Clinical Nurse Manager
CNS	Clinical Nurse Specialist
DOSA	Day Of Surgery Admission
ECG	Electrocardiography
ESA	European Society of Anaesthesiology
HDU	High-Dependency Unit
HIPE	Hospital In-Patient Enquiry
HSCP	Health And Social Care Professionals
HSE	Health Service Executive
ICT	Information and Communications Technology
ICU	Intensive Care Unit
KPIs	Key Performance Indicators
M&M	Morbidity and Mortality
NCHD	Non-Consultant Hospital Doctor
NCPA	National Clinical Programme for Anaesthesia
NICE	National Institute for Health and Care Excellence
PAU	Pre-Admission Unit
PPGs	Policies, Procedures and Guidelines
RCOA	Royal College of Anaesthetists
SOP	Standard Operating Procedure
TOR	Terms Of Reference
TQIP	Theatre Quality Improvement Programme
WTE	Whole Time Equivalent

### 1. EXECUTIVE SUMMARY

The 2014 CAI report *Providing Quality, Safe and Comprehensive Anaesthesia Services in Ireland – A Review of Manpower Challenges*<sup>1</sup> stated that workforce planning is a difficult process due to a large number of variables. These include developments in technology, the resources available for recruitment, and the model of care for service delivery. The document sets out the principles that the Model of Care for Anaesthesiology should be based on and what it might look like in practice in the Irish healthcare setting.

#### 1.1 Role of the Anaesthesiologist

In the past 20 years, the role of the Anaesthesiologist has expanded exponentially from being a theatre-based specialty to one involved in critical care, resuscitation, pain medicine, the provision of anaesthesia, for radiological, cardiac and other procedures outside the theatre environment, transport of the critically ill, and responding to critically ill or deteriorating patients on wards or in the emergency department. This extensive perioperative role is further illustrated in a United Kingdom (UK) survey of maternity patients, where more than 60% of patients had some interaction with an anaesthesiologist.<sup>3</sup> The provision of a comprehensive Anaesthesia/Critical Care service requires a team structure that enables the delivery of an elective service and also requires a team to provide Emergency Anaesthesia/Critical Care Services on a 24-hour basis. It is essential that this team is able to provide an immediate and sustained response to more than one emergency. Second emergencies – such as a category-1 caesarean section or a cardiac arrest in the emergency department, intensive care unit (ICU), or on the wards, as well as the transfer of critically ill patients to other hospitals – can arise while the team is already involved with other operating room cases. The basic building block of this emergency Anaesthesia/Critical Care cover is the '2 plus 2' arrangement, which involves two consultants and two NCHDs, as detailed in Section 2.3: 2 plus 2 model of Anaesthesia/Critical Care cover for unscheduled care.

#### 1.2 Unscheduled 24-hour care

In the context of the safety recommendations published by the AAGBI, *Recommendations for standards of monitoring during anaesthesia and recovery 2015*,<sup>4</sup> together with the recommendations contained in the AAGBI and Obstetric Anaesthetists' Association (OAA) publication entitled *OAA / AAGBI Guidelines for Obstetric Anaesthetic Services 2013*<sup>5</sup> and in the Department of Health's *Creating a Better Future Together: National Maternity Strategy 2016-2026*,<sup>6</sup> the 24-hour provision of a clinically appropriate safe Anaesthesia/Critical Care service for unscheduled care represents a major challenge.

Providing diverse anaesthetic services across so many different areas/sites within a hospital where the level of demand on such a service varies widely presents a particular difficulty for the specialty.

Within the current national configuration there are more than 40 public hospitals in Ireland, and most of these provide emergency services. It is not feasible to provide these services to an internationally acceptable level of safety with current staffing levels. In the Hospital Group structures, there is a need to urgently review the present level of service with a view to reconfiguring services in order to make the best use of the Hospital Groups' Anaesthesia/Critical Care resources to provide the recommended safe level of emergency cover across fewer sites.



### 1.3 2 plus 2 model of Anaesthesia/Critical Care cover for unscheduled care

In order to provide a comprehensive service in our Model 3 hospitals, which, along with an Anaesthesia/Critical Care service, have a co-located obstetrics unit with a possible addition of a trauma service, we recommend the 2 plus 2 model of cover for unscheduled care as the minimum acceptable cover. This 2 plus 2 model should be the basic building block for 24-hour unscheduled care.

We define this as the availability, at all times, of an on-call Anaesthesia/Critical Care team of two consultants and two NCHDs. This team will be responsible for the whole service, including the ICU and obstetrics units. If there is a significant additional trauma caseload, a busy critical care service or a heavy burden of inter-hospital transfers, then further additions will need to be made to this model.

This increased availability of the on-call Anaesthesia/Critical Care Team, as well as the provision of structured rounds in ICUs on weekends and public holidays, can be regarded as a first step towards alignment with the Joint Faculty of Intensive Care Medicine of Ireland *National Standards for Adult Critical Care Services 2011*<sup>7</sup> and the Intensive Care Society of Ireland (ICSI).

In the area of particular subspecialties, such as cardiothoracic, neuro-anaesthesia and transplant services, the long-term national goal should be to create larger subspecialty centres, geographically sited according to population need, with clearly defined referral patterns. These centres should be staffed with an adequate number of appropriately trained subspecialty consultant anaesthesiologists, thereby providing a comprehensive 24/7 service.

The Health Information and Quality Authority (HIQA) publication, *Report of the investigation into the quality and safety of services and supporting arrangements provided by the Health Service Executive at Mallow General Hospital*, published in April 2011<sup>8</sup> recommended that the HSE and all healthcare service providers should take prompt action to ensure that the system of emergency care in any hospital providing 24/7 emergency care includes immediate access to clinical triage and assessment, resuscitation and diagnostic support and full-time on-site senior clinical decision-makers with the required competencies.

Where such arrangements are not achievable or sustainable, the HSE should make the appropriate arrangements to discontinue the emergency service.

### 1.4 Administration and governance

Strong and effective management of an individual hospital's Anaesthesia service is vital at clinical and managerial level in order to ensure implementation of operational policies and day-to-day management of the service. Management of an Anaesthesia service requires input from all relevant stakeholders within the hospital/hospital group through regular formal meetings and communication. Within the hospital this should include service users, health and social care professions (HSCP) and pharmacy. Local departmental management is best led by an Anaesthesiologist with an interest and education/experience in management. It is vital that the Anaesthesiologist is allocated the additional and appropriate amount of non-clinical time to perform these duties.

Effective governance arrangements recognise the interdependencies between corporate, financial and clinical governance across the service.

In order to fully support quality and safety of an individual department's Anaesthesiology service within a hospital/Hospital Group, governance should be clearly set out in the context of the overall perioperative group governance structure and its interface with the hospital management team. If clinical directorates are in place, appropriate line reports with the relevant clinical leads should be clear and unambiguous.

### **1.5 Model 2 hospitals**

Model 2 hospitals should continue to develop their services in line with the framework outlined in the HSE/ Department of Health publication *Securing the Future of Smaller Hospitals: A Framework for Development*<sup>9</sup>. This will lead to a situation where there will be no Anaesthesia/Critical Care out-of-hours cover required in such hospitals.

This should facilitate the appointment of new consultant staff to the Model 3 hospitals, with a commitment to provide appropriate daytime services in Model 2 hospitals. Further development of pre-admission services and elective day surgery in these units may provide these hospitals with a key role in the group structure in these specific areas.

### **1.6 Non-training NCHD posts**

Given Ireland's level of dependence on IMGs to maintain the present service across all specialties, it is important that the HSE addresses this issue. It must be decided whether there is a need for another grade of service doctor other than consultant or trainee. The exact role and position of such a grade of service doctor within the health service would need to be clearly defined. These posts may be permanent and pensionable, thus contributing to the establishment of a more stable workforce in the service. If the HSE accepts that there is a need to create another grade of service doctor other than consultant or trainee, the criteria for entry into such posts and the remuneration would need to be negotiated. Training for such posts might best be organised and supervised by a body such as the CAI.

### **1.7 Consultant posts**

In order to deliver a comprehensive service, it is clear that more consultants will be needed.

It is important that consultant posts in the Irish health service are attractive and well-structured, with reasonable on-call commitments and that they provide the incumbents with the opportunity to use their skills/training appropriately.

It is well-recognised that onerous clinical duties and unrealistic workloads eventually lead to professional burnout and health issues, including mental health problems. The Practitioner Health Matters Programme (PHMP) has reported that, internationally, up to 10% of medical practitioners have alcohol and substance misuse problems. However, there are no official statistics on the prevalence of this problem in Ireland.

<http://practitionerhealth.ie/substance-alcohol-misuse-healthcare-professionals/>

The *National Study of Wellbeing of Hospital Doctors in Ireland: Report on the 2014 National Survey*<sup>10</sup> published in 2017 by the Royal College of Physicians of Ireland (RCPI), demonstrated high levels of stress among Irish medical practitioners and there is evidence of a link between hours worked and self-reported well-being.

Therefore, well-structured posts with a reasonable work–life balance and career development opportunities are beneficial both to the individual and to the health service in general over a lifetime career. It is our belief that the on-call frequency for these onerous posts should be 1 in 8 roster.

Such posts will enhance the health service’s ability to attract and retain consultants in the future. Each individual consultant post must be structured with adequate non-clinical time for administrative, teaching and research activities. Appropriate cover arrangements must be in place for attendance at educational meetings and courses, as well as for the taking of annual leave.

The workload should allow for subspecialty interest as well as for maintaining general skills. It is important that the CAI and other bodies continue to train sufficient numbers of consultants in the various subspecialty areas in order to provide the numbers required to implement the vision of this Model of Care.

### **1.8 Other recommendations**

The Model of Care for Anaesthesiology recommends a review of the services provided for patients with suspected Malignant Hyperpyrexia, and it outlines a number of options for this service.

It recommends a similar approach for the investigation and care of patients who experience an allergic reaction while under anaesthetic.

The Model of Care for Anaesthesiology also recommends that trained assistants for the Anaesthesiologist be present on all occasions when Anaesthesia is administered, i.e. in both elective and emergency settings.

## 2. SPECIALTY OF ANAESTHESIOLOGY IN IRELAND

### 2.1 History

In October 1846, William T Morton made history in the operating department at the Massachusetts General Hospital by being the first doctor in the world to publicly and successfully demonstrate the use of ether anaesthesia for surgery. In November of that year, Oliver Wendell Holmes, in a letter to Morton, suggested the word 'anaesthesia' to describe the mental state produced by the inhalation of ether vapour. The word had first appeared in the *Universal Etymological English Dictionary*, compiled by Nathan Bailey, in 1751. In 1897, August Bier performed the first spinal anaesthetic.

In 1893, the *British Medical Journal* (BMJ) opined that "The only safe rule is always to have a second person present and when possible that person should be a doctor or better still a skilled physician Anaesthetist". In 1901, the BMJ similarly suggested that "for surgical Anaesthesia it is advantageous to have an administrator of such large experience as to make him more or less a specialist". Today, this remains the primary standard of care in Ireland and internationally. The *Recommendations for standards of monitoring during anaesthesia and recovery 2015*<sup>4</sup> gave priority of place to the mandatory full-time presence of an Anaesthesiologist in the operating theatre.

In 1922, the first edition of the journal *Anaesthesia and Analgesia* was published in the United States of America (USA). It was followed by the founding of the *British Journal of Anaesthesia* in 1923. The AAGBI was set up in 1932, and a Diploma in Anaesthesiology was introduced in 1935. The National Health Service (NHS) was established in the UK in 1948.

In 1948, consultant status ensued for Anaesthesiologists working in the NHS. The Faculty of Anaesthetists of the Royal College of Surgeons of England fellowship was introduced in 1953. The Irish Faculty of Anaesthesia was established in 1959 and was located in the Royal College of Surgeons in Ireland (RCSI) in Stephens Green in Dublin. In 1998, the CAI was set up and is located in Merrion Square in Dublin.

The practice of intensive care medicine developed following the polio epidemic in Copenhagen in 1952, during which time more than 300 patients required artificial ventilation for several weeks. By 1953, Bjørn Ibsen, the Anaesthesiologist who had suggested that positive pressure ventilation should be the treatment of choice during the epidemic, had set up the first ICU in Europe.

Ibsen assembled a group of physicians and physiologists to care for all such patients in a dedicated ward where each patient had their own nurse. During the 1960s and 1970s, ICUs were set up in the UK, and their function was supported by the rapid expansion in consultant Anaesthesiologists together with an increase in trainee Anaesthesiologists who could staff such units around the clock.

In Ireland, departments of Anaesthesiology and Intensive Care medicine were established in all acute hospitals. Initially, the specialty of Anaesthesiology was developed to provide safe anaesthesia for performing surgery on patients who needed an operation. The development of specialist anaesthesia services, including pre-operative assessment, optimisation and the planning of post-operative care, led to surgeons having the option to operate on patients they would have previously refused. The introduction of regional anaesthesia techniques also contributed to this.

The skill sets of Anaesthesiologists have proved beneficial in areas such as the care and resuscitation of the critically ill, the transport of the critically ill, the medical optimisation of patients prior to surgery and the

provision of anaesthesia for radiological investigations and interventions. These skill sets also extend to the management of acute and chronic pain.

The *Model of Care for Adult Critical Care*<sup>11</sup> outlines the standards and staffing required for this service. It incorporates a 'hub-and-spoke' model for hospitals, with eight designated hubs in Ireland. Most of the consultants staffing an ICU come from an Anaesthesiology background. In many hospitals, very few of these consultants work in the ICU full time, most work there part time, in addition to having a role in delivering the anaesthesia service.

The provision of a separate on-call service for the ICU must be examined in the context of sufficient consultant staff numbers in order to allow for a reasonable on-call rota, as well as a sufficient case mix and number of beds to justify this arrangement. As part of the Model of Care for Anaesthesiology, a comprehensive intensive care medicine service that provides for appropriate out-of-hours cover for ICUs in Model 3 hospitals will need to be developed. The 2 plus 2 model would be the starting minimum Anaesthesiology resource recommended in these hospitals. A vital part of this arrangement would be that the CAI, in conjunction with the JFICMI, would train sufficient numbers of trainees with a special interest in intensive care medicine.

Handover of patients in Anaesthesia and Intensive Care Medicine is an inevitable and essential aspect of anaesthesia care, particularly in the care of critically ill patients.

Handovers occur at every shift change, taking place two to three times in a 24-hour period. In an on-call system, care of critically ill patients is handed over to the on-call team at the end of the working day. This care can last until the next working day, or in some instances over a weekend. Consequently, handovers are an extremely important part of the ongoing care of these critically ill patients.

Breakdowns in communication are one of the leading causes of patient harm, and therefore handover is a key component of safe patient care in the Anaesthesia/Critical Care setting. A structured system of patient handover, such as ISBAR (Identify, Situation, Background, Assessment and Recommendation), is recommended. Continuous audit should be conducted so as to ensure that handovers are occurring efficiently and effectively. They facilitate the accurate transmission of the information required for safe patient care as stipulated in the Department of Health's National Clinical Effectiveness Committee publication entitled *Communication (Clinical Handover) in Acute and Children's Hospital Services: National Clinical Guideline No. 11*.<sup>12</sup>

### **2.2 Anaesthesiology training in Ireland**

Specialist anaesthesiology training in Ireland is regulated by the CAI. The duration of training is six years and includes at least six months training in Intensive Care Medicine and three months training in Pain Medicine.

The curriculum involves trainees passing examinations as well as achieving a set of defined competencies leading to a certificate of specialist training in Anaesthesiology, Intensive Care Medicine and Pain Medicine. This allows admittance of a qualified doctor on the specialist register in the Medical Council Specialist Division – Anaesthesiology. There are opportunities for further training in Ireland or abroad. There are two



recognised subspecialties in Anaesthesiology, Intensive Care Medicine and Pain Medicine. A further two years training in each of these areas as well as successful completion of an examination are required to achieve dual certification in either Anaesthesiology or Intensive Care medicine or in Anaesthesiology and Pain Medicine. One year of extra training in intensive care medicine, as well as successful completion of an examination, entitles the doctor to be described as having a special interest in intensive care.

The CAI will need to train sufficient doctors with these qualifications in order to provide for the implementation of the Model of Care for Adult Critical Care<sup>11</sup> in the future.

### **2.3 Service provision**

The provision of an anaesthesiology service may be divided into two parts.

Historically, the first role of the anaesthesiologist was to provide anaesthesiology for patients requiring surgery.

In the Irish health system, anaesthesiology is physician-delivered only and each patient is under the care of a consultant anaesthesiologist while in the operating room and recovery area. This care is mainly delivered by a team, including the consultant anaesthesiologist and an NCHD, as well as a trained dedicated nurse and recovery room staff. The provision of appropriate staffing is calculated by determining the surgical specialty's requirement for a number of operating sessions, with additional time allocated for pre-operation assessment/optimisation of patients. The leadership role played by anaesthesiologists in the pre-admission process is set out in detail in the *Model of Care for Pre-Admission Units*, which was published by the HSE in 2014.<sup>13</sup> In addition, time must be allocated for the post-operative care of each patient. Occasionally, this care can extend to observation and ongoing management in an ICU or high-dependency unit (HDU).

Anaesthesiology can also be provided outside of the theatre setting for complex radiological/cardiac or vascular procedures in adults or for more routine paediatric radiological procedures that require the child to be anaesthetised. Other areas where the provision of anaesthesiology may be required include the endoscopy suite and dental theatre. Patients with specific psychiatric conditions may be prescribed electroconvulsive therapy, and for this they will need to be anaesthetised.

Over time the role of the anaesthesiologist has been greatly expanded, moving from the operating theatre to other areas of acute care and pain management. The skills and competencies acquired during anaesthesiology training have been recognised as essential elements of emergency/resuscitation medicine, major trauma care, care of critically ill patients, transport of the critically ill, and in the management of acute and chronic pain. Anaesthesiologists also play a significant role in the training and education of other healthcare professionals in these areas.

The second element of service provision involves the 24-hour emergency anaesthesia/Critical Care service.

This includes the care of patients needing emergency surgery and the care of critically ill patients in the ICU. In addition, the service covers emergency calls to deteriorating patients in hospital wards or in the emergency department, as well as the transfer of critically ill patients to other hospitals. In any acute hospital, the provision of a comprehensive 24-hour emergency Anaesthesia service is complex and requires a very significant manpower resource commitment.

## MODEL OF CARE FOR ANAESTHESIOLOGY

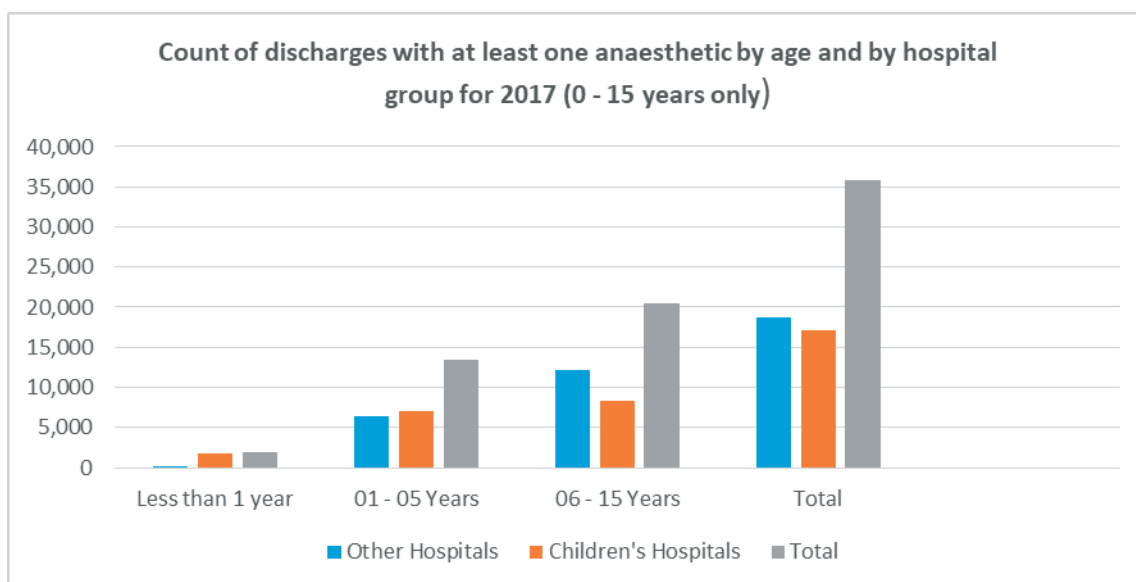
Since 2013, the NCPA and the Healthcare Pricing Office have produced an annual report on the number of general anaesthetics, neuraxial blocks and regional blocks administered in public hospitals in Ireland as captured in the Hospital In-Patient Enquiry (HIPE) system.

The reports clearly acknowledge that this only represents one aspect of the work undertaken by anaesthesiologists, they also note that the total number of all three anaesthetic types has remained more or less consistent, at approximately 230,000 per year (Table 1).

Year	2013	2014	2015	2016	2017
Anaesthetic type	Anaesthetic count				
General	173,564	174,976	170,879	168,304	169,640
Neuraxial block	53,565	53,075	53,609	53,058	52,692
Regional	7,312	7,623	7,900	8,414	9,466
<b>TOTAL</b>	<b>234,441</b>	<b>235,674</b>	<b>232,388</b>	<b>229,776</b>	<b>231,798</b>

*Table 1 - Number of anaesthetics administered, by anaesthetic type, 2013–2017 (NCPA/HPO Annual Report 2014 & 2015)*

The reports also provide data on gender, age and American Society of Anaesthesiologists (ASA) status of the discharges reporting an anaesthetic procedure. The 2017 report breaks down this information according to Hospital Group. For future planning purposes, the report can provide data on paediatric anaesthetic procedures carried out in all hospitals and compare this with the number carried out in exclusively paediatric hospitals (Figure 3). The reports indicate that around 10% of procedures are carried out as emergencies, which is significantly lower than the figure captured in the 2014 NAP5 report entitled *Accidental Awareness during General Anaesthesia in the United Kingdom and Ireland: Report and findings*.<sup>14</sup> The reasons for this discrepancy are being sought. The annual reports from the NCPA and the Healthcare Pricing Office will thus continue to provide useful data to assist with manpower planning.



*Figure 3 - Describes the number of patient discharges reporting an anaesthetic procedure(s) in 2017 by age and hospital group as reported to HIPE (NCPA/HPO Annual Report 2017)*

### 2.4 Current situation

In an acute hospital setting, the on-call anaesthesiology team may be involved in providing cover for all emergency surgery, including trauma. It may also be involved in providing epidural analgesia for the labour ward and in providing cover in theatre for obstetric emergencies such as emergency caesarean sections, cases of obstetric haemorrhage, and postpartum emergencies such as retained placenta. In most Irish hospitals, the on-call anaesthesiology team also provides out-of-hours and weekend cover for the ICU. This team can be called to the emergency department or to the wards to assist in the care of a deteriorating adult or paediatric patient. All hospitals have introduced the National Early Warning Scoring system (NEWS) and this has resulted in the Anaesthesia service being called more frequently and having to review increasing numbers of patients on the wards. One of the Anaesthesiologists on-call always carries a cardiac arrest bleep and attends all cardiac arrests with the cardiac arrest team.

Generally, in Irish hospitals only the larger units employ full-time intensivists. In most hospitals, dedicated ICU cover is provided by the Department of Anaesthesiology during normal working hours (i.e. Monday to Friday).

Not infrequently, critically ill patients will require urgent transfer to another centre for specialised care, e.g. neurosurgery or neuro ICU management, in-hospital transfer to the ICU or a HDU, or transfer from a Model 2 hospital to a Model 3 or Model 4 hospital, depending on the nature of the illness/injury or critical complexity of the case.

The transfer of critically ill adult or paediatric cases may require that the patient is accompanied by an anaesthesiologist moreover, where the transfer of a patient to a distant tertiary hospital is involved, it can mean that the accompanying anaesthesiologist is away from the base hospital for up to 10 hours.

The implementation of a national retrieval service is ongoing at present for critically ill adult, paediatric and neonatal cases. It is planned to have three adult retrieval service hubs one in Dublin, Cork and Galway respectively and to base a single paediatric retrieval service at the National Children's Hospital in Dublin. The National Neonatal Transport Programme currently operates from the three maternity hospitals in Dublin.

While these services will contribute greatly to the safe transfer of critically ill patients in Ireland, it will not be appropriate or possible to use the service in all cases.

Time-sensitive transfers such as head injuries, etc. will still, in most cases, need to be transported to neurosurgical units by members of the Anaesthesiology team in the hospital where the patient presents. Currently, the retrieval service is not in a position to provide 24/7 service for adults or paediatric cases. However, the service proposes to offer training to those non-specialist transfer teams in addition to standardising transport equipment and vehicles.

This emergency anaesthesia service has to be provided on a 24/7 basis, 365 days a year. Because of the very onerous nature of this on-call work, it requires a reasonable on-call frequency and an appropriately skilled team to deliver it. We believe that for such onerous work, the on-call frequency should not be more frequent than 1 in 8. This situation is common to many other acute specialties, e.g. acute medicine, surgery, trauma, paediatrics, and obstetrics. If the working conditions are not standardised and compatible with a reasonable work-life balance, it becomes difficult to attract and retain staff in these specialties. This will

continue to have a major impact on attracting and retaining staff, particularly in the smaller, geographically peripheral hospitals.

The onerous nature of this emergency cover places demand on the on-call consultant and raises the question of the effect of age on the individual's ability to deliver this intense level of service on a 24-hour basis.

Consultants over a particular age opting out of on-call duty is a feature of many health systems.

A 2016 special issue of *Anaesthesia News*, 'Age and the Anaesthetist'<sup>15</sup> reported on the findings of a working party investigating the issue, highlighting that while ageing is inevitable, the pace of physical and psychological change is highly variable.

While the volume of data is small, there is some emerging evidence that some older anaesthesiologists may have reduced clinical performance and that an anaesthesiologist's age per se could be a risk factor in patient safety. An AAGBI guideline published in 2014, *Fatigue and Anaesthetists*<sup>16</sup> states that it is the personal responsibility of each practitioner to be aware of personal fatigue and to provide a safe and effective anaesthetic service. Personal insight appears to be the key.

It is therefore appropriate that each hospital has a facility in place to review older Anaesthesiologists' out-of-hours working so that it can address any concerns that an individual might raise. These Anaesthesiologists, as a result of their long experience, can continue to contribute to the service in many beneficial ways. It may be appropriate to reduce or stop nocturnal on-call duties and instead undertake increased daytime clinical activities or scheduled weekend activities. Additional non-clinical duties, such as management and educational/training roles, are also options.

This provision for older consultants not to do on-call duty already exists on an informal basis in a number of hospitals. However, the details of each local arrangement are dependent on the age profile and the number of consultants in the department. A department has to have sufficient numbers to ensure a tolerable on-call frequency for those remaining on the on-call roster. The criteria for eligibility to cease on-call duty need to be clearly laid down. It should also be highlighted that age may not be the only factor to be taken into consideration. Frailty and personal health are likely more relevant than age alone when considering whether an individual can perform nocturnal and high-intensity/stressful on-call work.

At present, an emergency Anaesthesia/Critical Care service needs to be provided in all Model 3 and Model 4 hospitals. Under the *Securing the Future of Smaller Hospitals* framework document<sup>9</sup> it is not proposed to deliver an emergency Anaesthesia/Critical Care service in Model 2 hospitals. Some of the Model 3 and Model 4 hospitals have a co-located maternity unit. The National Maternity Strategy (2016–2026) recommends a separate dedicated Anaesthesia service for obstetrics.

This is in part due to there being a defined minimum response time of 30 minutes to delivery of the baby when a category-1 emergency caesarean section is called.

This can be difficult to achieve if the Anaesthesiology team is involved in the care of another patient in theatre or with a critically ill patient in the ICU, the emergency department or on the wards. It could also be that one team member is away from the hospital accompanying a critically ill patient on transfer to another unit.

Classification of emergency caesarean sections	
1	Immediate threat to life of woman or foetus
2	Maternal or foetal compromise – no immediate threat to life of woman or foetus
3	Requires early delivery
4	No maternal or foetal compromise at a time to suit the woman and maternity services

**Table 2 - 'Classification of Urgency of Caesarean Section – A Continuum of Risk (Royal College of Obstetricians and Gynaecologists & The Royal College of Anaesthetists)**

Traditionally the on-call anaesthesiology team consisted of a consultant with one or two NCHDs. Outside of normal working hours and at weekends, this was the emergency anaesthetic cover available. At present, the general understanding of normal working hours in the Irish health system is considered to be from 8.00am to 5.00pm or 6.00pm, with some minor variations in particular units. This means that a lot of hospitals are working on an on-call basis for anything up to two-thirds of each day and from 5.00pm on Friday to 8.00am on Monday.

The current focus is on extending this concept of the normal working day to 10 or 12 hours in order to improve theatre efficiency. It can also be viewed as a method of providing greater patient safety by ensuring that a greater part of the service offered to emergency cases is delivered while the hospital is working at normal staffing levels.

In the larger Model 4 hospitals, the on-call anaesthesiology team has increased in numbers with specialised areas, such as obstetrics or the ICU, having a dedicated team consisting of a consultant and an NCHD for each of these areas. In some Model 4 hospitals this may extend to separate specialty teams for cardiothoracic, neuro-anaesthesia and transplantation services, for example. Internationally, subspecialty teams exist for these areas. There is built-in flexibility in these systems that allows crossover in order to assist other anaesthetic colleagues who are dealing with complex or more than one emergency in a particular area.

In the *Securing the Future of Smaller Hospitals* framework document<sup>9</sup> it is proposed that Model 2 hospitals provide an Anaesthesia service that covers lists of non-complex day case procedures.

This anaesthesiology cover is provided by consultants from a base or lead hospital department within the Hospital Group. Hospital Group consultants participate in the on-call rota in the lead hospital as well as doing a certain proportion of their weekly rostered work in that hospital. This can be a useful method of manpower deployment within the Hospital Group structures now in place, where consultants are appointed to the Group rather than to a specific hospital.

Clinical skills are maintained by working on the delivery of the more specialised services in the base or lead hospital. Service delivery of appropriate procedures in a Model 2 hospital setting by consultants from the base hospital takes pressure off the operating theatres in the base or lead hospital. The selection of appropriate patients will be based on surgical procedure type, ASA grading (Figure 4) and the patient's social circumstances.



ASA class	Definition	Examples, including, but not limited to:
I	A normal healthy patient	Healthy, non-smoking, no or minimal alcohol use.
II	A patient with mild systemic disease	Mild diseases only without substantive functional limitations. Examples: current smoker, social alcohol drinker, well-controlled Diabetes Mellitus (DM), Hypertension (HTN), or mild lung disease.
III	A patient with severe systemic disease	Substantive functional limitations; One or more moderate to severe diseases. Examples: poorly controlled DM or HTN, Chronic Obstructive Pulmonary Disease.
IV	A patient with severe systemic disease that is a constant threat to life	Examples: recent (<3 months) Myocardial Infarct, stents, ongoing cardiac ischemia or severe valve dysfunction, severe reduction of ejection fraction, sepsis.
V	A moribund patient who is not expected to survive without the operation	Examples: ruptured abdominal/thoracic aneurysm, massive trauma.

**Figure 4 – ‘ASA Physical Status Classification System’ American Society of Anaesthesiologists**

There are 19 maternity units in Ireland. Four are standalone maternity hospitals, although plans are in place to move these to a co-located site within a general hospital setting. This will improve access to facilities such as intensive care and interventional radiology, which are not provided for in these stand along maternity units.

In the remaining 15 hospitals with a co-located maternity unit, only four have a dedicated obstetric Anaesthesia service.

At present, the development of a National Trauma Strategy will help clarify the number of major trauma centres and trauma units required (Figure 5) and may suggest where they should be located.

This will then contribute to the decision-making regarding the provision of appropriate Anaesthesiology resources to match the role of the hospital.



management of these cases, demands a huge input from consultants. Difficulties in recruiting NCHDs with the appropriate skill level have increased this reliance on consultants.

The CAI has 240 recognised training places. In addition to these, there are at least the same number of non-training NCHDs employed throughout Ireland to maintain the present 24-hour rosters on the many sites where emergency services are currently delivered. These doctors are in what are described as non-training or service posts. With full implementation of the European Working Time Directive (EWTD) on all these sites, the number of NCHDs is likely to increase further in Irish hospitals.

In the development of the Model of Care for Anaesthesiology, we have described the situation as it is today. If the service is left unchanged, current problems will continue, especially as the population ages and the service demand increases. The present service is facing difficulties in attracting and retaining both consultants and NCHDs. In many parts of Ireland it is difficult to sustain the present level of service. This in itself represents the strongest possible argument for the need for immediate change. In proposing a solution, we have researched the published best practice recommendations in anaesthesiology that we think are appropriate for Ireland. From these we have agreed a set of basic principles of good practice as a guide for our work. Because our proposals are for a national Model of Care, we have considered issues of equity and access to the system. This document will propose a Model of Care for Anaesthesiology that builds on the work of the CAI's 2014 report, *Providing Quality, Safe and Comprehensive Anaesthesia Services in Ireland – A Review of Manpower Challenges*.<sup>1</sup> The report noted that one of the difficulties in manpower planning for future anaesthesiology services was the absence of a model of care for anaesthesiology, hence, we now propose this Model of Care for Anaesthesiology in Ireland.

### 3 CURRENT WORKFORCE

#### 3.1 Consultants

The CAI trains doctors to consultant level to deliver Anaesthesia services for all surgical specialties, Critical Care, and Pain Medicine. This is done both in isolation and together, taking into account synergies, overlaps and inter-relationships between Anaesthesiology, Critical Care, and Pain Medicine. As such workforce planning must look at these three different specialties. Anaesthesiology is recognised as a specialty by the Medical Council and the CAI is the only postgraduate training body (PGTB) recognised to train doctors to practice Anaesthesiology in Ireland.

The JFICMI – which is a faculty of the CAI, the RCPI and the RCSI – is the advisory body for intensive care training, accreditation and standards. Although, in theory, graduates of any of the JFICMI's parent colleges may pursue a career in intensive care medicine, in practice the vast majority of practitioners currently come from an Anaesthesiology background. Intensive care medicine has specialty status recognition with the Medical Council.

The CAI Faculty of Pain Medicine regulates the training and assessment of pain medicine specialists in Ireland. It also runs the Diploma and Fellowship in Pain Medicine for pain practitioners. A graduate of one of the other postgraduate training bodies may seek a career in pain medicine but in practice, almost all practitioners are consultant Anaesthesiologists who allocate a proportion of their sessions to delivering acute and chronic pain services.

In order to estimate projected Anaesthesiology workforce numbers, we therefore need to look at the numbers in each of these specialties. Many intensive care and pain medicine practitioners also practice Anaesthesiology, and so will be included in Anaesthesiologist numbers.

- The NCPA surveyed all anaesthetic departments in late 2016 with the intent of ascertaining current manpower and work practices. There were 319 whole time equivalent (WTE) consultant posts occupied by permanent appointees in public hospitals in Ireland at that time. The actual number of anaesthesiologists practising is likely to be higher, as some of these WTEs are made up of part-time providers. NDTP estimates that there are 40 part-time anaesthesiologists in 20 WTE posts. If so, the actual number of HSE anaesthesiologists is approximately 339.
- In addition to the 319 WTE posts, a further 43 approved posts were vacant at the time of our survey. **The approved total of consultant anaesthesiologist posts in Ireland is therefore 362 posts.** This is similar to the HSE NDTP estimate of 363 approved posts from May 2016, as outlined in '*NDTP Medical Workforce Planning Ireland – A Stepwise Approach*' (2016).
- Along with the 319 WTEs staffing anaesthesiology departments, there are currently 45 locum consultants working in the service. We would assume that the majority of these are working in the vacant posts. The result of this is that approximately 12% of approved consultant posts are unfilled. This is in line with the percentage of vacant posts in other medical specialties in Ireland at present.

### 3.2 NCHDs

The survey carried out by the NCPA also reveals that there are 223 WTE anaesthesiologists in training posts in Ireland and a further 266 NCHDs in non-training posts. *Providing Quality, Safe and Comprehensive Anaesthesia Services in Ireland – A Review of Manpower Challenges*<sup>1</sup> recorded these figures as 206 and 255, respectively. There has been an increase of 26 NCHDs nationally since 2015 with the number of trainees in CAI approved posts and the number of non-training scheme doctors working in anaesthesiology each increasing by a broadly similar number. The number of doctors in non-training posts remains greater than those in CAI recognised training posts. These NCHDs in non-training posts play a major role in service provision, in addition to contributing significantly to making on-call rotas EWTD compliant. They are registered with the Medical Council General Division and are required to participate in a competence assurance scheme with the CAI. This situation is mirrored in many specialties. These doctors have mostly received their undergraduate medical education outside of Ireland and may have undertaken some postgraduate training in other countries prior to coming to Ireland. The non-recognised posts held by this group of IMGs are usually of one year’s duration and can be renewed.

It continues to be a matter of concern that such a significant number of NCHDs – more than 250 – are in non-training posts. This makes for a very unstable workforce with NCHDs moving around from hospital to hospital with little or no prospect of career progression. While some of these doctors continue to train and take the examinations, others may be in Ireland for economic reasons. Having trained in their own country they are uninterested in training in the Irish system and are not eligible for specialist registration here.

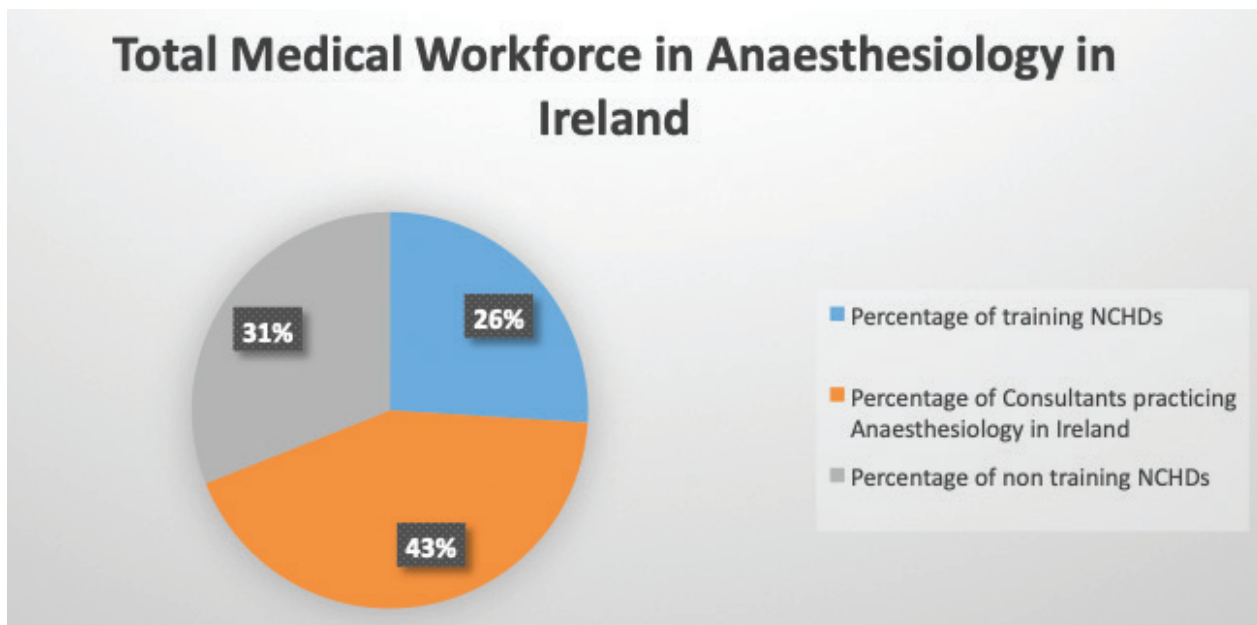


Figure 6 – NCPA 2016 Survey of Total Medical Workforce in Anaesthesiology in Ireland

The benefits to the Irish health system of a stable workforce have often been alluded to. On many previous occasions, discussion has taken place on the creation of a non-training permanent grade NCHD in the Irish health service.

Consensus on this matter has not been reached. In anaesthesiology this has been a divisive issue and there is no clear agreement on such a grade of non-training doctor, nor is there agreement on the terms and conditions of employment for such doctors. The minimum criteria for such a post would be a clear academic level of achievement, plus an agreed level of competence. These doctors’ role in an anaesthesiology service



would need to be clearly defined, including the level of supervision required. To make these posts attractive to the right applicants, they would need a defined salary scale with a pathway to advancement, as well as a permanent pensionable contract. When *Providing Quality, Safe and Comprehensive Anaesthesia Services in Ireland – A Review of Manpower Challenges*<sup>1</sup> was published, it was assumed that the numbers of IMGs in non-training posts would decrease and eventually disappear. In 2003, the Chairperson of the National Task Force on Medical Staffing, David Hanly, recommended in the *Report of the National Task Force on Medical Staffing*<sup>18</sup> that more consultants should be appointed to deliver a more consultant-based service. We acknowledge that a change in the consultant's contract would need to be negotiated in order to provide the terms and conditions for consultants to live in the hospital when on-call.

This has not happened, and as long as the present structure of NCHDs providing in-house, on-call cover exists, there will be a need for this large number of NCHDs in order to ensure that the rosters are EWTD compliant.

Another major factor in the need for this number of NCHDS is whether we elect to continue to provide 24-hour unscheduled care across the large number of sites in existence today.

The training competencies and examinations associated with eligibility for such non-training posts might best be organised and supervised by a body such as the CAI. Responsibility for curriculum development could then be placed with the CAI and a national scheme put in place to organise intake of suitable candidates and provide a scheme of rotations on a national basis. HSE funding would be required for this. There would be a need to look at issues such as equivalence of training received in other countries when joining such a scheme or when applying for one of these posts. This is another area where the CAI has a good deal of experience.

The issue of a permanent non-training grade of NCHD needs to be discussed across all specialties in the Irish health service. Agreement on the role, and the qualifications required for such posts, would have to be reached for all specialties. Pay and conditions of service would require involvement of the representative organisation for doctors.

### 3.3 Model 2

The 2013 *Securing the Future of Smaller Hospitals: A Framework for Development*<sup>9</sup> document suggested that Model 2 hospitals should have no on-call anaesthesiology cover. From the NCPA 2016 national survey, it appears that an on call Anaesthesiology service still exists in a number of Model 2 hospitals. Furthermore, Model 2 hospitals have been subcategorised into Model 2S and Model 2R. Our understanding is that this has no implications for Anaesthesia emergency on-call cover in these hospitals.

### 3.4 Model 3

There are 20 Model 3 hospitals in Ireland. Of these 20 Model 3 hospitals, 13 provide obstetric services and all also provide ICU care (*at the time of writing this Model of Care, the status of University Hospital Waterford was not clear and is included as a Model 3 in this section of the document. It's designation may be confirmed as a Model 4 hospital at a later point*).

The minimum out-of-hours on-call requirements for these hospitals is the 2 plus 2 model, i.e. two consultants and two NCHDs however, only one hospital Our Lady of Lourdes Hospital, Drogheda currently provides this level of cover.



## MODEL OF CARE FOR ANAESTHESIOLOGY

None of the other Model 3 hospitals have two consultants on-call. Eight of the twelve have two NCHDs on-call out-of-hours the other four have only one consultant and one NCHD covering obstetrics, ICU and theatre on call. In addition, six of the hospitals have consultant rotas more onerous than a 1 in 6. At NCHD level, eight of the rotas are more onerous than a 1 in 6.

We acknowledge that rotas of 1 in 8 are required for long-term sustainability and attractiveness of posts. However, as an initial step in this incremental process of getting to a 1 in 8 rota, we have chosen to look at the implications of transitioning these 12 hospitals to a 2 plus 2 model on the basis of a 1 in 6 rota. This will require an additional 41 NCHDs and 73 consultants. These numbers are spread across 12 hospitals.

The resource implications associated with a 2 plus 2 staffing model are significant. The daytime workload will not merit this staffing level in many of these hospitals and there will be a discord between the elective workload anaesthesiology staffing requirement and the out-of-hours emergency care anaesthesiology staffing requirement in these hospitals. From both a resource and efficiency viewpoint, a reconfiguration of services delivered at these hospitals would be beneficial.

Hospital	No. of WTE consultants	On-call rota	ICU rota	Theatre	Obstetrics rota	NCHDs on-call	Need for extra NCHD rota	NCHD rota	NCHDs needed 2 + 2	Consultants needed 2 + 2
Midland Regional Hospital, Mullingar	5	1:5	1 shared			2	0	1:5	2	7
St Luke's General Hospital	6	1:6	1 shared			1	1	1:6	6	6
Wexford General Hospital	4	1:4	1 shared			2	0	1:4	4	8
Midland Regional Hospital, Portlaoise	3	1:3	1 shared			1	1	1:5	7	9
Cavan General Hospital	6	1:5	1 shared			1	1	1:7	5	7
Our Lady of Lourdes Hospital, Drogheda/Louth County Hospital Dundalk/Our Lady's Hospital, Navan	20	1:6/7	2			3	0	15	0	0
			n/a	n/a	n/a					
			1	n/a	n/a					
University Hospital Kerry	6	1:6	1 shared			2	0	1:8	4	6
South Tipperary University Hospital	5	1:5	1 shared			1	1	1:05	7	7
University Hospital Waterford	9	1:6	1 shared			2	0	1:05	2	3

Letterkenny University Hospital	8	1:8	1 shared with obstetrics	1	1 shared with ICU	2	0	1:06	0	4
Mayo University Hospital	7	1:7	1 shared		2	0	1:06	0	5	
Portiuncula University Hospital	5	1:4	1 shared		2	0	1:4.5	3	7	
Sligo University Hospital	8	1:6	1 shared		2	0	1:05	2	4	
<b>TOTAL NO.</b>	92							42	73	

**Table 3 - This table indicates the number of consultants required to bring all rotas in the 13 hospitals with a co-located maternity unit to a 2 plus 2 on-call arrangement on a 1 in 6 rota. This is an interim step to the recommended 1 in 8 rota. (NCPA Survey 2017)**

### 3.5 Model 4

Model 4 hospitals should have separate rosters for the ICU, theatre and obstetrics units (if a maternity service is provided on that site). Such an arrangement may potentially require a further roster for any subspecialty services provided by the hospital, e.g. cardiothoracic or transplant services.

With the exception of University Hospital Limerick, all other Model 4 hospitals have separate ICU rosters. Most have a single consultant covering theatre out-of-hours, although University Hospital Galway, the Mater Misericordiae University Hospital in Dublin and St James’s Hospital in Dublin have two consultants on-call for theatre. Of the three Model 4 hospitals with obstetric facilities, two have separate obstetric on-call rosters. University Hospital Galway does not have a separate dedicated obstetric roster.

Most Model 4 hospitals have rosters of 1:6 or greater. In Cork University Hospital, although there are 28 consultants and three rosters, the frequency of call is stated as 1 in 5.

It is possible that local arrangements are in place in some large hospitals where older members in a department are excused from on-call duty once they reach a particular age.

Overall, Model 4 hospitals appear to have sufficient numbers of consultants to satisfy the standards for out-of-hours service delivery. Organisational changes may be required in University Hospital Galway and University Hospital Limerick in order to provide separate obstetric and ICU rosters respectively.

There are three standalone maternity hospitals in Dublin and one in Limerick. All have plans to move to a co-located site with a Model 3 or Model 4 hospital. As of 2018, all three hospitals in Dublin have two resident NCHDs and a single consultant on-call. This should be maintained as a minimum acceptable level of cover in such single-specialty standalone maternity hospitals pending the move to a co-located site. The only hospital requiring additional manpower is the Coombe Women & Infants University Hospital in Dublin, where a single consultant is required in order to bring the on-call roster to a minimum of 1:6.

### **4. STANDARDS REQUIRED FOR THE PROVISION OF ANAESTHESIOLOGY**

The NCPA has aggregated certain minimum standards/guidelines for service delivery of anaesthesiology and manpower planning for hospitals and networks. Many of these standards have been published already by professional bodies, including the CAI, the JFICMI, the AAGBI and the Irish Society of Obstetric Anaesthesia. In addition, during the course of developing this document, certain consensus guidelines have emerged from the anaesthesiology and intensive care community.

#### **4.1 Elective work**

##### **(a) Anaesthesiology providers**

The NCPA supports the principle that only anaesthesiologists whose names are included in the Medical Council's Register of Medical Specialists (Division of Anaesthesiology) or who are eligible for inclusion, should practise independently, i.e. as consultants (Medical Practitioners Act 2008). Although non-physician anaesthesiologists play a role in the delivery of anaesthesiology services in many countries in Europe and in North America, we do not consider that they have a role to play in Ireland. This would be consistent with the position adopted in the NHS in the UK, which has a hospital organisation and service delivery structure similar to Ireland's. In general, the use of non-physician anaesthesiologists exists in countries with considerable differences in structure and standards from those of both Ireland and the UK.

##### **(b) Consultant staffing**

Because Anaesthesia and Critical Care are both 24/7 services, consultant staffing levels are dictated by both the elective requirements and out-of-hours requirements. In many institutions these numbers may match. However, this may not always be the case, particularly where smaller hospitals are required to provide anaesthesia care to surgical emergencies or obstetric emergencies, along with having responsibility for critical care services. The services provided in a scheduled form by a department of Anaesthesia/Critical Care cover a very wide breadth. The theatre workload of a general Anaesthesiologist would be a combination of pre-, intra-, and post-operative anaesthetic care as well as a dedicated amount of time for administrative, teaching and educational activities.

The role of designated trainers and CAI tutors should be recognised, with time allocated in their departmental and personal job plans.

A standardised template for such activities applicable to all consultant posts would be very useful. This then could be developed to allow for subspecialty interests. Pain Medicine and Intensive Care Medicine are the main subspecialty areas associated with Anaesthesiology.

For elective work the number of consultants required depends on the services delivered, which may include elective theatre work, obstetric care, critical care, pain medicine service delivery and pre-operative assessment. In Model 4 centres, daily and weekly elective theatre scheduling for certain subspecialty areas (e.g. cardiac and neuro-anaesthesiology) needs to be factored in. The elective requirements for obstetric services, pain and critical care are detailed below. It has been calculated that elective theatre work of eight hours' duration requires 1.8 WTEs to staff one anaesthesiology site for 52 weeks of the year, when the weekly clinical workload and leave are taken into consideration. Elective theatre work provision is dependent on the local theatre scheduling policy and list duration. For example, in the context of an extended working

day, this will impact on the number of WTEs needed to staff a theatre. To be more accurate, we would recommend using two WTEs to staff a theatre five days a week on an extended working day basis. Because of the number of personnel involved and the often complex, expensive and specialised equipment required for some procedures in our general theatres, it is an area of enormous cost. For the health service, it is vital that these theatres and the equipment in them are used to maximal efficiency. This reinforces the concept of using them for extended days and at weekends. Agreed start and finish times need to be put in place by the perioperative directorate, with constant auditing of adherence to these start and finish times.

### **(c) Obstetric anaesthesiology**

During working hours, a Department of Anaesthesiology must provide an epidural service and Anaesthesia for elective caesarean sections and other planned obstetric procedures. During daytime hours the epidural service could be considered elective as can the provision of a pre-assessment/information-provision service to prospective parturients. In addition, a designated Anaesthesia and Critical Care emergency team must be promptly available on a 24-hour basis for category-1 caesarean sections and for haemorrhaging or deteriorating critically ill obstetric patients. The epidural service also has to be provided outside of normal working hours.

Recommendations from the AAGBI state that an on-call anaesthesiologist must be immediately available for emergency work on the labour ward 24 hours a day. If the on-duty anaesthesiologist is an NCHD, a consultant anaesthesiologist must be available to assist them at all times.

If the on-duty anaesthesiologist is a consultant, the workload of the unit may dictate the need for additional manpower in order to deliver a safe service, and therefore contact details of a backup anaesthesiologist should be available at all times.

### **(d) Critical care**

The JFICMI standards dictate that there should be one critical care specialist per 12 beds present in a unit during normal working hours. These consultants should be supplemented by training NCHDs. NCHDs should have a minimum roster of one NCHD per six beds and no other commitments.

### **(e) Pain medicine**

The requirements for the provision of a comprehensive pain medicine service are outlined in Chapter 8 – Provision of Pain Medicine Services. The service provides for delivery of a large part of the service in Model 3 hospitals in the regions close to where patients live with more complex procedures being delivered in a small number of centres. The posts in regional hospitals would involve anaesthesiologists working up to 50% of their time in pain medicine and the remainder in general anaesthesiology services. This would maintain their contribution to the general on-call rotas in these hospitals.

### **(f) Work scheduling**

All scheduled lists should have defined start and finish times and these times should be adhered to. The precise start and finish times can be decided locally by theatre management and it is recognised that for some specialties the duration of the list may need to be 12 hours, rather than the customary 8 hours.

### **(g) Emergency theatre**

Every hospital should have theatre space available for emergency cases during the hospital's weekly elective schedule. For Model 4 hospitals, this would probably mean the availability of an all-day emergency theatre.

In Model 3 hospitals, the time dedicated to emergencies may be somewhat less and can be decided locally, based on anticipated demand.

The aim is to complete as much emergency work as possible within routine hours. The National Confidential Enquiry into Patient Outcome and Death (NCEPOD) in the UK<sup>19</sup> has clearly demonstrated improved patient outcomes in this scenario compared with operations performed out-of-hours by less experienced personnel.

### **(h) Day case surgery**

Standalone day case theatre suites should have 2 Anaesthesiologists available during working hours. This may be a consultant and an experienced Anaesthesiology trainee or two consultants as recommended by the British Association of Day Surgery (BADs)

### **(i) Pre-admission service**

The Pre Admission service will require dedicated consultant sessions calculated according to the guidelines published in the Model of Care for Pre-Admission Units.

## **4.2 Out-of-hours/unscheduled care**

### **(a) Rosters**

The 2003 *Report of the National Task Force on Medical Staffing*<sup>18</sup> recommended a 1 in 7 rota to staff a 24-hour on-site service for an average of 52 hours per week. The NCPA recommends that in planning the service, the aim for consultants and trainees should be for a 1 in 8 roster.

However, given the present situation in many hospitals, we strongly advocate as a first step that trainee and consultant rosters should not be more onerous than 1 in 6. This 1 in 6 roster, as the minimum acceptable for all 24/7 services (i.e. anaesthesiology, critical care and obstetric anaesthesiology), must include cover for holidays and study leave.

Realistically, to achieve this 1:6 on-call frequency, up to eight staff are required to be allocated to each roster once annual leave and study leave are accounted for and including other less predictable leave types, such as parental/sick/compassionate leave.

### **(b) Services requiring 24/7 cover in Model 4 hospitals**

Model 4 hospitals will have a regional ICU a theatre complex and may have a maternity or major trauma unit. Covering these services 24/7 will require a minimum of:

- Six consultants and six NCHDs to cover theatre activity out-of-hours, i.e. one roster of NCHDs and one roster of consultants at a minimum. It needs to be pointed out that such a 1:6 roster, allowing for holidays and study leave, will require at least seven or eight consultants.
- Where a maternity unit is co-located an additional six consultants and six NCHDs will be required. *Creating a Better Future Together: National Maternity Strategy 2016-2026*<sup>6</sup> recommended a dedicated

obstetric anaesthesiology service, and *OAA/AAGBI Guidelines for Obstetric Anaesthetic Services 2013*<sup>5</sup> stipulates that there must be a dedicated on-duty anaesthesiologist immediately available (i.e. within five minutes) 24/7 where the on-duty anaesthesiologist is a consultant, another consultant should be available as immediate backup as necessary.

- In the ICU the recommended staffing level during routine hours is one consultant per 12 ICU beds and one NCHD per six ICU beds. Out-of-hours, the ratio is lower: one consultant per 30 beds and one NCHD per 12 ICU beds. A hub ICU will therefore require two resident NCHDs and one consultant on-call.
- The situation at weekends from 8.00am to 5.00pm is slightly more complex. In busy units, the out-of-hours recommendation of one consultant per 30 beds is insufficient for the level of daytime activity at weekends. It is likely that, in future, additional consultant sessions may be rostered for large hub ICUs from 8.00am to 5.00pm at weekends and on public holidays.
- Where there is a major trauma unit separate consultant and NCHD rosters will be required.
- At a minimum, a Model 4 hospital with an ICU and maternity unit or a major trauma unit may therefore require four rosters of NCHDs and three rosters of consultants out-of-hours.

Increasingly in western healthcare systems, such as those in the USA, the UK, Australia and Canada, subspecialty anaesthesiology services are now provided by subspecialty-trained anaesthesiologists who have undergone fellowship-level training in the relevant subspecialty.

Subspecialty examples include obstetric, paediatric, hepatobiliary, vascular, cardiothoracic, difficult airway, day case, regional and neurosurgical Anaesthesia.

Subspecialty centres within these healthcare systems are often standalone units and even when they are housed within a larger hospital complex, the subspecialty Anaesthetic team is generally only responsible for providing anaesthetic services for the particular subspecialty, both in the elective and emergency situations. The formation of such units could potentially also increase subspecialty training opportunities within Ireland by facilitating the creation of more fellowship posts and in the process increase research productivity. It would also be likely to improve job satisfaction among permanent anaesthetic staff, thereby increasing retention rates.

The majority of international healthcare systems are servicing populations considerably larger than the population of the Republic of Ireland, and consequently they have more than one national site providing 'super' subspecialty services, unlike in Ireland.

Additionally, in Ireland, partly due to the small population size, as well as the historical development of certain subspecialty services, there are certain surgical subspecialties where an adequate number of subspecialty-trained anaesthesiologists does not exist in one location to safely staff a subspecialty on-call rota. This fact leads to non-subspecialty-trained anaesthesiologists undertaking subspecialty emergency cases outside of normal working hours.

Another consequence of the current configuration is that the particular subspecialty elective activity volume in each of the sites providing services may not be high enough to maintain that subspecialty skill set in the appropriate number of anaesthesiologists to adequately staff a subspecialty anaesthesiology rota at each site.



In major Irish cities, there may be an adequate number of appropriately trained subspecialty consultant anaesthesiologists across several different sites with the necessary skill mix to provide a comprehensive subspecialty service. Additionally, there may be the volume of work across multiple sites to ensure the maintenance of this skill set.

This fact should lead to consideration of amalgamating subspecialty services, resulting in fewer physical sites where subspecialty care is delivered but ensuring a higher volume of activity at each site.

Fewer sites would potentially provide the increased activity volume to enable maintenance of a subspecialty skill set within an adequate number of individuals to safely staff a rota with a reasonable and sustainable on-call frequency at the one designated location. Reconfiguration of certain subspecialty services in this manner would ensure that the Irish population is provided with an anaesthetic service delivered by a team with an internationally recognised standard of skills for subspecialty procedures on a 24/7 basis across all subspecialties.

An interim solution to the problem of ensuring the 24/7 presence of a trained subspecialty Anaesthesiologist in every subspecialty (which may be more feasible in the short term than complete site and service subspecialty amalgamation) would be to encourage the amalgamation of subspecialty on-call rotas within geographically close locations. Out-of-hours work could potentially be reconfigured so that it is concentrated at one main location and all emergency out-of-hours admissions within that subspecialty would be directed to that one location.

This allocated main emergency centre would be the primary on-call base of each subspecialty anaesthesiologist, even if their usual elective workload is not performed at that site. Consequently, some subspecialty-trained consultant anaesthesiologists would have to be prepared to potentially perform the majority of their on-call work at a centre that is not their base hospital for elective work. This would not provide a solution for every emergency situation, and consultants on any such subspecialty rota would have to be willing to potentially travel to administer Anaesthesia for emergency cases at the centres that undertake elective subspecialty work for out-of-hours even though those locations might be neither their 'base' hospital nor the dedicated emergency subspecialty site.

The longer-term national goal should be to create larger subspecialty centres, geographically sited according to population need with clearly defined referral patterns.

These centres should be staffed with an adequate number of appropriately trained subspecialty consultant Anaesthesiologists, thereby providing a comprehensive 24/7 service.

The volume of work undertaken by each of these centres should be greater than the internationally recognised minimum volume activity.

Higher-volume units have been shown in multiple specialties to improve patient outcomes, provide better standards of care, reduce complication rates and, consequently, result in greater patient satisfaction.

### (c) Services requiring 24/7 cover in Model 3 hospitals

*Creating a Better Future Together: National Maternity Strategy 2016-2026*<sup>6</sup> identified 13 Model 3 hospitals with a co-located maternity unit. These hospitals need Anaesthesia cover for the obstetric unit, emergency surgery, the ICU and for the possibility of accompanying a critically ill patient on transfer to another unit. The National Maternity Strategy recognised the need for a dedicated obstetric Anaesthesia service. In these Model 3 hospitals, the initial minimum cover recommended in the strategy is two consultants and two NCHDs on-call – this is the 2 plus 2 model referred to in this Model of Care document. The model is based on the emergency anaesthesiology team being able to respond to two simultaneous emergencies requiring immediate anaesthesiology input.

Each team would have a consultant and an NCHD. Strictly speaking, this is less than the separate standards for ICU and obstetric anaesthesia however, given the level of activity in some of these hospitals, this may be sufficient as a starting point. For example, many of these ICUs would have significantly fewer than 12 beds and therefore may not require a dedicated on-call consultant out-of-hours.

There would be some intensive care units where this is inadequate and individual hospitals would have to evaluate the absolute requirement for further appropriate cover as they move towards full implementation of the JFICMI standards. As a consequence of this requirement for additional cover, one could argue that there should be three NCHDs on site to deal with these three separate areas if and when an emergency arose.

In addition, the skill mix of the on-call consultants should include competence either in the delivery of critical care or in the provision of obstetric Anaesthesia.

It is clear that each of these 13 hospitals will require at least 12 consultants and 12 (or 18) NCHDs to maintain their current levels of emergency service.

Where such manpower resources are unavailable, the Health Information and Quality Authority (HIQA) is unambiguous in stating: “The HSE should make the appropriate arrangements to discontinue the emergency service” (HIQA *Report of the investigation into the quality and safety of services and supporting arrangements provided by the Health Service Executive at Mallow General Hospital 2011*)<sup>50</sup>

### (d) Services requiring 24/7 cover in Model 2 hospitals

*Securing the Future of Smaller Hospitals*<sup>9</sup> proposes that there should be no out-of-hours anaesthesiology cover for Model 2 hospitals. Medical staff who cover these hospitals should be fully trained in resuscitation, including airway management.

The time-sensitive transfer of a deteriorating medical patient must be organised and effected by the medical team to an ICU with an agreed ‘no refusal’ policy with respect to such referrals. Such a policy is of course dependent on the Model 3 ICUs having sufficient bed capacity to deliver this service. Non-acute transfers may be organised with the National Ambulance Service Critical Care & Retrieval Services.

### **(e) Out-of-hours emergency theatre**

Each hospital providing out-of-hours cover should have a fully functioning emergency/trauma theatre. Appropriate resources, i.e. anaesthesiology assistance in theatre and full recovery, should be available out-of-hours for this theatre, commensurate with the expected workload. This means that resources may need to be available late into the evening on weekdays and for a defined time period at weekends. When resources such as recovery are unavailable, only immediate life-saving surgery should be performed.

### **(f) Daytime cover at weekends**

It is apparent that a number of services are as busy during the daytime at weekends as they are during the working week. This may overstretch the proposed on-call rosters, particularly in areas such as ICUs in Model 4 hospitals and the provision of anaesthesia for trauma lists. In these cases, additional consultant cover will be needed for the daytime period. We have identified a number of solutions which may provide additional consultant availability.

These include:

- I. Including the weekend as part of a 39-hour week, i.e. fulfil 39 hours over seven days rather than over five days. This cover would need to take some account of the antisocial nature of working weekend hours, particularly its impact on family and work–life balance.
- II. Paying weekend sessions at premium hourly locum rates over and above 39 hours.
- III. In the UK, consultants who reach the age of 55 or 60 are given the option of coming off 24/7 call and providing daytime weekend cover in return.

### **(g) Current insufficient manpower**

Where there is insufficient anaesthesiology manpower to fully staff out-of-hours rosters, services should shut to all but life-threatening emergencies. The National Clinical Advisor and Group Lead for Acute Hospitals addressed this in April 2016, when he instructed Model 3 hospitals to move towards recruitment of sufficient staff for 2 plus 2 cover. In the interim, in the absence of this level of cover, he suggested a number of possible incremental steps to address the problem. These included reconfiguring services within a Hospital Group. This would result in a hospital reducing the number of specialties delivering 24-hour unscheduled care on that site. Choosing which element of service delivery obstetrics, the ICU or emergency Anaesthesia should be reduced is open to consideration. However, the need for Critical Care services, both as a part of the obstetric Anaesthesia service and the general surgical theatre service, would indicate that a reduction in obstetric service is the only viable option.

Where these resources are not available, the hospital/hospital group must make a decision on what services can be safely provided in that institution. This should be a clearly documented, joint decision involving the HSE managers, the hospital CEO and the Anaesthesia/Intensive Care Medicine (ICM) practitioners in that institution.

**4.3 Departmental structures and governance**

The governance under which anaesthesiology care is delivered must include a fully supported/resourced department of anaesthesiology incorporating intensive care and pain medicine where appropriate.

Strong relationships between clinical and hospital management are vital in order to ensure the successful implementation of operational policy and day-to-day management of the department. This department must fully participate in and contribute to the functioning of the perioperative directorate in that hospital. A group-wide perioperative directorate should overarch this structure. There should be close links between the individual anaesthesiology departments in the Hospital Group.

**(a) Structures**



Figure 7 – A Model for Hospital Group/Hospital/Departmental Governance Structure (NCPA)

Where it is geographically possible, a joint department of anaesthesiology should be operated across the Hospital Group. Reporting structures should be clear and unambiguous.

A perioperative quality and safety group, including representation from theatres, surgical wards and pharmacy, should be integrated into the clinical and managerial structure within the hospital/hospital group. Within each department, it is recommended that link roles be formally established with other specialties, in addition to roles in training/education and research/audit. These roles should be rotated between members of the department. As a result of the key role played by the anaesthesiology service in emergency care, a consultant anaesthesiologist should be nominated to a lead role in the provision of 24-hour unscheduled care in each hospital.

A useful guide on these structures and functions can be found in the 2006 edition of the Royal College of Anaesthetists and the Association of Anaesthetists of Great Britain & Ireland publication, *Good Practice: A guide for departments of anaesthesia, critical care and pain management*<sup>20</sup>. The role of college tutor provides an important link between trainees and the CAI. These tutors should also have a role in encouraging other members of the department to participate in college activities, such as examinations, running courses and the functions of CAI council.

### 4.4 Electronic records

With the introduction of e-healthcare records, many of the larger departments in Ireland have electronic record systems or anaesthesiology information management systems in place. It is important to note that extracting information and maximising the benefit of having these databases in place requires a lot of time and expertise, both of which are at a premium.

For an electronic anaesthetic record/charting system to improve efficiency and provide reliable data, it will be necessary to customise the system to an individual institution's workload and needs. This start-up customisation requires dedicated time and information technology skills. It may be that the necessary skill set exists within a department, but it is equally likely that it does not.

Additionally, time is required to maintain any system, the ongoing maintenance time includes staff training, error repair, continued customisation and, very importantly, valid data extraction. In a larger institution, this is a full-time job.

Therefore, when costing for such systems, it is essential that the time and skill sets required to meet these ongoing needs are accounted for, and the employment of a data manager is advisable. This will ensure that the electronic record system is utilised to its maximum potential and that it provides a beneficial return for the financial outlay.

There are different levels of expertise to be sought – database management and interrogation being one, and another being programming and software design. It is important that departments are supported in this activity, with dedicated personnel and training made available.

### 5. MODEL FOR UNSCHEDULED 24-HOUR CARE

In this chapter we will outline our vision of the appropriate anaesthesiology model of care for the acute hospitals sector in Ireland. The standards underlying this vision are those stated in the previous chapter. They include the AAGBI guidelines on the need for an on-duty anaesthesiologist to be immediately available to the labour ward, backed by the availability of a second anaesthesiologist if needed. The National Maternity Strategy 2016–2026 advocates a dedicated obstetric Anaesthesia service consisting of a consultant and an NCHD. The intensive care cover recommendation for 12 ICU beds is one consultant and two NCHDs during normal working hours and one consultant per 30 beds out-of-hours. *Providing Quality, Safe and Comprehensive Anaesthesia Services in Ireland – A Review of Manpower Challenges*<sup>1</sup> and the Irish Standing Committee of the AAGBI report entitled *Recommendations on staffing for safe anaesthesia provision in Ireland*<sup>21</sup> made similar recommendations. From these, the construct of a 2 plus 2 model of cover evolved to provide a minimum level of Anaesthesia/Critical Care cover that would be in a position to respond to two simultaneous emergencies requiring an immediate and sustained response from the anaesthesiology service. Examples of such emergencies include a category-1 caesarean section, an accidental extubation or an unstable patient in the ICU, a critically ill adult or child in the ward or in the emergency department, a major haemorrhage, a major trauma case, or a severe head injury. All of these can occur while the anaesthesiology team is committed to caring for a patient in theatre or while one member of the team is absent from the hospital on a transfer of a critically ill patient to a tertiary centre. Our conclusion is that the team of two consultants and two NCHDs would provide the basic building block of an Anaesthesia/Critical Care out-of-hours on-call service.

This more comprehensive service would encompass emergency theatre work and enhanced critical care cover, including consultant-led ward rounds of the ICU on Saturdays, Sundays and public holidays. This cover would extend to the labour ward for epidurals, plus the assessment and care of critically ill patients in the emergency department and on the medical, surgical, obstetrics and paediatric wards when required. It would augment the capability of the service to assist in inter-hospital transfers requiring an anaesthesiologist, without as significant an effect on the remaining anaesthesiology service provision in the hospital. In Model 3 hospitals out-of-hours and at weekends and public holidays, the two NCHDs and two consultants (or more if required) will be responsible for the whole service, including the ICU and obstetrics units.

#### 5.1 Emergency services

It is intended to use the hospital modelling 1 to 4 system (Table 4), as introduced by the National Acute Medicine Programme, but which subsequently has found much wider use in the designation of the roles and services offered by acute hospitals. Significantly, it has been referenced by the *Model of Care for Acute Surgery: National Clinical Programme in Surgery*<sup>22</sup> and the *Model of Care for Adult Critical Care: National Clinical Programme for Critical Care*.<sup>11</sup>



## MODEL OF CARE FOR ANAESTHESIOLOGY

<b>Model 1</b>	Community/district hospital
<b>Model 2</b>	Ambulatory care, diagnostics, selected medical inpatients, medical assessment and local injury units
<b>Model 2S</b>	As per Model 2, plus intermediate elective surgery
<b>Model 3</b>	Undifferentiated acute medical and surgical patients, emergency department and intensive care unit
<b>Model 4</b>	University teaching hospitals – as per Model 3, plus tertiary referral and higher level intensive care

*Table 4 – HSE Hospital Modelling System - National Acute Medicine Programme*

The provision of emergency anaesthesiology differs from elective anaesthesiology in that it is required every day of the year, 24 hours a day. The demands on the service vary in an unpredictable manner, according to the severity of illnesses presenting, the urgency of intervention required and the number of cases requiring intervention. The unpredictable nature of emergency anaesthesiology means that, when compared with elective anaesthesiology, there are greater challenges to providing a service that meets published standards of care.

This unpredictability means that hospitals need to have flexible systems in place that can respond to variations in demand in order to ensure that appropriate standards of care are maintained. This will include sufficient capacity and capability to manage peaks of activity. The ability to respond to an emergency is particularly well-defined in the case of a category-1 caesarean section. This provides for a window of 30 minutes from the time the emergency caesarean section was called to delivery of the baby.

Given the wide range of emergency situations that may require an immediate response from the anaesthesiology service in most Model 3 hospitals, the provision of a safe service must include the ability to respond to two simultaneous emergencies requiring anaesthesiology input.

It is recognised that these emergencies often involve the most critically ill patients, and therefore this response needs senior clinician involvement. The 2 plus 2 model of cover is our recommended minimum level of cover required in order to provide for this immediate and sustained response.

### **5.2 The working day**

Traditionally, hospitals have worked electively on a 9.00am to 5.00pm basis Monday to Friday. This resulted in an on-call service covering most hospitals outside of these hours and at weekends.

It is recognised that patients need to be cared for on a 24-hour basis 7 days a week. To reduce this reliance on the on-call service, a number of steps can be considered.

A first step would include extension of the working day and the facilitation of scheduled work sessions at weekends. These two measures would substantially decrease the workload on the on-call service and reduce the overall time the hospital was reliant solely on the on-call service. It would represent a positive

step in the area of patient safety, as the National Confidential Enquiry into Patient Outcome and Death (NCEPOD)<sup>19</sup> has identified greater clinical risk involved in emergency cases performed outside of normal working hours. A new definition of what is the normal working day in our hospitals is required. Extending the elective working weekday to 8.00am to 8.00pm has been frequently suggested. This should apply to all medical services, particularly to support services such as laboratory, portering and investigational/diagnostic services. Without these intrinsic components of the service it is impossible to conduct elective work in any meaningful fashion.

### 5.3 Model 4 hospitals

Model 4 hospitals already provide separate on-call teams for the ICU and general emergencies. Where there is a co-located obstetrics facility, this should have dedicated consultant and NCHD cover. Other high-intensity clinical services, such as transplants, cardiac and neurosurgery services, may promote the need for further dedicated on-call rotas if the caseload warrants this. The cover for large ICUs may need additional scheduled sessions on Saturdays and Sundays during daytime hours in order to share the workload with the on-call team.

Such additional sessions would allow for ward rounds and the care of patients in ICUs to be delivered by rostered teams at weekends, providing for better continuity of high-quality critical care throughout the seven-day week, and not just from Monday to Friday. *A Trauma System for Ireland: Report of the Trauma Steering Group - Department of Health (2018)*<sup>51</sup> would indicate that there is a need for one or two major trauma units in Ireland.

The staffing of such centres in a Model 4 setting would require a further on-call layer of consultants and NCHDs dedicated to the care of trauma patients. The critical care needs of a major trauma patient in the ICU should be provided by the critical care team. The critical care staffing in a major trauma centre would need to be appropriately resourced in order to deal with the workload presenting to that centre.

### 5.4 Model 3 hospitals and obstetrics

Model 3 hospitals represent the largest number of acute hospitals delivering 24-hour services in Ireland. The size and complexity of the caseload in these hospitals varies considerably. All have 24-hour emergency departments receiving medical and surgical emergencies, both adult and paediatric. All receive trauma patients, and some have an on-site trauma unit. All have ICUs, with the number of beds usually ranging between three and six. There are 19 maternity units in Ireland, 13 of which are co-located on a general hospital site. Only Our Lady of Lourdes Hospital, Drogheda and Midland Regional Hospital, Mullingar have delivery rates over 2,000 births per annum. Three hospitals – South Tipperary General Hospital, Sligo University Hospital and University Hospital Kerry – have delivery rates at or less than 1,500 per year (*Irish Maternity Indicator System: National Report 2015*).<sup>23</sup> The National Maternity Strategy 2016–2026<sup>6</sup> would support the provision of a dedicated emergency anaesthesiology team for these maternity units, i.e. a team comprising a consultant and an NCHD.

However, as three of these hospitals have a delivery rate below 1,500 per year and eight others have fewer than 1,800 deliveries per year, we would suggest that this 2 plus 2 arrangement could provide the additional on-call cover to the relatively small ICUs present in most of these hospitals. Such an arrangement would

require complete flexibility by this team of four to respond to emergencies in theatre and elsewhere, but it would have the benefit of retaining the ability to respond to an obstetric emergency in a timely way when required.

### **5.5 Model 3 hospitals and trauma units**

Outside of the major trauma centres, there will be a number of trauma units dealing with less complex trauma cases. This service will require dedicated theatre time.

Provision of timely operative intervention in cases such as hip fractures is not being achieved in many hospitals, according to an audit on hip fractures carried out by the National Office of Clinical Audit (NOCA) *Irish Hip Fracture Database National Report 2016* <sup>24</sup>.

Some of the inability to get the patient to theatre within the recommended time may be due to a lack of theatre nursing staff or anaesthesiology resources, or to competition with other surgical disciplines for theatre access.

With correct categorisation of the urgency of these cases, we suggest that most could wait and be performed within normal working hours on scheduled trauma lists during the daytime (between 8.00am and 8.00pm) on weekdays and at weekends.

This plan would require that the availability of theatre and anaesthesiology resources be guaranteed for this purpose. The small number of trauma cases requiring urgent transfer to theatre would need to be factored into the on-call workload. Where necessary, the trauma load at weekends might justify scheduled sessions to be rostered for an anaesthetic team that is not on-call.

### **5.6 Model 3 hospitals and intensive care units**

Most Model 3 hospitals have ICUs with between three and six beds. There is some variation in the level and complexity of care provided in these units. All provide ventilatory support and most now provide renal replacement therapy. The Model of Care for Adult Critical Care recommends that consultant sessions in the ICU should be in place during the working day. Dedicated daily consultant sessions are scheduled in many units Monday to Friday. Out-of-hours cover is generally provided by the on-call anaesthesiology team, made up of one consultant and one or two NCHDs.

The minimum 2 plus 2 arrangement of emergency cover in this setting allows for an immediate response to emergencies in the ICU and elsewhere in the hospital, particularly when other team members are busy in theatre.

In Model 3 hospitals, the situation can arise where a critically ill patient is required to be transferred in a time-sensitive manner to a tertiary centre for more specialised care.

An anaesthesiology NCHD usually accompanies such cases. This can have a major impact on the cover being provided in the hospital while that NCHD is away.

The time away from the base hospital can be up to eight hours for hospitals like Sligo University Hospital, Letterkenny University Hospital or Mayo University Hospital. As a result, the level of service available to emergency and critically ill patients in the hospital becomes restricted.

The 2 plus 2 model means that the loss of an NCHD for patient transfers can be better accommodated and not impact as significantly on the care provided to other patients. In addition, in these hospitals the model allows for the provision of structured ICU rounds at weekends.

In hospitals without a maternity unit – such as Midland Regional Hospital, Tullamore, Naas General Hospital, Connolly Hospital Blanchardstown and Mercy University Hospital – it will be necessary to assess the needs of their ICUs and emergency departments, as well as the number of inter-hospital transfers requiring the accompaniment of anaesthesiology personnel, in order to make a recommendation of appropriate anaesthesiology cover for these hospitals.

### **5.7 Model 2 hospitals**

Model 2 hospitals are referred to in *Securing the Future of Smaller Hospitals: A Framework for Development*<sup>9</sup>, which proposed no 24-hour anaesthetic cover or critical care service in these hospitals. From our survey, however, we note that a number of Model 2 hospitals still have 24-hour cover in place.

The Smaller Hospital Framework (SHF) is clear concerning out-of-hours responsibility: for a Model 2 hospital, “[A]...Consultant ... anaesthetist on-call (and free to attend) would not be appropriate.”<sup>9(p. 15)</sup> Hence, the allocation of out-of-hours anaesthesiology resources to Model 2 hospitals is not in the SHF. For a patient in need of overnight stay for surgical reasons, a Surgical Observation Unit (SOU) is defined for a Model 2 hospital, the SHF (p. 17).

For example, a differentiated orthopaedic case may be observed in the SOU of a Model 2 hospital and transferred if deterioration occurs unexpectedly. The SHF requires that the SOU be covered out-of-hours by a member of the surgical team. Furthermore, it states that for these hospitals “no patient should have a planned, anticipated need for HDU or ICU care post-operatively.”<sup>9(p. 18)</sup>

Medical patients admitted to a Model 2 hospital via the Medical Assessment Unit (MAU) are considered to be at low risk of deterioration. Should deterioration occur in one of these patients and transfer to a critical care facility arise, the responsibility for the transfer of this patient remains with the medical team.

### **5.8 Transport medicine**

The delivery of care in all hospitals will be underpinned by a National Ambulance Service Critical Care Retrieval Service with three hubs – in Dublin, Galway and Cork – in addition to a paediatric retrieval service based in Dublin.

It is envisaged that these retrieval services will operate on a 24-hour daily basis, 365 days a year. In addition to the safe transfer of a patient by a trained retrieval team, this will also contribute to reducing the patient transfer load from the on-call anaesthesiology team. However, where the transfer is time sensitive, such as in the case of head injury, this will still be carried out by the anaesthesiology team from the hospital to which the critically ill patient presented.

Similarly, occasions will arise when the retrieval service will already have been deployed to another distant hospital and will not be readily available to do a second transfer. This will again necessitate the patient being accompanied by an anaesthesiology team member from the hospital where the patient presented.

The transport service will play a major role in the standardisation of transport equipment and ambulances. It will support the initial training and ongoing education of all staff involved in transferring critically ill patients.

### **5.9 Conclusion**

We acknowledge that no one system appropriately describes the full role of all hospitals in the Irish health service, and that no two hospitals are exactly the same. However, we are of the view that the development of a model of care appropriate to each individual hospital would be an impossible task for the model of care working group.

We suggest that the proposed model of care be examined by each Hospital Group. Consideration should be given to the future development plans of each hospital within that group.

Agreement will subsequently be sought on implementation of the principles contained in the Model of Care for Anaesthesiology in the manner most suitable to delivering a comprehensive and safe anaesthesiology service in any particular hospital. Acknowledging that change occurs slowly in the health service, it is anticipated that an incremental approach will be necessary in implementing the changes required in order to achieve alignment with the Model of Care for Anaesthesiology.

This methodology has the advantage of long-term sustainability and future-proofing. As population needs shift and service requirements alter in a Hospital Group, it should be able to react and adapt its Hospital Group infrastructure to meet the new needs of the changed environment.

A national reconfiguration of specialty services, with amalgamation of units, has the potential to utilise pre-existing resources more efficiently and more effectively. High-volume units are recognised internationally as delivering higher standards and better outcomes. Some specialist services could be delivered more efficiently by centralising these services into single-centre national units.

The Model of Care for Anaesthesiology supports the national aim to increase reliance on consultants (rather than NCHDs) delivering care. However, we accept that increasing the supply of fully trained consultants will take some time. Implementation should include consideration of the number of sites where 24-hour emergency cover is currently provided and a realistic assessment of whether such sites are sustainable in the medium to long term.

Staffing in many hospital anaesthesiology departments is close to being sufficient to provide the recommended minimum levels of cover. However, a significant number of smaller units are very deficient in anaesthesiology manpower.

### **6. NATIONAL AMBULANCE SERVICE CRITICAL CARE RETRIEVAL SERVICES**

#### **6.1 Overview**

The phrase 'retrieval and transfer medicine' refers to the inter-hospital transfer or pre-hospital transfer of patients with critical illness or life-threatening injuries using specialised expert clinical teams, equipment and transportation platforms. These patients are typically transported to access a higher level of critical care (e.g. high-dependency to Level 3 intensive care), specialist care (e.g. paediatric intensive care, neonatal therapeutic cooling) or specialised diagnostics (e.g. cerebral angiography). The aim of retrieval and transfer medicine is to deliver the same or a higher level of clinical care during transport as that delivered at the point of referral. Retrieval and transfer medicine patients can be in the highest patient risk category, as they may not have complete diagnoses or the required therapeutic intervention at the point of presentation and transfer. Therefore, the practice of retrieval and transfer medicine must be based on skilled medical expertise, preparedness, risk-averse processes, and anticipation, so as to meet patient needs in a reliable and timely manner.

#### **6.2 Organisation of retrieval and transfer medicine services in Ireland**

In Ireland, outside of the neonatal population, the Anaesthesiology specialty has historically been the provider of the bulk of critical care transfer medicine services for adults and children, in partnership with nursing colleagues from the ICU, ED or anaesthesiology departments, using local ambulance services. Critical care patient transport was achieved using local resources and based on standards published by the Intensive Care Society of Ireland (ICSI), the AAGBI and the Royal College of Physicians of Ireland (RCPI) Faculty of Paediatrics.

Organised specialist services, such as the Mobile Intensive Care Ambulance Service (MICAS), the National Neonatal Transport Programme, and the Irish Paediatric Acute Transport Service (IPATS), have been developed.

During the period from 2011 to 2018, the National Transport Medicine Programme (NTMP), under the direction of the HSE Clinical Strategy and Programmes Division (CSPD), oversaw the organisation of retrieval and transport medicine activities, including development, planning and standardisation of systems and processes in relation to critical care transports.

In 2018, following a strategic review and stakeholder engagement, the HSE accepted the NTMP's recommendation that the programme (including the three specialist services) should transition into a service within the National Ambulance Service (NAS).

#### **6.3 Development of governance for specialist transfer and retrieval services**

The NTMP became a service within the NAS in 2018, under the title National Ambulance Service Critical Care Retrieval Services (NAS-CCRS), a model in keeping with similar international services. The service is a discrete clinical directorate within the NAS, drawing clinical staff from partner hospitals and paramedical, emergency medical technician (EMT) and administrative staff, as well as vehicles and logistical support, from the NAS. The clinical directorate has a parallel vertical reporting relationship with the Director of the NAS and the National Director of the HSE's Acute Hospitals Division. The service is led by a clinical



director and is guided by an advisory committee that oversees the operational, financial, safety and strategic performance of the service. The service has ring-fenced financial support and is tasked with the development of retrieval services in Ireland aligned to patient need, health service configuration and health policy. The service seeks the secondment of clinical staff and services (e.g. clinical engineering) from partner hospitals through memoranda of understanding (MOUs) with the NAS. The service will continue to act as an educational resource for clinical staff and will provide guidance and leadership on transport medicine standards, policies, protocols and logistics.

### **6.4 National Neonatal Transport Programme (children weighing <5 kg or from birth to six weeks corrected gestational age)**

The National Neonatal Transport Programme (NNTP) is a retrieval service for the stabilisation and transportation of critically ill neonates who require transfer to tertiary centres nationally or abroad. Since 2001, the service has been bringing to the point of retrieval a level of care akin to that of a tertiary neonatal centre. The NNTP provides a comprehensive 24/7 service, transporting approximately 550–650 neonatal patients annually. It meets 87% of the national demand for neonatal transports.

The service is accessed via a single telephone number – 0818-300-188 – which activates both the neonatal intensive care unit (NICU) bed and the retrieval team. A neonate requiring a paediatric intensive care unit (PICU) bed will need a further referral to a PICU.

The NNTP also has a website ([www.nntp.ie](http://www.nntp.ie)) which contains support tools, standard operating procedures and standardised referral forms for referring hospitals.

The proposed extension of the existing NNTP service provision would include:

- **Non-acute neonatal transports** (advance practice/clinical nurse specialist-led), and
- **Retro-transfer** (refers to moving patients to lower levels of care closer to home).

The ongoing development of the NNTP to encompass a repatriation service is a prerequisite for the enablement of the Model of Care for Neonatal Services in Ireland, the National Model of Care for Paediatric Healthcare Services in Ireland, and the National Maternity Strategy 2016–2026, as well as the functioning of the National Children’s Hospital and its networks.

### **6.5 Irish Paediatric Acute Transport Service: (children weighing >3.5 kg and aged 16 years or younger)**

Paediatric critical care is a centralised model of care in which tertiary care is offered by Our Lady’s Children’s Hospital, Crumlin (OLCHC) and Temple Street Children’s University Hospital (TSCUH). There are 400–450 external transfers of critically ill children to PICUs annually, of which approximately 150–200 constitute neonatal patients. IPATS commenced operations on a pilot basis in October 2014 and provides a Monday-to-Friday, 10-hour-per-day service for the transport of critically ill children. IPATS is delivered by TSCUH and OLCHC clinical teams, with ambulance support from the NAS and the Saoirse Foundation. This service will form part of a broader initiative to combine the activities of both PICUs, in keeping with the plans for the National Children’s Hospital Group. The current funding envelope for IPATS only allows for a Monday-to-Friday daytime service, meaning that only between 40% and 50% of the demand for a paediatric critical care transfer service (outside of that met by the NNTP) is being met. The target for meeting service demand

is between 80% and 85% of all paediatric transfers (the remainder of transfers would be time critical, this precludes waiting for the IPATS team to arrive) and necessitates the referring hospital team to transfer the paediatric patient itself.

All paediatric facilities where undifferentiated paediatric patients present must retain the equipment, designated facilities and competencies to resuscitate, stabilise, package and transfer out critically ill children.

The ongoing development of IPATS to provide a 24/7 retrieval and transport service is a prerequisite for the safe operation of the Urgent Care Centres in Connolly Hospital and Tallaght University Hospital (to open in 2019), as well as of the National Model of Care for Paediatric Healthcare Services in Ireland and the functioning of the National Children's Hospital and its networks.

### **6.6 Mobile Intensive Care Ambulance Service: patients aged 16 years or older**

The Mobile Intensive Care Ambulance Service (MICAS) is at present provided by three hubs: Dublin (MICAS East), Galway (MICAS West) and Cork (MICAS South).

The Dublin MICAS hub provides a seven-days-per-week service delivered by four hospitals on a rotational one-in-four-week basis. Hours of operation are Monday to Friday from 8.00am to 8.00pm for two weeks a month, 8.00am to 4.00pm for two weeks a month, and weekend cover from 8.00am to 8.00pm.

The MICAS South hub delivers a four-days-per-week service in Cork from 10.00am to 8.00pm. Expansion of the operational hours of this hub is planned in the coming years.

Up to 2016 MICAS handled approximately 100–120 patients a year. Since 2017, there has been an exponential increase in activity due to increased operational hours, the introduction of a second hub and the development of the ACCEPT (**A**ccessing **C**ritical **C**are **E**mergency **P**atient **T**ransport), patient pathway.

Additionally, evidence from a survey of inter-ICU transfers (*Inter Hospital Transfers of Adult Critically Ill Patients June–November 2015 – AM Murphy/Dr. R. Dwyer/Dr. J. McAdoo*) suggests that at least 1,000–1,200 such transfers are undertaken each year. At present, these transfers are undertaken by the hospitals themselves, which highlights a significant area for expansion of the utilisation of the adult MICAS service. Also, while inter-ICU transfer of critically ill patients is currently the primary activity of MICAS, it will likely evolve to the retrieval of patients from Model 2 hospitals, major trauma retrievals, and potentially primary retrieval in the future.

Taken together, this will likely see an exponential increase in demand for MICAS services in the coming years.

The ongoing development of MICAS to a 24/7 retrieval and transfer service is a prerequisite for the advanced trauma and critical care networks. This should match the trauma hubs in Dublin and Cork, which will be consultant-led retrieval teams with aeromedical support. The development of a medically led aeromedical response protocol will enhance the Irish health system's response to major trauma and/or major clinical incidents.

### **6.7 Locally sourced transport teams (LSTTs)**

Regardless of the level of specialist retrieval services provided, there will always be time-critical cases that cannot wait to be retrieved by a retrieval team, and consequently require transport by the referring hospital team. Future planning for this must parallel the development and roll-out of 24/7/365 specialist-led teams while maintaining the capacity and competencies of locally sourced transport teams.

Locally sourced transport teams (LSTTs) are usually drawn from the referring hospital's internal resources (both in terms of equipment and personnel) and are transported by emergency ambulances (as opposed to dedicated critical care ambulances). Equipment choice, training and procedures must reflect this.

Typically, LSTTs transport high-acuity patients, but the complexity of the patients can range from low to highly complex intensive care transfers. Anaesthesiologists and intensive care nurses have been at the forefront in the provision of medium- to high-complexity transfers. The determinant for whether a transfer is anaesthesiology-supported or not is usually the need for (or potential to require) mechanical ventilation.

The team composition can range from a registrar and nurse to a consultant, registrar and nurse combination, but may also include other specialties, such as paediatrics or surgery, when the need arises. This reality should be reflected in the rostering of the anaesthesiology on-call services i.e. the 2 plus 2 model of anaesthesiology staffing. This model reduces the exposure of other patients in the hospital to potential harm due to insufficient anaesthesiology staffing in the eventuality of an unscheduled transfer-out of a critically ill patient.

Clinical staff undertaking transports must be resourced by reference to workload backfill for the following day, proper nutrition and adequate rest. They should be attired in clothing suitable for the patient transport environment.

The composition and seniority of a transport team should reflect the needs of the actual patient over those of a potential patient. It is not acceptable for junior medical staff to be instructed to accept the care of a patient if they do not have the requisite training or experience, in order to preserve capacity in the base hospital to treat other emergencies.

### **6.8 Clinical governance of critical care patient transfers**

The decision to refer and/or seek advice is that of the referring consultant. The referring consultant has overall responsibility for the patient while the patient resides in the referring institution, irrespective of advice or instructions issued by a retrieval consultant, the receiving consultant or a relevant specialist. In the case of LSTTs, where an anaesthesiologist or intensivist is consulted to provide an opinion on transfer and subsequently undertakes the transfer, clinical governance is then shared within each consultant's scope of practice. The decision to accept the patient is that of the receiving consultant, who assumes clinical responsibility once the patient has been handed over at the receiving institution.

For specialist transfer teams, the decision to accept the patient for transfer is that of the retrieval consultant. While the patient remains in the referring hospital, clinical responsibility is shared between the referring consultant and the retrieval team.

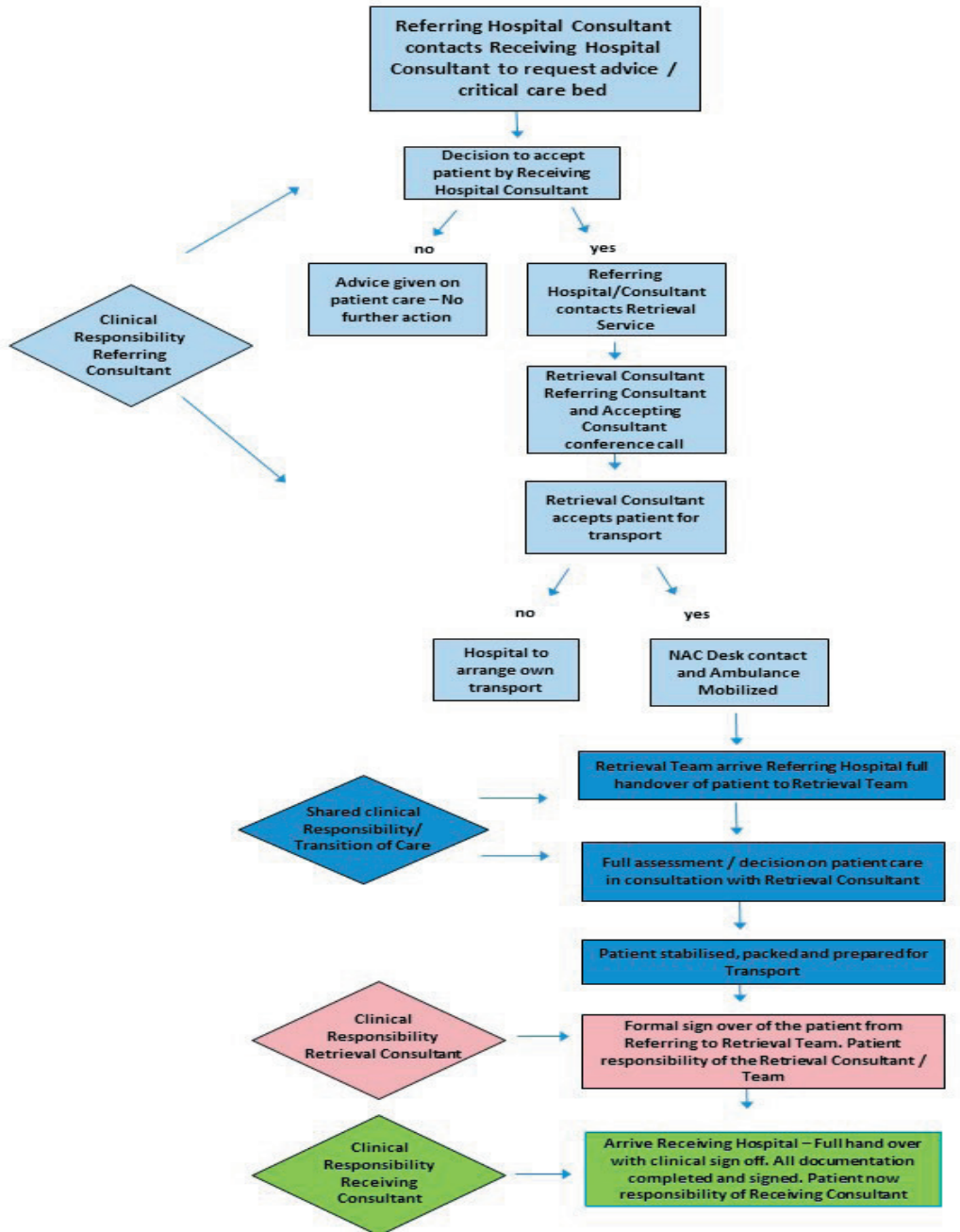
The retrieval consultant assumes overall clinical responsibility from the point where the patient leaves the referring institution until arrival and handover of the patient at the receiving institution.

## MODEL OF CARE FOR ANAESTHESIOLOGY

The retrieval consultant reserves the right to defer or deny transport of the patient for clinical reasons (e.g. the patient is too unstable) or operational reasons (e.g. adverse weather conditions).

For Anaesthesiology trainees and nurses, similar principles apply along established reporting lines and corporate responsibility.

In the case of a specialist transport team, clinical governance and corporate responsibilities are detailed in the *NTMP/NAS-CCRS agreed Governance Structure for National Transport Medicine Service January 2018*.<sup>25</sup>



Date printed:  
05/04/2018

**Figure 8 - Governance Structure for National Transport Medicine Service**

One of the core functions of a transfer medicine network is call coordination.

Currently, there is no centralised system for referral, and operational tasking is being developed in the NAS National Emergency Operations Centre (NEOC) for inter-facility critical care patient transfers using a system known as ACCEPT (**A**ccessing **C**ritical **C**are **E**mergency **P**atient **T**ransport).

Aside from the specialist teams, LSTTs will have access to call coordination in order to access specialist advice and to coordinate logistics with participating parties, such as the NAS, An Garda Síochána and the Irish Air Corps.

ACCEPT – 1800-ACCEPT/1800-222-378 – is a project that will streamline the process for the referral of a critically ill patient into an ICU bed in another hospital and facilitate the transport of that patient by a specialist transport team. The four constituent parts of ACCEPT were developed and became operational in 2018. The ACCEPT online tools will be hosted on a website [www.ACCEPT.ie](http://www.ACCEPT.ie) and the Communications Hub will be developed in partnership with the NAS-NEOC.

The four constituent parts of the ACCEPT project are:

- I. National Transport Medicine Service Communications Hub: This will be a 24/7/365 call handling facility, where the referring doctor will be connected to the receiving doctor and the critical care transport team doctor by the phone number 1800-ACCEPT/1800-222-378 for adult, paediatric and neonatal transfers.
- II. Critical care vehicle (CCV) and specialist transport team operational tasking: Once the patient has been accepted and a decision to transfer has been made, the CCV and specialist transport team will be dispatched to the referring hospital by the NEOC from the CCV hub.
- III. Clinical support from the receiving hospital and/or retrieval service to the referring hospital: online (using online clinical support tools and guidelines from [www.ACCEPT.ie](http://www.ACCEPT.ie)) and telephone support for the referring team will be available and recorded.
- IV. The ACCEPT desk at the NEOC will have knowledge of National ICU Live Bed Censuses for Children, Neonates and Adults (when developed). This will provide real-time information regarding national critical care bed capacity for adults, children and neonates.

It will give the referring doctor the option to (potentially) connect to the accepting doctor through ACCEPT. The transfer doctor can then be connected to the call and a decision on CCV tasking seamlessly made.

### **6.9 Ambulance provision by the NAS**

Ambulance provision is delivered by the NAS. For LSTTs, these are front-line ambulances that are crewed by two EMTs/paramedics. They can be accessed by a referring hospital team making a 112/999 call, and an ambulance is then dispatched by the NEOC using a dispatch protocol known as Protocol 37. This is an algorithm-based protocol that enables tasking of an ambulance and appropriate ambulance crew based on urgency and patient complexity.

Many front-line ambulances are not designed to transport critical care patients in terms of available electrical power and medical gases. Teams using front-line vehicles must have the capacity to transfer patients, specifically they must have medical gases and electrical power as well as medications and provisions required to complete the transfers.

A pool of dedicated critical care ambulances, which are collectively referred to as Critical Care Vehicles (CCVs) and ambulance personnel is available to the specialist retrieval teams. The CCVs are bespoke ambulances, in terms of medical gases and power supply, designed to take all categories of critical care patients and to transport the medical equipment and spare provisions that are required for use by the team. CCVs can only be accessed through the NEOC by the respective NAS-CCRS (e.g. MICAS) using the ACCEPT protocol

### **6.10 Aeromedical transport**

Despite air transport being employed in the transfer of patients since the 1960s, aeromedical transport in Ireland is not well-developed.

The Irish Air Corps has heretofore provided the bulk of patient air transfers, and continues to do so under a service level agreement (SLA) between the Department of Health and the Department of Defence on an 'as is' and 'as available' basis.

The SLA enables the inter-hospital transfer of neonatal patients, as well as priority 1 patient transfer to Britain for solid organ transplantation, but does not encompass inter-hospital transport within Ireland for adults or children.

A paramedic-led Helicopter Emergency Medical Service (HEMS) service from Athlone Emergency Aeromedical Service (EAS-112) is tasked principally with primary retrieval for the NAS.

In 2016, the HEMS EAS-112 service undertook only 11 inter-hospital missions (compared with 436 HEMS primary retrieval missions, and the Irish Coast Guard undertook 44 inter-hospital and 102 HEMS primary retrieval missions). Additionally, most Irish hospitals do not have well-developed helipads or fixed-wing landing facilities, which introduces complexity, time and risk to the transfer process.

Aeromedical services are accessed through the NAS-NEOC, which has a designated aeromedical control desk, known as the National Aeromedical Coordination Centre (NACC). The NACC has expertise in coordinating ground ambulances with the Irish Air Corps, the Irish Coast Guard and private providers. The NACC has real-time inventory of available air assets and liaises closely with the Irish Air Corps and Irish Coast Guard.

There will be significant unmet need for inter-facility aeromedical transfer, arising from the following changes and developments within the health service:

- (i) Time-sensitive diagnoses and interventions (e.g. neonatal therapeutic hypothermia) requiring specialist teams



- (ii) Adult (MICAS) and paediatric (IPATS) intensive care ambulance services being extended to 24/7/365 over the coming five years
- (iii) Head injury pathways in development
- (iv) Implementation of trauma strategy – integrated trauma networks, and
- (v) Hospital reconfiguration requiring reliable and increased availability of rotary wing (helicopter) aeromedical transfers over and above the HEMS services.

It is recommended that clinical staff should have basic training on the etiquette, safety and communication aspects of aeromedical transport. Clinical staff should not undertake aeromedical transfers without having undergone an appropriate basic training course.

Given the lack of a cohesive strategy for aeromedical transfer, a need exists for the long-term design of an integrated aeromedical service for Ireland. Such a service could provide consistency by leveraging access to multiple aircraft and aircrews from one or more providers.

It would encompass pre-hospital and inter-hospital transfers in Ireland, priority one transfers abroad and patient repatriation, and would have the potential advantage of enabling stated public health projects such as the trauma networks.

### 6.11 Manpower projections for transfer and retrieval medicine

**Specialist teams:** For the foreseeable future, specialist retrieval and transfer medicine will be a consultant-led specialist service comparable to most international models. The membership of specialist transport teams is cross-specialty and cross-disciplinary and should reflect patient need and circumstances. The teams will adopt a tiered staffing model, using consultants, medical trainees, transport nurses, critical care paramedics, paramedics and EMTs. Transfer and retrieval medicine can be onerous and exhausting. Frequently, the need occurs during the night. Clinicians should be of adequate physical fitness levels and have the facility to recover properly following a long transfer before resuming clinical duties.

**Consultants:** A consultant in retrieval and transfer medicine is a doctor who possesses, in addition to specialist certification in his/her base specialty (anaesthesiology, emergency medicine, intensive care, paediatrics or neonatology), significant experiential training in a recognised retrieval medicine service for a period of at least one year. Consultants will be appointed to partner hospitals (or the NAS), and will have defined times allocated for the provision of retrieval services. These appointments will typically be made as part of a split position (e.g. 20 hours anaesthesiology, 19 hours NAS-CCRS). Alternative arrangements, such as fixed-period secondments to the NAS with funded backfill to the consultant's substantive post, should be in place. Finally, fee-for-service agreements between doctors and the retrieval medicine service will assist in populating acceptable duty rosters of a frequency greater than 1 in 6, and preferably 1 in 8, on-call cover.

**Transfer and retrieval nursing:** Nurses are typically drawn from the nursing disciplines that correspond with the relevant medical ones.

Nurses must have specialist core competencies before undertaking the additional training required for the transport medicine environment. Following a period of education, preceptorship, observed practice and sign-off, nurses are considered to have achieved the required competencies.

Engagement between the NAS specialist teams and partner hospitals will be specified in MOUs.

In essence, a cadre of suitably trained nurses will be provided by the partner hospitals for the service, with the hospitals agreeing to adhere to the policy and procedures for retrieval medicine as described by the NAS retrieval service. It is also likely that retrieval nurses will be employed directly by, or seconded to, the NAS-CCRS in the future.

**Critical care paramedic (CCP)/advanced nurse practitioner (ANP):** The NTMP had begun to develop ANP roles in retrieval and transport medicine prior to its transition to becoming a service. It is envisaged that these roles will support expanding and enhanced retrieval services. This grade of practitioner should be able to undertake a proportion of retrievals independently across the Adult, Paediatric and Neonatal services. This would relieve some of the medical workload, in addition to providing an attractive career development pathway, which will itself assist with recruitment and retention for the service. The CCP role is another area that the NTMS is exploring, in collaboration with the Pre-Hospital Emergency Care Council (PHECC). CCP is a relatively new role and it is being used in some jurisdictions to support retrieval and transport. ANP and CCP roles in transport are well-recognised internationally and provide stability and robustness to retrieval and transport services. The development of the ANP and CCP roles reflect their interchangeability in the development of a non-medical transport medicine practitioner.

### 6.12 Education, training and research in retrieval

Education and training for clinical teams working within the transport medicine environment is quite a new phenomenon in Ireland. In the past, no formal training was delivered to teams who undertook inter-hospital transfers of critically ill patients. A need was identified to provide education and training to teams performing within the transport medicine environment. Following a needs analysis, a course was devised and delivered to support specialist and non-specialist teams who undertake the inter-hospital transfers of critically ill patients.

### 6.13 Specialist team training

Team members who form part of the formal retrieval services (MICAS, IPATS and NNTP) undertake an advanced training course as part of their induction when they join the teams. The training is a multidisciplinary programme for the adult, paediatric and neonatal services and is delivered biannually by the individual services.

Competencies for use by the critical care retrieval teams are modelled on those required by transport groups in the UK, the AAGBI and the Patient Centred Acute Care Training (PACT) retrieval service. This is followed by 'buddy shifts' in the patient transport environment, with recognised learning outcomes and achievement of core competencies for all team members.

NCHDs in anaesthesiology, paediatrics, neonatology and emergency medicine are rotated into (or apply for) positions that are funded by the NTMP. However, while the NTMP funds these posts, they are not recognised for specific training in transport medicine. The basics of transport medicine should be included in the general curriculum as it would be impossible to deliver modular experiential training for all trainees across the relevant specialties given the number of posts available and the frequency of clinical contact.

Experiential training in transport medicine is best attained at a senior trainee level for example, it could be carried out during the trainee's special interest year in a transport service that incorporates the trainee's base specialty or allied specialty. Alternatively, it could be carried out during a post- Completion of Certificate in Specialist Training (CCST) fellowship which is tailored around the candidate's learning or research needs. Universities abroad are now offering opportunities for certification at diploma level.

### **6.14 Accreditation of education in transfer and retrieval medicine/nursing/paramedicine**

Transport medicine is a cross-disciplinary field, with clinical staff drawn from medicine, nursing and paramedicine, as well as cross-specialty (anaesthesiology, critical care, paediatric critical care, neonatology and emergency medicine). As transport medicine develops into a discrete field in terms of clinician specialisation and expertise, it begs the question: to which parent body would it align itself?

At the time of writing, there are several consultant positions, registrar posts and fellowship posts in anaesthesiology, emergency medicine, neonatology, and paediatric critical care whose job description includes a substantial commitment to transport medicine.

As in other evolutions in the history of medicine, medical practice precedes the development of the supporting structures, such as a parent college. The development of the specialty within a parent college would allow the development of the practice in terms of education, standards, accreditation, research, consensus, integration, competencies, and continuing professional development.

This would seem to be a relevant next step, following the amalgamation of the NTMP and the NAS. This would enable the establishment of formal educational and accreditation criteria for the practice of transport medicine.

### **6.15 Locally sourced team training – outreach education**

The goal of the outreach education programmes is to allow full engagement between the specialist transport teams and all those who look after or may encounter seriously ill patients requiring emergency transport to a specialist receiving hospital. It allows for the building of relationships between the specialist transport teams and LSTTs, so as to encourage open, collaborative working relationships with specific emphasis on the standardisation of policies, procedures and guidelines and the sharing of knowledge.

As local teams around Ireland continue to undertake patient transfers, outreach education programmes will continue to be developed. These programmes will be delivered nationally and will include adult, paediatric and neonatal teams using generic and high-fidelity-simulation in-ambulance training. All clinicians who undertake (or have the potential to undertake) transport medicine services should receive basic training before undertaking a patient transfer.

### **6.16 National standardisation of equipment**

The standardisation of medical equipment is key to patient and staff safety in retrieval and transfer medicine. Equipment for use in the patient transport environment has been standardised (where possible) across the specialist retrieval teams.

It has been NTMP policy to standardise critical care trolleys and ancillary equipment, as well as consumables and medications, for retrieval teams in referring hospitals.

Equipment used for air transport must be certified with the aircraft avionics (communication or navigation systems), and be appropriately secured or stowed to aviation standards (Irish Aviation Authority or Irish Air Corps) in the event of excessive air turbulence or an emergency landing.

### **6.17 Transport documentation**

Standardised documents (adult, paediatric and neonatal) have been devised for use in patient transfers, including a patient transport record, which is activated at the initiation of the transfer and is used until the patient is handed over at the receiving unit. The unique identifier for this document is sourced from the unique case reference generated by the NAS. This will allow cross-referencing of the patient record with the NAS record.

These are national documents that are being utilised for all inter-hospital transfers. The use of a generic transport record will help inform requirements, will facilitate patient monitoring during transport, and will also enable the extraction of data for audit and quality assurance.

### **6.18 Standards and standard operating procedures**

Standards are described across the key areas of transport medicine: clinical, communication, operational, technical, and environmental. Some standards have a legislative basis, while others are derived from evidence-based medicine or consensus.

However, there is no unifying resource that brings all of these standards together to describe the practice of retrieval and transfer medicine.

The development of national standards will enable oversight of the effectiveness and quality of transport medicine services, and will encompass the relevant legislative, technical and clinical evidence, as well as international guidelines. This will be undertaken under the auspices of the Department of Health's National Clinical Effectiveness Committee.

While the development of national standards is a goal of the NAS-CCRS, individual services have developed standard operating procedures (SOPs) across a range of protocols (both technical and clinical) for use within the patient transport environment.

Several of the developed SOPs are currently available for use by LSTTs are available for download from the NTMS website ([www.ntms.ie](http://www.ntms.ie))

### **6.19 Transport metrics and audit**

There is a need for the development of a system-wide operational and clinical audit for transport and retrieval medicine, based on relevant and practical standards and administered through the National Office of Clinical Audit (NOCA).

This would be a valuable tool for patient safety, education, system efficiency and service planning. Currently, no system exists to capture information for LSTT transfers.

This audit process should be based on national and international standards, and should include both specialist and non-specialist teams incorporating standardised documentation and procedures. Other key parts of this audit system should include the clinical coordination and operational tasking necessary to ensure appropriate, timely and safe utilisation of transport assets.

At the time of writing, the NAS-CCRS audits its specialist services to include critical incident, adverse event and near-miss reporting, as well as clinical and operational key performance indicators (KPIs). The IPATS and NNTP teams currently submit their data to a UK platform to allow for peer comparisons.

The audit process is in its infancy and, while largely based on international models, such as Ground Air Medical Quality Transport (GAMUT), it needs to evolve over time to better reflect nuances of the Irish healthcare system and deliver information that can be used to inform resource allocation.

While critical incidents are processed through the National Incident Management System, the results of current audits of NAS-CCRS activity will be reported to the NAS. Ideally, the audit output of transport teams would be collected under the auspices of NOCA.

Where clinical standards have been established and accepted, the Health Information and Quality Authority (HIQA) would have an oversight role.

Timely reporting and open, non-judgemental case review based on standardised documentation and procedures is an essential tool to support and improve patient outcomes and team learning and to enhance patient safety in the transport environment.

### **6.20 Indemnity**

Indemnity of clinical staff (including anaesthesiologists) and ICU nursing staff rests with the enterprise liability cover of the State Claims Agency for all HSE hospitals or HSE-sanctioned activity. It does not include activity in private hospitals, unless the patient is being retrieved from a private institution to a HSE facility or to a facility otherwise sanctioned by the HSE.

### 7. PROVISION OF PAIN MEDICINE SERVICES

#### 7.1 Acute pain management

The primary reference document for the model of care for centres with acute pain management services (APMS) is *Core Standards for Pain Management Services in the UK*,<sup>26</sup> published in 2015 by the Faculty of Pain Medicine of the Royal College of Anaesthetists.

With respect to manpower requirements, acute pain services should be led by an anaesthesiology specialist consultant (FFPMCAI desirable, but not essential). Acute pain teams must be led by or include named consultant(s) who have the appropriate knowledge base, training and competencies. It is recommended that those appointed as leads for acute pain services should have completed advanced pain training (FFPMCAI or Diploma in Pain Management, CAI).

The greater part of the delivery of acute pain services is provided by nursing staff. Adequate nursing numbers and skill mix must be available during working hours. Adequate staff and systems must be in place to provide timely pain management to all inpatients. Out of normal working hours, this may be in the form of acute pain service (APS) nursing staff or appropriately trained on-call anaesthesiologists. For nursing recommendations and standards, please refer to pages 75–78 of the *Core Standards for Pain Management Services in the UK*.<sup>26</sup>

It is envisaged that clinical nurse specialists in pain management should be able to prescribe drugs from an approved list.

The current situation in Model 3 and Model 4 hospitals with an APS and chronic pain management unit is for two senior nurses, ideally at the clinical nurse specialist (CNS) or ANP level with prescribing competencies to manage acute pain and chronic pain. This model allows for outpatient clinic input, acute pain consultation, procedural input, and review of policies.

In conjunction with nursing staff, NCHD support for training and service provision is desirable, though not essential. Involvement by NCHDs can be integrated into a pain medicine/regional anaesthesiology/day case module in the context of the SAT programme.

Additionally, the presence of interns to prescribe, with guidance from the pain service, can improve the quality and timeliness of acute pain service interventions.

The Acute Pain Service (APS) must be able to provide specialist pain management for complex pain problems, such as acute neuropathic pain, opioid tolerance, acute-on-chronic pain, pain involving patients with problem drug use, or acute cancer pain.

The APS should also provide advanced methods of pain relief to facilitate the recovery of patients following major surgery or trauma, appropriate to the level of care required in individual hospitals (e.g. paravertebral or epidural analgesia for patients with severe chest trauma requires close cooperation with emergency departments, surgical teams and critical care).

Collaboration with pharmacy and medicine management groups, particularly in the development of new analgesic strategies, will lead to superior pain control in the acute pain setting. In centres without a



formalised APS, the model of care for delivery of treatment for acute pain defaults to the primary team, with the anaesthesiology team providing input in the perioperative periods.

### **7.2 Chronic Pain - Consultant manpower requirements (quantity and qualifications)**

According to the CAI report entitled *Providing Quality, Safe and Comprehensive Anaesthesia Services in Ireland – A Review of Manpower Challenges*,<sup>1</sup> the ratio of consultant pain physicians to the population should be 1 per 100,000 population. Based on a population of 4.4 million from the most recent census (2016), the number of whole time equivalent (WTE) pain medicine specialists should be 44. The Republic of Ireland currently has 16 WTE pain medicine specialists. Pain management services should be delivered by consultants holding a Fellowship of the Faculty of Pain Medicine, College of Anaesthesiologists of Ireland (FFPMCAI), or equivalent qualification.

### **7.3 Models of Care for Chronic Pain**

Two models of care for the provision of pain management services to patients suffering from chronic pain are proposed, and are for the most part already in existence.

Firstly, there are centres for modular training in pain medicine for trainees undergoing specialist anaesthesiology training (SAT). These are Model 2 or 3 hospitals. The consultant in pain medicine would be assigned up to a 50:50 split between anaesthesiology and pain medicine. No specific pain medicine on-call service is required.

These centres provide interdisciplinary liaison and training for the SAT pain module. Services provided include inpatient consultation services, outpatient clinics and less complex interventional procedures. These centres would assess and stratify patients with chronic and cancer pain and then plan and deliver their treatment.

The second model of care focuses on centres for advanced (pain medicine) training. These would be in designated Model 3 or Model 4 hospitals. The consultant pain medicine specialist could have full WTE pain medicine commitments. There will also be a pain medicine on-call requirement necessary for the management of emergencies, such as those arising from complications from intrathecal pumps, etc.

These centres will train Special Interest Year (SIY within SAT scheme) trainees and Post Certificate of Specialist Training (CST) Fellows in Pain Medicine and provide interdisciplinary liaison and training as well as assess and stratify patients with chronic and cancer pain.

Services provided will include inpatient consults, outpatient clinics, complex interventional procedures, pain management programmes (multidisciplinary rehabilitation) and neuromodulation.

### **8. ASSISTANCE FOR THE ANAESTHESIOLOGIST**

#### **8.1 The need for dedicated assistance for the anaesthesiologist**

Anaesthesiology in Ireland is physician delivered. The care of the patient undergoing an anaesthetic is provided by a team, namely a consultant anaesthesiologist, an NCHD and an anaesthetic nurse/midwife. The Model of Care for Anaesthesiology defines dedicated anaesthetic assistance as the availability of a nurse, midwife or operating department practitioner (ODP) who has completed a recognised theoretical and competency training programme.

The requirement for anaesthesiology assistance applies wherever general, regional or local anaesthetic or sedation is administered by an anaesthesiologist and should include all areas where such activity is undertaken, e.g. in the operating department, the emergency department, the endoscopy unit, the obstetrics unit, the radiology department, the cardiology department and where electroconvulsive therapy (ECT) is administered and (*Assistance for the Anaesthetist: A Report by the Irish Standing Committee of the Association of Anaesthetists of Great Britain & Ireland 2007*).<sup>27</sup> The anaesthetic assistant is an integral member of the anaesthesiology team and is recognised as essential to the delivery of safe and high-quality patient care. Clearly defined roles and responsibilities need to be identified for each member of the team. The presence of an appropriately trained assistant throughout the conduct of anaesthesiology has been shown to reduce the incidence of adverse anaesthetic events and to improve patient outcomes (*Assistance for the Anaesthetist in the Republic of Ireland Irish Standing Committee of the Association of Anaesthetists of Great Britain & Ireland 2007*).<sup>28</sup>

Anaesthetic assistance is provided by nurses and midwives in Ireland and Scotland, whereas in England and Wales, this assistance is more commonly provided by ODPs.

Changes in the delivery of healthcare internationally in response to service demands has initiated an expansion of roles with the introduction of the physician's assistant (anaesthesia). In the UK, this represents a highly trained and skilled practitioner who works within an anaesthetic team under the direction and supervision of a consultant anaesthesiologist (Royal College of Anaesthetists 2018).<sup>29</sup>

The certified registered nurse Anaesthetist is a role that exists in the United States of America (USA).

This is an advanced practice registered nurse (APRN) who has acquired graduate-level education and Board certification in anaesthesia from the American Association of Nurse Anaesthetists.

While there may be overlap among the different roles, each practitioner must perform within their scope of practice, which is decided by their regulatory body. These expanded roles support the need in Ireland to train expert, knowledgeable and highly skilled assistants to improve the delivery of quality patient care.

#### **8.2 Post-anaesthetic care unit**

##### **(a) Introduction**

In Ireland, there is some variance in the title of the 'post-anaesthetic care unit'. However, internationally this is recognised as a designated area where patients are brought after surgery to safely regain full consciousness from Anaesthesia and receive appropriate post-operative care. For the purpose of this document, such an area will be referred to as a post-anaesthetic care unit (PACU).

The patient should be physiologically stable prior to transfer to the PACU and the Anaesthesiologist makes the decision on the requirement for monitoring during transfer. The AAGBI recommends that departments work towards providing full monitoring, including capnography, in patients with a tracheal tube or supraglottic airway in situ during transfer, (AAGBI 2015) <sup>4</sup>. It is also recommended that supplemental oxygen be administered routinely during transfer.

### **(b) Management of patients in the PACU**

Many post-operative issues and complications can arise in the initial stages following surgery. Therefore, it is essential that patients are cared for by competent trained staff in an appropriately equipped and designated PACU. Patients require close monitoring and the length of time spent there varies depending on the surgical procedure and type of anaesthesia.

The patient is accompanied to the PACU by an Anaesthesiologist and a registered nurse from the operating theatre. An agreed structured clinical handover, both verbal and written, must be communicated, highlighting any issues or concerns as well as post-operative instructions.

Clinical handover (sometimes called clinical handoff) refers to the transfer of professional responsibility and accountability for some or all aspects of care for a patient or group of patients to another person or professional group, either on a temporary or permanent basis.

Clinical responsibility can only be transferred when responsibility is accepted by the designated individual clinician or clinical team, as outlined in the policy of the healthcare organisation.

The point at which responsibility is transferred and accepted needs to be agreed between both departments/parties, and it needs to be explicitly stated and formally documented (*Communication (Clinical Handover) in Acute and Children's Hospital Services: National Clinical Guideline No. 11*).<sup>12</sup> Once care is accepted, the PACU staff carry out an initial assessment. Patients are at different and varying levels of consciousness and therefore the PACU staff require specialised knowledge and clinical skills. Patients must be observed on an individual basis by either the Anaesthesiologist or by a PACU staff member until they have regained control of their airway, are able to communicate and are in a stable condition. The PACU staff provide complete patient care using continued monitoring and observation, and ensure that patient safety is maintained at all times.

The removal of an endotracheal tube is ultimately the responsibility of the Anaesthesiologist. However, this may be carried out by nursing/midwifery staff in some units, where the nurse/midwife has been trained and their competency is documented. Each unit should aim to provide staff with training in the management and safe removal of all airway devices, including endotracheal tubes. The staff have responsibility for maintaining the patient's airway, recording vital signs, assessing pain scores, and administering analgesia and anti-emetics, as required. Accurate documentation of the patient's vital signs and condition needs to be maintained and the safe handover of care to the ward nurse must be completed when the agreed discharge criteria are met. All PACUs must have minimum criteria for discharge to ward which have been agreed by the department of Anaesthesiology with input from nursing and surgical colleagues. All of these processes should be governed by local policies, protocols and guidelines (PPGs). The same level of post-anaesthetic care must be provided to patients requiring out-of-hours emergency surgery or those undergoing procedures in outlying areas.

The nature of these cases and the location can increase the risk of complications and therefore provision of safe post-operative care is essential.

The AAGBI states that the provision of a satisfactory quality of care during recovery from anaesthesia and surgery relies heavily on investment in the education and training of recovery room staff. Maintenance of standards requires continuous updating, e.g. in resuscitation skills, in the application of new techniques, and in advances in pain management.

PACU staff are specialists and often play a key role in the education of others, including other theatre staff, ward-based nurses, midwives and trainee doctors. All specialist staff should have received appropriate training, ideally to a nationally recognised standard. Training should be tailored to meet the needs of the individual unit and recovery room. In addition, ongoing practical training and maintenance of skills must supplement theoretical knowledge in each unit.<sup>30</sup>

### (c) Monitoring in the PACU

The AAGBI regards it as essential that minimum standards of monitoring are adhered to until the patient has recovered fully from anaesthesia in order to enable rapid detection of airway, ventilatory and cardiovascular disturbance, thereby reducing clinical risk and improving patient outcomes (*Recommendations for standards of monitoring during anaesthesia and recovery 2015*).<sup>4</sup> These standards apply in all locations where anaesthesia is administered. The minimum standard would include:

- Pulse oximetry
- Electrocardiography (ECG)
- Non-Invasive Blood Pressure
- Capnography
- Temperature monitoring

Additional monitoring will be required depending on patient status, comorbidities and surgical procedure, e.g. central venous pressure (CVP) or invasive blood pressure (IBP). The patient is also monitored for level of consciousness, volume status, fluid balance, pain, sedation score and nausea. Wound sites, dressings, and drains are also inspected in the PACU.

## 8.3 Nursing

### (a) Staffing requirements

When calculating the number of staff required for anaesthesiology assistance in the perioperative area, including the PACU, the following factors need to be taken into consideration: patient throughput, patient and surgery complexity and acuity, training and competency of staff, skill mix, theatre utilisation, layout of department, practice standards and the need to provide anaesthesiology services in outlying areas.

In order to improve productivity and efficiency in the operating department, it is recognised that a particular focus needs to be placed on the recruitment, education, development, support and retention of all theatre staff, including nursing/midwifery staff.

In its book entitled *Staffing for Patients in the Perioperative Setting*,<sup>31</sup> the Association for Perioperative Practice (AfPP) in the UK recommends a minimum standard of two scrub practitioners, one circulating staff member, one anaesthetic assistant and one post-anaesthetic care practitioner per elective session and a minimum of one scrub practitioner, one circulating staff, one anaesthesiology assistant and one post-anaesthetic care practitioner per emergency case.

The AAGBI recommends in its 2002 publication, *Immediate Post Anaesthetic Recovery*,<sup>30</sup> that no fewer than two staff (of whom at least one must be a registered practitioner) should be present when there is a patient in the PACU who does not fulfil the criteria for discharge to the ward. The AfPP also recommends that an identified individual clinical educator, training coordinator or practice development practitioner be responsible for assessing the training requirements for staff.

### **(b) Skills and competencies**

National Health Service (NHS) Education for Scotland recommends that all anaesthetic assistants should complete a recognised training programme and achieve an agreed set of competencies (see page 2 of the 2011 NHS Education for Scotland publication entitled *Core Competencies for Anaesthetic Assistants*).<sup>32</sup>

Adequate time and financial support for continuing professional development are essential in order to ensure that knowledge, expertise and clinical competence are achieved and maintained.

In 2014, the Nursing and Midwifery Board of Ireland<sup>56</sup> recommended that all qualified nurses maintain their own professional competence by participating in continuous professional development (CPD).

The *British Anaesthetic and Recovery Nurses Association: Standards of Practice*<sup>33</sup> recommends that all nurses/midwives assisting with anaesthesiology or working in PACUs should receive regular updates in the following skills:

- Mandatory training and update on immediate life support (ILS), manual handling, fire training, security and health and safety
- Advanced life support (ALS), ILS and paediatric advanced life support (PALS) for advanced practitioners
- Training in pre-assessment skills for those working in day surgery
- Anaesthetic and recovery nursing courses
- Management courses for experienced practitioners
- In-house provision of education and training in male catheterisation, intravenous (IV) drug administration, cannulation, and venepuncture
- In-house unit orientation programme for all newcomers

These recommendations have also been ratified by the following organisations:

- American Society of Peri Anaesthesia Nurses (ASPAN)
- International Federation of Nurse Anaesthetists (IFNA)
- Irish Anaesthetic & Recovery Nurses Association (IARNA)
- Royal College of Anaesthetists (RCOA)
- Association of Anaesthetists of Great Britain & Ireland (AAGBI)

The responsibility of the anaesthetic/PACU nurse/midwife includes but is not limited to:

- Planning, prioritising and providing holistic nursing care requirements and support to the patient
- Acting as patient advocate, thus contributing to continuity of care
- Providing support to the Anaesthesiologist pre-, peri- and post-operatively
- Preparing operating department environment and equipment, including checking on the functioning and maintenance of Anaesthesia machines, infusion pumps, fluid warmers, diathermy machines, tourniquets, flexible scopes, ultrasounds and all emergency equipment
- Patient education
- Infection control and prevention measures
- Risk identification, assessment, reporting and reduction
- Health and safety
- Documentation

### **(c) Nursing leadership and management**

It is recommended that a clinical nurse manager with appropriate qualifications and experience should be assigned leadership and management responsibility for the anaesthesia and PACU services. Both of these areas may come under the umbrella of one manager, or may be the responsibility of different managers. An effective nurse leader will develop and build a team based on open communication, trust and respect, in order to ensure positive patient outcomes. Responsibilities include but are not limited to:

- Planning, coordinating and managing day-to-day activity
- Delivering quality patient care by promoting evidence-based best practice
- Ensuring effective and efficient use of resources
- Providing leadership and clinical expertise
- Carrying out risk assessment
- Promoting education and professional development for all staff
- Providing effective communication
- Ensuring commitment to quality improvement and audit

### **(d) Current education for Assistants for the Anaesthesiologists in Ireland**

Currently, there is no mandatory requirement for nurses/midwives assisting the Anaesthesiologist or working in the PACU to undertake a postgraduate qualification.

There is a recognised need for a structured educational pathway for anaesthesiology assistants and PACU staff to ensure the delivery of safe and high quality patient care.

The education and practice of anaesthesiology assistants varies worldwide. There are also huge variations in the education programmes' prerequisites, instruction and how certification is maintained. There are as many differences in practice and education as there are countries. The 1998 *Report of The Commission on Nursing: A blueprint for the future*<sup>34</sup> clearly stated the need for further education for nurses and midwives.



The National Clinical Programme for Anaesthesia (NCPA) recommends that all staff assisting the Anaesthesiologist and working in a PACU should undertake formal education and training in line with the 2010 AAGBI guideline document entitled *The Anaesthesia Team 3*.<sup>35</sup>

During 2012 and 2013, the NCPA conducted a national survey on the education and skills of nurses/midwives involved in anaesthesiology/recovery room care. The results of this survey showed that 50% of the nursing/midwifery staff assisting with anaesthesiology and working in a PACU had not completed an appropriate recognised postgraduate education programme. This formed the basis for the development of a national standardised accredited anaesthetic nurse/midwife education foundation module.

The Level 8 foundation module in Anaesthesia/Recovery Room Care for Nurses and Midwives was designed and developed by the NCPA in collaboration with the Office of the Nursing and Midwifery Services Director (ONMSD), the CAI and national representatives working in the perioperative area.

It is being delivered collaboratively by the School of Nursing and Midwifery at Trinity College Dublin and by the CAI. It commenced in September 2016 and has been awarded 10 credits from the European Credit Transfer System (ECTS).

The module combines theory and clinical practice elements delivered by blended learning. The provision of simulation training provides the students with exposure to controlled emergency scenarios, e.g. anaphylaxis and the unanticipated difficult airway.

Other elements of the workshop training day programme allow students to gain knowledge of best practice guidelines on communication and crisis management, massive transfusion protocols and the malignant hyperpyrexia algorithm. The programme also includes a look at some anaesthesiology equipment, e.g. the anaesthesiology machine and difficult airway equipment.

Continuous competency assessment in the clinical area over the duration of the module is based on supervision and interviews by an appointed mentor. This module reflects a move to standardisation of the knowledge and skills for nurses/midwives working in this area with core competency achievement.

The simulation training in recognising and managing anaphylaxis, the management of a difficult airway, teaches students the value of clear communication and algorithm decision-making in a safe environment. This is achieved through a process of debriefing following each scenario. In addition, it facilitates reflective learning.

The units of learning include:

- Preparation of patient for theatre
- Airway management and intubation
- Types and principles of anaesthesiology
- Circulation and haemodynamic monitoring
- Positioning of the patient
- Anaesthesia for specific conditions
- Anaesthesiology for surgical subspecialties, e.g. ear/nose/throat (ENT)
- Anaesthesiology in outlying areas

- Equipment in anaesthesiology/recovery and maintenance
- Post-operative patient care

The simulation training consists of planned learning experiences which are designed to augment the knowledge, skills and attitudes of registered nurses and midwives for the enhancement of nursing and midwifery practice, education, leadership and research.

Continuing professional and personal development is required in order to maintain and enhance professional standards and to provide quality, competent and safe patient care (*Scope of Nursing and Midwifery Practice Framework*).<sup>36</sup> This contributes to safe and effective practice in an ever-changing healthcare environment.

### **(e) Development of career pathway**

Research indicates that expanding the role of the nurse/midwife results in improved patient outcomes, enhanced outcomes for healthcare staff and improved service quality and development (Comiskey *et al* 2013; Begley *et al.* 2014; Fealy *et al.* 2015).<sup>37, 38, 39.</sup>

Consideration needs to be given to the expanded role of the nurse/midwife as well as to the development of CNS and ANP roles in the Anaesthesia/PACU area.

### **(f) Advanced practice nursing**

The Nursing and Midwifery Board of Ireland (NMBI) defines advanced practice nursing as a career pathway for registered nurses committed to continuing professional development and clinical supervision to practise at a higher level of capability as independent, autonomous, and expert practitioners. Advancing this role in Anaesthesia/post-anaesthesia care requires further exploration. Any developments must be guided by patient and service need, meet NMBI requirements, and have the support of the multidisciplinary team (*Advanced Practice (Nursing) Standards and Requirements*).<sup>41</sup>

## **8.4 Operating department practitioners**

In HSE and voluntary hospitals, the ODP role is fulfilled by registered nurses/midwives, who are regulated by the NMBI. At present there is no regulatory body for ODPs employed in the private sector in the Republic of Ireland.

In Ireland, the anaesthetic nurse/midwife may sometimes work solely in the area of assisting the Anaesthesiologist with induction, maintenance and reversal of Anaesthesiology. However, it is not unusual to find the nurse in the operating department undertaking a diverse role and rotating in all areas of perioperative care, i.e. Anaesthesia, circulating, assisting the surgeon, and post-Anaesthesia care.

## **8.5 Healthcare assistants/support workers**

The role of healthcare assistants (HCAs) in Anaesthesia and the PACU varies in Ireland. The 1998 *Report of The Commission on Nursing: A blueprint for the future*<sup>34</sup> recommended that there should be an examination of opportunities for the increased use of care assistants and other non-nursing staff.

The role of the HCA is to support the delivery of patient care under the supervision and direction of qualified nursing staff - Department of Health & Children – *Effective Utilisation of Professional Skills of Nurses & Midwives – Report of the Working Group (2001)* (Ref).<sup>42</sup>

### 9. SERVICES FOR PATIENTS WITH MALIGNANT HYPERTHERMIA

#### 9.1 Introduction

Malignant hyperthermia (MH) is a potentially fatal pharmacogenetic disorder triggered by common types of anaesthetic agents such as sevoflurane.<sup>43</sup> Genetic and biochemical evidence shows that defects in skeletal muscle ryanodine receptor calcium release channels account for most cases of malignant hyperthermia.<sup>44</sup>

A fulminant MH crisis is characterised by hyperthermia, skeletal muscle rigidity, tachycardia, and respiratory and metabolic acidosis. The mortality rate of MH has been as high as 70%. However, greater awareness of the syndrome, advances in patient monitoring, and early intervention to discontinue the anaesthetic agent on the appearance of early MH indicators have significantly reduced the mortality rate to less than 5%. This has been achieved by early detection of the MH episode with the aid of capnography, prompt use of Dantrolene and the introduction of diagnostic testing.<sup>45</sup> As MH can be avoided by the use of non-triggering anaesthetic agents, knowledge of the susceptibility of individuals prior to anaesthesia is of vital importance for prevention.<sup>43</sup>

The accepted and validated test for diagnosing susceptibility to MH is an in vitro contracture test (IVCT) performed on skeletal muscle tissue obtained by biopsy from at-risk cases.<sup>46</sup> Individuals are diagnosed on the contracture response of their muscle to caffeine and halothane as follows: MH sensitive (MHS), hypersensitive to caffeine and halothane MH exposed (MHE), hypersensitive to caffeine or halothane and MH negative (MHN), not hypersensitive to either agent. Clinically, both MHE and MHS individuals are considered susceptible to MH.

The IVCT is the gold standard for MHS diagnosis. However, as understanding of the syndrome grows, genetic analysis is replacing the IVCT in appropriate cases. Typically, when a new index MH case is recognised, the IVCT is performed on the proband to confirm MHS. Mutation screening of an MHS index sample will regularly yield an RYR1 mutation that can subsequently be used for genetic testing in the extended family of the index case.<sup>45</sup> However, there are a number of factors that confound genetic studies and pose an obstacle to the development of a simple non-invasive diagnostic test for susceptibility to MH in all cases.

#### 9.2 MH SERVICES IN IRELAND

##### a) History

In Ireland, the investigation and diagnosis of patients with MH (and their families) has to date been carried out at the Department of Anaesthesiology, Cork University Hospital (CUH) in conjunction with the School of Biochemistry and Cell Biology, University College Cork (UCC).

The introduction of the investigation and diagnostic service followed on the research carried out under the direction of Professor Jim Heffron (UCC), Professor Tommie McCarthy (UCC) and Dr Mary Lehane (CUH) in 1984. Over the next 30 years, patients were referred from across the island of Ireland to CUH for clinical review, muscle biopsy and IVCT and genetic testing. Funding was provided indirectly through UCC and CUH. A national centre for MH has not been established, nor has direct funding been provided by the HSE. Despite this, and in large part due to the dedication of the team involved, many hundreds of patients have been counselled and tested for MH.

**b) Current status**

Based on the incidence of MH in children (the age group with the highest incidence of the disorder), the likelihood of a child with MH susceptibility reacting during general anaesthesia and the number of children receiving general anaesthesia per year, it is estimated that the prevalence of MH in the UK is 1 in 8,000–10,000.

The number of new cases of MH presenting in the UK with a clinical reaction has averaged approximately 25 per year since 2008. This represents an incidence of 1 in 2.4 million in the general population. However, only approximately 3 million people receive a general anaesthetic each year and so the incidence in the anaesthetic population is 1 in 120,000. The age distribution of those developing a reaction is skewed towards children and young adults with an incidence of MH in children having general anaesthesia of 1 in 20,000–50,000. These data are based on referral patterns to the MH Unit of St. James’s University Hospital in Leeds (UK national referral centre) and are similar to epidemiological data for other countries.

Using genetic data, Monnier and colleagues in France estimated the gene frequency at 1 in 3,000 *Presence of two different genetic traits in malignant hyperthermia families: implication for genetic analysis, diagnosis, and incidence of malignant hyperthermia susceptibility*<sup>52</sup>.

In 2012, a joint decision between CUH and UCC led to the discontinuation of muscle biopsy and IVCT. The service continues as follows:

- The MH-relevant records of patients are maintained by the CUH Department of Anaesthesiology. These include results of previous muscle biopsy and IVCT and genetic testing
- Advice is given to patients and their families with a suspected history of MH.
- Advice is given to clinicians dealing with patients with a suspected history of MH.
- Patients are referred onward for muscle biopsy and IVCT
- Referrals are given for family members of those susceptible to MH for testing. Heretofore, this has been based on referrals to the service by relatives themselves or their physicians. Similar to the UK service, relatives are not actively sought out for testing by the service. Affected patients are advised to inform their relatives and provide information on how to contact the service.
- Genetic testing is provided in conjunction with UCC and the Centre Hospitalier Universitaire Grenoble-Alpes, France.

When patients require a muscle biopsy and IVCT, they are referred to the MH Unit at St James’s University Hospital in Leeds.

**Approximately 850 patients have been investigated for MH at CUH since 1984**

Muscle biopsy and IVCT	580
Genetic analysis	260
Susceptible to MH	307
Not susceptible to MH	327
Total number of patients reviewed	850

Table 6

**Since 2012, when modified CUH guidelines were adopted**

Patients referred to the service	130
Genetic analysis	40
Referred abroad for IVCT	17

*Table 7*

**9.3 Cork University Hospital Malignant Hyperthermia Patient Pathways**

- I. The MH-relevant patient records, including family pedigrees, will be maintained by the CUH Department of Anaesthesiology.
  - These records contain results of genetic testing and IVCT which may need to be referred to by patients and their doctors.
  - Family pedigrees are important in order to identify patients at risk for MH.
- II. Approximately 50 patients are currently awaiting IVCT. These patients may be categorised as:
  - a) Those for whom screening for a genetic mutation may provide a diagnosis of ‘susceptible to MH’, or
  - b) Those for whom IVCT will be required in order to provide a definitive diagnosis.

Patients in category (a) were written to in 2013 and offered blood testing and mutation analysis at CUH. They were counselled that failure to find a mutation associated with MH would necessitate IVCT and that this testing will not be provided at CUH.

Patients in category (b) were written to and informed that they should consider themselves susceptible to MH. Their children must also be considered susceptible to MH. They were referred to their primary care physician or referring anaesthesiologist should they wish to pursue the option of IVCT at another testing centre, e.g. the St James’s University Hospital MH Unit in Leeds. The CUH Department of Anaesthesiology will endeavour to facilitate this process through provision of the clinical information available.

All patients will be reminded of the clinical implications of a presumptive diagnosis of MH and of the necessary precautions, should they require Anaesthesia. Copies of all correspondence were forwarded to patients’ primary care physicians.

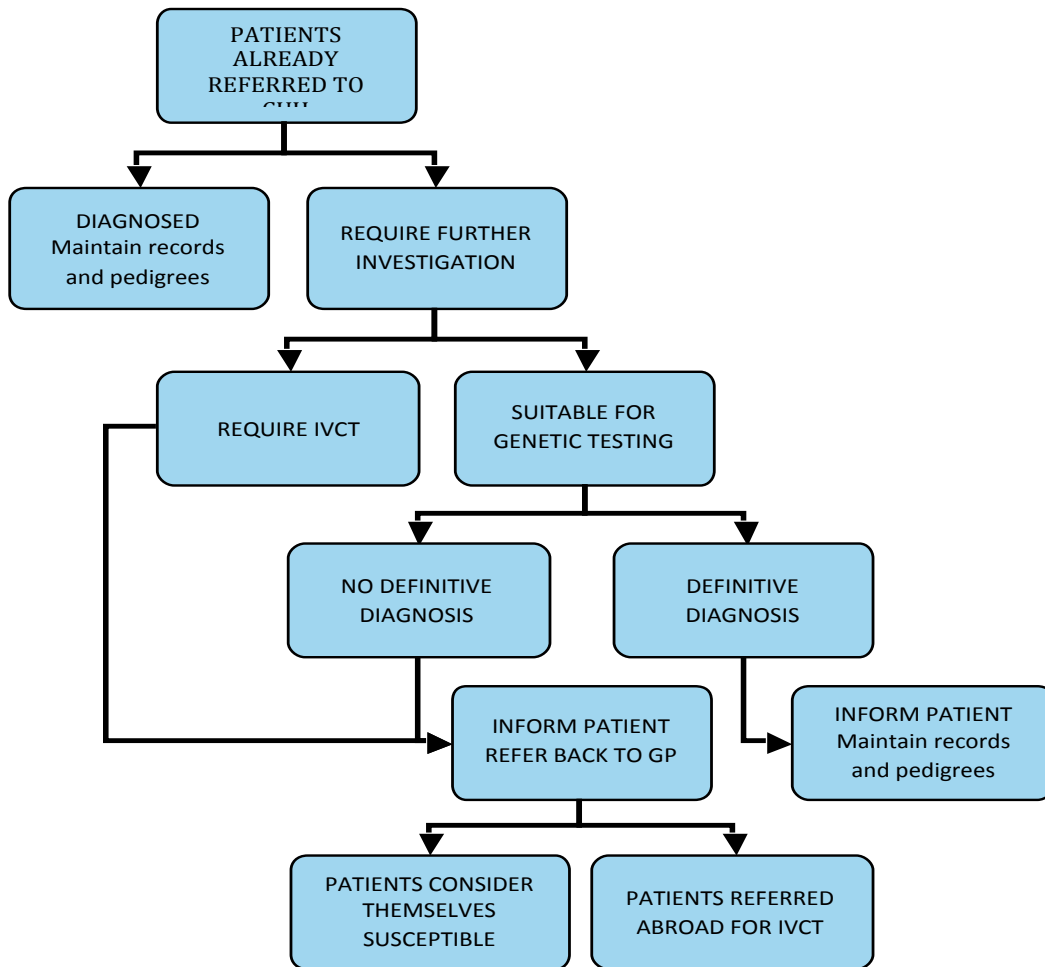


Figure 8: Pathway for patients previously referred to the Malignant Hyperthermia Unit

III. Patients who have had a suspected MH crisis.

Clinicians who are caring for these patients are advised to seek a diagnosis in the following fashion:

Apply a clinical grading scale to determine the likelihood that a perioperative event was an MH crisis. *Larach M, Localio A, Allen G, Denborough M, Ellis F, Gronert G, Kaplan R, Muldoon S, Nelson T, Ørding H, Rosenberg H, Waud B, Wedel D. A Clinical Grading Scale to Predict Malignant Hyperthermia Susceptibility. Anesthesiology. 80(4):771-779, April 1994<sup>53</sup>.*

- Where these events are graded '**somewhat greater than likely**', '**very likely**' or '**almost certain**' to be MH, liaise with the St James's University Hospital MH Unit in Leeds or the Institut de Biologie et de Pathologie at the Centre Hospitalier Universitaire Grenoble-Alpes to arrange genetic testing.
- Counsel patients appropriately in terms of clinical implications for themselves and their families.

The CUH Department of Anaesthesiology advises clinicians on this process.

IV. Patients with relatives previously investigated by the St James's University Hospital MH Unit in Leeds:

Clinicians may refer family members of patients previously confirmed as being susceptible to MH. These patients may be categorised as:



## MODEL OF CARE FOR ANAESTHESIOLOGY

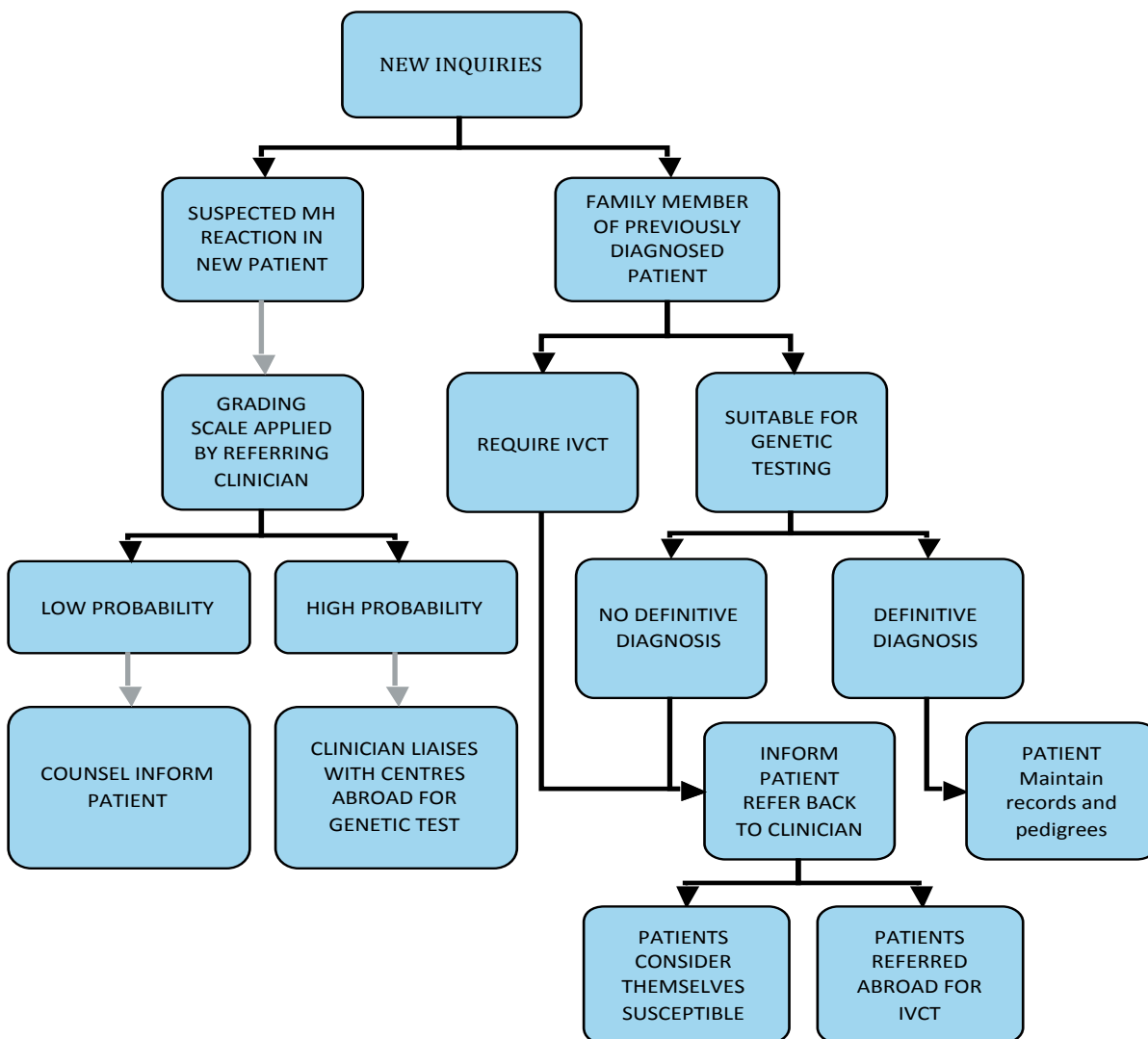
- a) Those for whom screening for a genetic mutation may provide a diagnosis of 'susceptible to MH',  
or
- b) Those for whom only IVCT can provide a definitive diagnosis.

Patients in category (a) are written to and offered blood testing and mutation analysis at CUH. They are counselled that failure to find a mutation associated with MH necessitates IVCT, which CUH is not in a position to offer.

Patients in category (b) are written to and informed that they should consider themselves susceptible to MH. Their children must also be considered susceptible to MH.

They are referred to their primary care physician or the referring anaesthesiologist, should they wish to pursue the option of IVCT at another testing centre, e.g. the St James's University Hospital MH Unit in Leeds. The CUH Department of Anaesthesiology facilitates this process through provision of the clinical information available.

All patients are reminded of the clinical implications of a presumptive diagnosis of MH and of the necessary precautions should they require anaesthesia. Copies of all correspondence are forwarded to patients' primary care physicians.



**Figure 9: Pathway for new inquiries to the CUH Department of Anaesthesiology**

### 9.4 Cork University Hospital Malignant Hyperthermia Unit – Work Description

The Cork University Hospital Malignant Hyperthermia Unit workload can be summarised as follows:

- **Maintenance of patient records and family pedigrees:** Because of the inherited nature of MH susceptibility, family records are vital to the service. The decision to consider a patient at risk of MH or to perform testing will be influenced by the family pedigree, and accurate records must be maintained. The records are also used to select relatives for testing in the case of a positive result in an index case. The records need to be maintained in perpetuity as families grow.
- **Accepting referrals as above:** Referrals need to be examined and analysed in order to determine whether testing is indicated and what the appropriate test pathway is. In some cases this is by discussion with a referring physician and examination of clinical notes in other cases this is done by referencing family pedigrees.
- **Genetic mutation analysis:** Having established the need for testing, genetic mutation analysis may be performed. Blood samples are taken from patients and family members and are transferred to University College Cork (UCC) for cold storage. They are then sent in bulk to the laboratory for analysis. In the past, patients had blood taken by their GPs, and were then forwarded to CUH. However, this proved expensive and many samples were either inadequate or spoiled, as the blood sample needs to be maintained at a low temperature. Patients now attend the Pre Admission Unit at CUH, where they sign consent and have blood taken.
- **Administrative work:** In addition to maintaining records, a considerable amount of administrative work is required. Patients require letters to be sent to their GPs, surgeons and anaesthesiologists. The CUH Malignant Hyperthermia Unit provides documentation to all family members who are susceptible or likely to be susceptible to MH as well as to those who are confirmed as not susceptible to MH. Results of genetic testing and IVCT need filing in hospital and in the Malignant Hyperthermia Unit records.

### c) Resources

The resources currently available to the service are as follows:

- Eight hours clinical time per week from a consultant anaesthesiologist
- Informal support from the School of Biochemistry and Cell Biology, UCC
- Costs of genetic analysis of blood samples at the Centre Hospitalier Universitaire Grenoble-Alpes are covered by CUH
- Patients have successfully applied for funding for muscle biopsy and IVCT at St James's University Hospital, Leeds under the HSE Treatment Abroad Scheme <https://www.hse.ie/eng/services/list/1/schemes/treatmentabroad/apply.html>

### 9.5 Future directions

There are a number of potential options for an MH service in Ireland.

### 9.5.1 Model 1 – Comprehensive National MH Unit

A comprehensive national unit would provide a full range of diagnostic and investigational services for patients throughout Ireland who are suspected of being susceptible to MH. This would entail:

- a) Accepting referrals for patients from across Ireland
- b) Evaluating each case using clinical records and patient interviews
- c) Performing muscle biopsy and IVCT in a timely fashion
- d) Performing genetic mutation analysis as appropriate
- e) Developing a national electronic database of affected patients and their families, with corresponding links to electronic patient records and genobank
- f) Having established an MH proband, inviting all potentially affected members of that family for IVCT and/or genetic mutation analysis in a proactive fashion
- g) Implementing a comprehensive genetic screening programme to identify all mutations affecting Irish families
- h) Direct State funding.

To facilitate this, the following upgrading would be required:

1. Full-time administrative support (estimate: one WTE Senior Executive Administrator (SEA)). In order to accept referrals in timely fashion, process two to three patients per week, coordinate admission and theatre lists, prepare test result documentation and general practitioner (GP) communication, organise blood sample collection and storage, and maintain electronic database.
2. Additional clinical staff. Each biopsy package, from admission to discharge, takes approximately eight hours of clinical work, as outlined above. The current clinical commitment (eight hours per week) would therefore need to be at least doubled. To prevent loss of skills and continuity of care, at least two consultant clinical staff should be employed.
3. Improved access to hospital beds. 2017 estimate: three half-day beds would be required per week.
4. Theatre space. Three first-on-list slots would be required per week.
5. Laboratory facilities and access. Based on current (2017) national demographics and referral rates, the resources to perform three IVCTs per week would be required. This would necessitate significant investment in laboratory staff and equipment. A laboratory technician (one dedicated WTE) would need to be employed on at least a part-time basis. Training of an additional laboratory technician and upgrading of the equipment to European Malignant Hyperthermia Group accreditation standard would be required in order to safeguard the future of the testing facility.
6. Dedicated support from experts in genetics, genetic counselling, and biochemistry.

### 9.5.2 Model 2 – CUH as ‘signpost centre’ for MH in Ireland

Model 2 – CUH as ‘signpost centre’ for MH in Ireland is the current model of care. The disadvantages of Model 2 are as follows:

- a) Little administrative/secretarial support
- b) Inadequate clinician time
- c) Single clinician involved – skill loss over time, loss of the service due to retirement/illness, etc.
- d) No ring-fenced funding stream

- e) Costs of outsourcing genetic testing to laboratory in France
- f) Patient inconvenience of referrals to testing centre at St James's University Hospital, Leeds
- g) Absence of genetic counselling, expertise in genetic analysis and interpretation
- h) Requires development of and investment in a national electronic database of affected patients and their families with corresponding links to electronic patient records and genobank.

### **The advantages of Model 2 are as follows:**

- a) Maintenance of local skills and knowledge
- b) Existing records of genetic testing and muscle biopsies are maintained
- c) Clinical input from consultant anaesthesiologist

### **9.5.3 Model 3 – Transfer MH investigation to National Centre for Medical Genetics**

Testing for MH in Ireland is now largely carried out by genetic testing with a minority of patients referred abroad for muscle biopsy and IVCT.

### **The advantages of Model 3 are as follows:**

- a) Utilising existing resources and funding. National funding structure and expertise in genetics and genetic counselling are already in situ.
- a) A larger staff avoids the risks associated with just one individual maintaining the service.
- b) The service piggy-backs on existing administrative and secretarial support.
- c) There is potential cost savings in genetic testing as a result of using existing diagnostic services.
- d) It is a truly national service.
- e) There is the potential to form a national electronic database of MH patients and their families, with advantages in terms of research and information sharing.
- f) It makes use of the National Centre for Medical Genetics (NCMG) as a 'centre of excellence' for genetic testing, rather than occasional testing by non-experts in a regional setting.
- g) It could facilitate the development of a national electronic database of affected patients and their families, with corresponding links to electronic patient records and genobank.

### **The disadvantages of Model 3 are as follows:**

- a) There is a continuing requirement to refer certain patients abroad for muscle biopsy and IVCT.
- b) Anaesthetic input would still be required.
- c) It would require transfer of existing MH records to the National Centre for Medical Genetics

### **9.5.4 Model 4 – Discontinue MH services in Ireland**

Model 4 would see a discontinuation of MH services in Ireland and referral of all patients to an MH testing unit in another country, e.g. the UK. The nearest MH unit to Ireland is located at St James's University Hospital, Leeds.

Funding for the St James's University Hospital MH Unit is partially provided by the NHS, partially by the University of Leeds and partially by a number of external sources such as the Wellcome Trust and the

Medical Research Council (MRC). The unit has more than 6,100 patients and more than 650 MH probands. The Leeds unit also runs an extensive mutation screening programme, which aims to screen for all common and less common UK diagnostic mutations.

**The advantages of Model 4 are as follows:**

- a) No further investment is required in the Irish service.
- b) A well-funded and resourced MH centre will offer economies of scale for a rare disorder
- c) Genetic testing as well as muscle biopsy and IVCT, could be streamlined into one centre.
- d) The MH Unit in Leeds has already investigated a number of Irish patients.
- e) A good professional relationship is already established.

**The disadvantages of Model 4 are as follows:**

- a) There would be a loss of local expertise in the field.
- b) There are costs associated with outsourcing the service.
- c) Patients will need to travel abroad for muscle biopsy and IVCT as is the case currently
- d) Patient MH records and pedigrees will need to be transferred to another centre.
- e) There could potentially be difficulties with Brexit and funding.

## 9.6 CONCLUSIONS

The current MH service is not fit for purpose. It is under-resourced, poorly staffed and is not in line with international norms. Patients and clinicians receive a limited advice service, outsourcing of genetic testing and referral to a foreign system for biopsy and IVCT. There is no formalised national referral service, nor is there formal direct State funding.

There are numerous risks to the service at present: uncertain funding with the possibility of discontinuation of the service, reliance on the Treatment Abroad Scheme to support what is largely a diagnostic procedure, the risk of losing the MH Unit in Leeds as a referral destination post-Brexit, an absence of dedicated expertise in genetics and counselling in a field that is increasingly dominated by genetic advances, and reliance on a single individual to run the service.

Whichever model is adopted, the overall national plan for investigation and treatment of patients with MH should align with *EUROPLAN – the European Project for Rare Diseases National Plans Development*<sup>54</sup>

Details are available at <https://www.eurordis.org/content/europlan-documents>).

### 10. NATIONAL POISONS INFORMATION SERVICE

#### 10.1 National Poisons Centre

The National Poisons Information Centre (NPIC) based in Beaumont Hospital provides information to doctors and healthcare professionals to assist them in the management of acute poisoning. This service is available 24 hours a day, 365 days a year at (01) 809-2566. The National Poisons Information Service (NPIS) in the UK is contracted to answer enquiries between 10.00pm and 8.00am every day.

The NPIC was established in June 1966 at the Charitable Infirmary in Jervis Street by Dr Joseph Woodcock, who was head of the Department of Anaesthesia. Dr Edel Duggan, Consultant Anaesthesiologist in Beaumont Hospital, is the current Clinical Director and holds a postgraduate qualification in medical toxicology. NPIC staff comprise a clinical director, five poison information officers, a manager and a clerical officer.

#### 10.2 Role of the Clinical Director

In addition to their role as a consultant anaesthesiologist, the clinical director provides telephone advice to healthcare professionals to assist them in the management of poisoned patients. The clinical director is on-call from 8.00am to 10.00pm seven days a week. The NPIC received 10,356 enquiries in 2016, an increase of 7% compared to 2015. Poison information officers give advice concerning the poisoning incident, with further medical advice available from the clinical director.

The clinical director is also responsible for:

- Producing an annual report outlining the activity of the NPIC, which is available online at [www.poisons.ie](http://www.poisons.ie)
- Ensuring that a list of antidote availability in hospital pharmacies is maintained
- Ensuring that information on chemical hazards is provided to the NPIC under European Regulation (EC) No 1272/2008 on classification, labelling and packaging of substances and mixtures
- Ensuring that information on pesticides and biocides is also provided to the NPIC by manufacturers under S.I. No. 624/2001 – European Communities (Classification, Packaging and Labelling of Plant Protection Products and Biocide Products) Regulations, 2001 and S.I. No. 625/2001 – European Communities (Authorization, Placing on The Market, Use and Control of Biocidal Products) Regulations, 2001
- Attending commissioning meetings and meetings of the Clinical Standards Group of the NPIS in the UK
- Attending meetings of the Early Warning and Emerging Trends Committee of the National Advisory Committee on Drugs and Alcohol
- Assisting in the ongoing training of poison information officers by organising continuous professional development (CPD) including staff meetings, journal clubs and CPD meetings
- Continuing the development of a Poison Prevention Programme, and
- Liaising with the NPIS on the provision of TOXBASE to emergency departments out of hours.



### **11. HYPERBARIC MEDICINE SERVICES**

#### **11.1 Background**

Galway University Hospital has provided a National Recompression Service since 1976. The original chamber was deemed unsuitable for purpose in 2008 and was subsequently decommissioned. That chamber at UCHG was a small 4-person chamber, located on site, but removed from the main hospital. It was used for emergencies only. During this period of time the chamber was run by the Galway Sub-Aqua Club on a volunteer basis with supervision by the Department of Anaesthesia. However, the provision of recompression treatment was dependant on the availability of volunteers on any given day.

A new chamber was installed in a purpose built Hyperbaric Medicine Unit and was commissioned in September 2009. This chamber is located in the main hospital and is a state of the art facility. It is much larger and can accommodate nine seated patients or one stretcher patient comfortably. It is suitable for both routine and emergency treatments and has relatively easy access from the Emergency Department and the Critical Care Unit. However, no dedicated funding was made available for the running of the chamber. Therefore, no on-call roster exists and staff availability is unpredictable.

#### **11.2 Overview**

Hyperbaric Oxygen Therapy (HBOT) is a well-established medical therapy worldwide and entails the provision of usually 100% oxygen at 2ATA or greater. The increase in tissue oxygen tension facilitates wound healing in conditions such as radiation tissue damage, refractory osteomyelitis, osteoradionecrosis and gas gangrene. It also expedites the removal of injurious gases such as carbon monoxide, and the nitrogen present in bubbles after diving. The increased pressure reduces the size of the bubbles which are amongst the mechanisms of injury in Decompression Illness and Arterial Gas Emboli. HBOT is therefore used for both acute and sub-acute/chronic conditions.

#### **11.3 Acute medical response**

Currently there is no on call roster in place due to a lack of dedicated funding and when an emergency arises, a web-text is sent out and a patient can only be accepted if an appropriate team can be assembled within a suitable timeframe.

On occasion it has not been possible to organise a team and patients have had to be sent elsewhere. Alternative chambers currently include Craigavon and those in mainland UK and require formal service agreements to be in place.

There are certain conditions for which lack of urgent treatment could lead to poor patient outcomes and potential medico-legal issues could arise.

#### **11.4 Cage**

Patients have sustained iatrogenic cerebral artery gas embolism (CAGE) in Irish hospitals. Many of these cases relate to improper removal of central venous access catheters. Harm can be mitigated in these cases using recompression. These are avoidable events with devastating consequences for patients. In such

cases, the treatment is urgent recompression and this is supported by the HSE website (*Embolisms that are caused by air bubbles are usually treated in a hyperbaric chamber*). However, without a rostered service in place, the ability to respond is unpredictable.

### 11.5 CO poisoning:

Severe carbon monoxide is associated with 10-40% residual neurological sequelae, which may be reduced with early recompression therapy. Indeed, the HSE website advocates the consideration of HBOT in certain cases of CO poisoning, despite not being in a position to guarantee such therapy. <https://www.hse.ie/eng/services/publications/nursingmidwifery%20services/wound-management-guidelines-2018.pdf>

### 11.6 Decompression Illness

Decompression illness (DCI) is a term used to describe symptoms that arise from a reduction in ambient pressure, with the subsequent liberation of, usually nitrogen, bubbles. These in turn can damage nerves including the spine, block blood vessels, become trapped in the lungs and can exert pressure effect on cells and organs in the body. By placing a diver in a recompression chamber and increasing the pressure, the size of the bubbles is reduced. The addition of oxygen relieves any oxygen deficit in the body and helps to wash out gas faster from bubbles and tissues. Reducing the time to definitive treatment i.e. recompression in a hyperbaric chamber, is related to better outcomes.

Despite the absence of dedicated national funding, the hospital has treated 48 divers with decompression illness since 2011. Divers came from 17 counties in the Republic as well as from Australia, France, Scotland and England.

As a result of a near miss, there is now a policy of not accepting a diver if a team cannot be identified within 30 minutes. The diver is then transferred to Craigavon if available.

If Craigavon is unavailable or if the diver needs a level 3 support (UCHG is the only hyperbaric facility in Ireland capable of this level of support), then that diver must be transferred to the UK. Again this introduces the issue of delay to treatment and further potential for harm.

The following is an extract from the document ***Time to treatment for decompression illness: Prepared by North Sea Medical Centre for the Health and Safety Executive 2007***: "Here we show that early HBO treatment in divers with neurological DCI is robustly associated with a better outcome. There is a suggestion in this study that divers with DCI are less responsive if HBO treatment is delayed for 350 minutes or more (or approximately six hours) after surfacing from the incident dive".

### 11.7 Garda Water Unit

A very important role of the unit is support for the Garda Water Unit.

The Garda Water Unit has 17 trained officers, and provides an operational support and search capability to other Garda units and outside agencies in marine environments and hazardous locations. They work in very demanding and challenging conditions such as recovery operations at sea. Both the Naval and Garda sub aqua unit can be deployed to assist in this task. The Garda Water Unit conducts in the region of 240 dives per year. This body is governed by strict diving regulations and can only carry out its job safely with

the support of a backup facility. Regulations state that that for all dive operations deeper than 10 meters, provision must be made in advance to ensure a Garda diver can be transported to a suitable facility within 2 hours of an incident occurring. Again, Galway may not be in a position to provide acute recompression services and alternative arrangements have to be put in place.

### **11.8 Naval Service**

The Naval service has its own chamber in Haulbowline and this could potentially be used for members of the Garda Water Unit. However, ironically due to its portable nature it may not be available. For example the Irish Naval Service Dive Team can be simultaneously conducting a search in another location and their portable recompression chamber maybe on deck of their support vessel. The effect of this is the chamber may not be made available for the Garda Water Unit.

This necessitates dependence on the chamber in Galway University Hospital and the use of the Coastguard Helicopter service on standby to provide transport if required. Even if available, the Navy chamber is not capable of treating a seriously ill diver who requires ventilation.

The only chamber in the country capable of providing this level 3 service is the chamber at Galway University Hospital and then only when the appropriate personnel are available.

### **11.9 Commercial**

While major commercial organisations i.e. off shore oil industry have their own chambers, smaller enterprises such as the fish farming industry rely on the availability of the National Hyperbaric Unit.

The availability of a national, hospital based, fully funded and fully operational Hyperbaric Medicine Unit would ensure that the diving population, including Garda, commercial and recreational, has prompt access to a level 3 recompression chamber. The ability to promptly treat a diver and prevent long-term illness has significant individual and societal benefits.

### **11.10 Elective Medical Patients**

The benefits of Hyperbaric Oxygen Therapy, while widely appreciated and used in other countries, have been significantly under recognised in Ireland within the health care setting.

The British Hyperbaric Association has 11 member chambers and the NHS currently provides funding for 10 chambers in England. Scotland, with a population of 5.1 Million and an active off shore diving industry, has a National Hyperbaric Unit located in Aberdeen and three other independent chambers capable of treating Decompression Illness. In Ireland, we have one hospital based chamber in the Republic which currently receives no national funding and whose future is uncertain.

In 2016 the 10th European Committee for Hyperbaric Medicine (ECHM) Consensus Conference on the indications and practice of HBOT was held in Lille on April 16-17, 2016 and the subsequent paper was released: Tenth European Consensus Conference on Hyperbaric Medicine: recommendations for accepted and non-accepted clinical indications and practice of hyperbaric oxygen treatment. *Diving and Hyperbaric Medicine* 2017; **47**(1):24-32).

Our largest group of elective patients comprises those who have developed chronic radiation tissue injuries. The radiation treatment has left areas of tissue with a poor vascular supply. These areas are subsequently prone to infections and lack the capacity to heal. By providing oxygen under pressure, the amount of oxygen dissolved in tissues rises, enabling oxygen to reach areas of tissue with previously low oxygen concentrations.

Alternating high oxygen during hyperbaric sessions with the usual low oxygen states drives new vessel formation. This facilitated healing continues even after the hyperbaric sessions have finished.

The benefits to patients are many and include the following examples:

Three patients who have avoided the need for a cystectomy with the associated reduced morbidity to patients and the reduced financial burden of hospitalisation including theatre time and ICU time. One patient with a non-healing wound which subsequently healed after a 20 sessions of HBOT. A young patient with osteomyelitis of the foot avoided amputation after 90 sessions of HBOT. Numerous patients with radiation induced haematuria and transfusion requirements no longer need such intervention.

Patients with chronic conditions impose a significant burden on the health system. The use of HBOT can improve patients' quality of life and reduce the need for repeat hospital visits, wounds dressings, red cell transfusions and surgical procedures.

The number of patients seeking hyperbaric medicine is growing. This can in part be explained by the expansion of private chambers which advertise the benefits of hyperbaric oxygen widely. Sometimes the treating doctors are unfamiliar with the concept of HBOT and more should be done to educate the medical community. Time needs to be allocated to deliver such education. However there is little incentive to advertise a treatment knowing that the ability to deliver such treatment is very limited. Due to lack of dedicated funding and staff rostering, the future of the Galway chamber is precarious, and remains dependant on the availability a few key individuals.

It is likely that, as more patients become aware of the potential benefits of HBOT, the demand for the service will increase. If this demand is not met locally, then the alternative is the much more-costly approach of transferring patients to the UK or other European centres. Alternatively, some patients will pay for HBOT in private and unregulated chambers.

Investing in this service now will ensure long term gain in terms of quality and patient safety through our ability to deliver a service promptly when required.

### **11.11 Activity to Date**

It is clear that operating on an emergency basis only, both underutilises our facility and prevents our staff from becoming proficient in the running of the chamber and the care of hyperbaric patients.

Therefore it was proposed to the hospital management that, pending full time funding, we would run two six-week, Monday to Friday, programmes per year. This was approved and we ran our first elective program in 2010. A service level agreement was put in place with the Galway Sub Aqua Club, who had previously run the chamber voluntarily, to support running of the chamber on an emergency basis and to participate in

the two elective six week sessions. A 5-day training programme for ten people was held on site in February 2013. This training was delivered by the London Hyperbaric and Wound Healing Centre, Whipps Cross University Hospital. This afforded an opportunity for staff to gain certification and competency as both chamber attendants and chambers operator. A further one-day course was provided to inside attendants and medical staff in March 2014.

To ensure maintenance of high standards of care in a cost efficient manner the unit nurse manager has developed a training program for attendants and operators and this has been recognised by the European Underwater and Baromedical Society (EUBS). This was a personal initiative and should be recognised as a major achievement for a service with limited resources.

### **11.12 Staffing**

To run a treatment session for a non-critically ill patient(s) we need a minimum of two chamber operators, one inside attendant, medical staff available within 3-4 minutes in the event of an emergency and a consultant anaesthetist to oversee the treatment. When a patient is unstable or critically ill, an inside attendant with ICU skills is required and ideally the consultant anaesthetist and the unit manager Mark Keating should be in attendance. Name deleted

### **11.13 Operators & Attendants**

The two chamber operators generally consist of a staff member from the HSE (nursing, paramedical or radiotherapy) and one from the Galway Sub Aqua Club. We endeavour to have a registered nurse or paramedic as the inside attendant but due to staff unavailability a member of the GSAC usually takes on this role for divers who are not unstable. The SLA with the GSAC is due to be updated and needs to take into account the expansion of the emergency services in the interim.

### **11.14 Medical Input**

The assessment and selection of suitable patients is carried out by a consultant. This elective service is provided by Dr Pauline Whyte and she and Dr Noel Flynn support the provision of emergency services. Much of the original work was done on a voluntary basis outside working hours. In 2015 Dr Whyte was allocated one day a fortnight for hyperbaric duties.

While beneficial to the Hyperbaric Program, the immediate impact is the removal of a consultant from Theatre/ICU duties. The involvement of only one consultant in the elective programme is not sustainable and the availability of one or other consultant for emergencies is very onerous and not sustainable. Due to the nature of diving, many of the calls come in at weekends and bank holidays. The unavailability of both consultants effectively closes the program. Great efforts are made to ensure that one consultant is available (including off duty but willing to take phone calls) at all times. Should one of the consultants retire or be ill or on leave, this would inevitably mean that the service will have to close when the remaining consultant is unavailable. A business case is being submitted for another Consultant anaesthetist with an interest in HBOT.

### 11.15 Education & Research

Exposure to HBOT is provided to the anaesthesia trainees in Galway bi-annually. This consists of an introductory talk in July and January followed later in the year by a series of lectures and an opportunity to experience pressurisation in the chamber.

The other group that should be regularly exposed to HBOT teaching is the Emergency Medicine physicians who are generally the first physicians to encounter divers and patients with CO poisoning. There have been instances of delayed referrals due to lack of knowledge amongst ED trainees regarding decompression illness and its treatment. With this in mind, we held a HBOT day for ED trainees which was extremely well received. With full time funding, providing regular teaching to the ED physicians is something that needs to be developed.

While HBOT provides unique challenges for Randomised Control Trials, there is certainly a lot of scope for research opportunities. A research program could certainly be introduced if The National Hyperbaric Medicine Unit was open on a fulltime basis.

The unit also occasionally host visits for diving clubs. The aims of these days are familiarisation with the chamber and a lecture with emphasis on safe diving practices. Demand for these days currently exceeds the ability to accommodate clubs with a missed opportunity for education.

In summary, the National Hyperbaric Medicine Unit has treated divers and emergencies patients since 1976 and elective patients since 2011 despite no national funding. The NHMU has responded to emergencies such as iatrogenic gas emboli thereby improving patient outcomes.

Treatment at the unit has improved the quality of life of patients and reduced the burden on hospital beds, theatre time and transfusion requirements. It has provided a unique educational experience for doctors in Hyperbaric Medicine and raised safety awareness amongst visiting dive clubs.

However, the situation described is unsustainable as demand grows and staff retire.

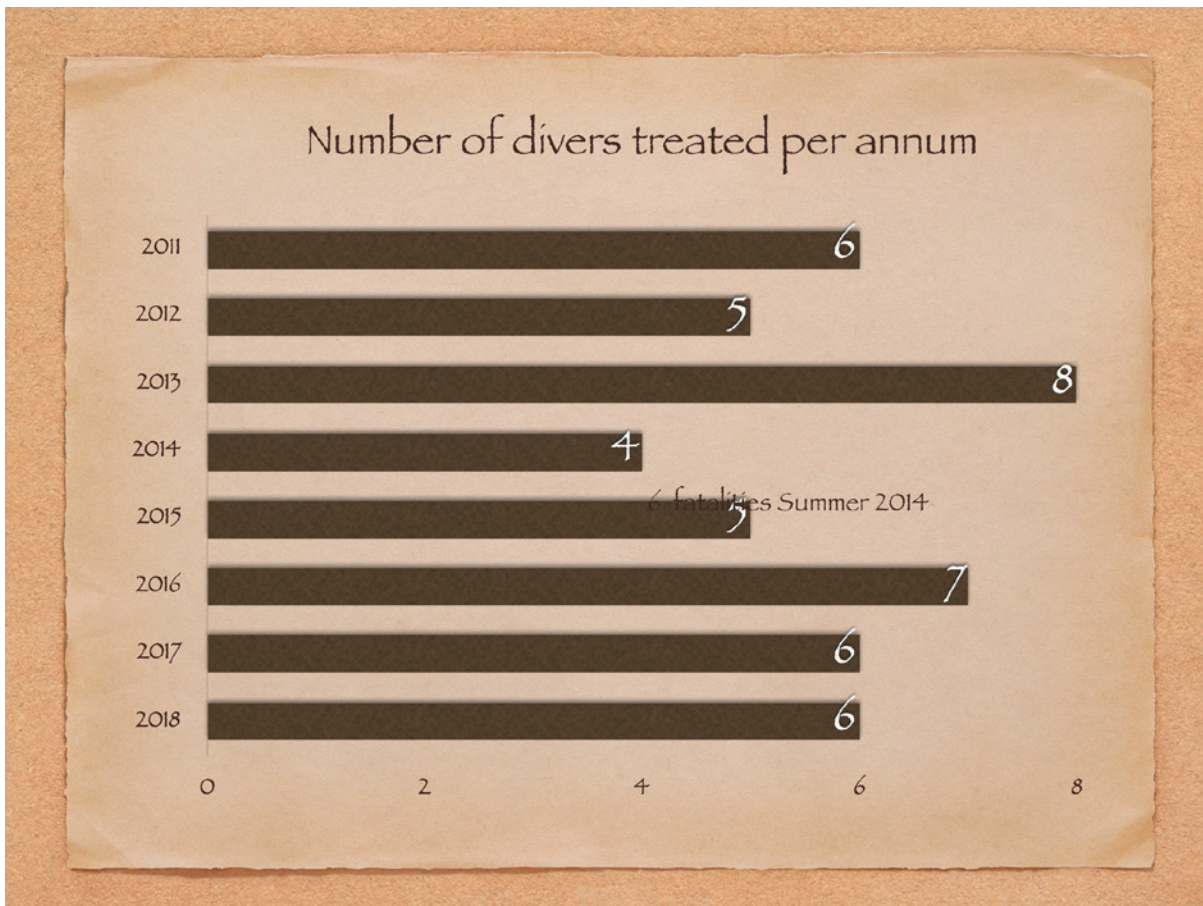
#### *The options are as follows:*

**Full-time HMU:** This requires a commitment to financially support the development of the National Hyperbaric Medicine Unit in Galway as a 365-day service treating both elective and emergency patients and the recruitment of appropriate staff. We would envisage running the HMU on a five-day basis for elective patients and on a 24/7 basis for emergencies. We would therefore require 2 WTE anaesthetists to support the elective work. The on call rota would require a minimum of 6 anaesthetists and would need to be supported by colleagues with an interest in Hyperbaric Medicine.

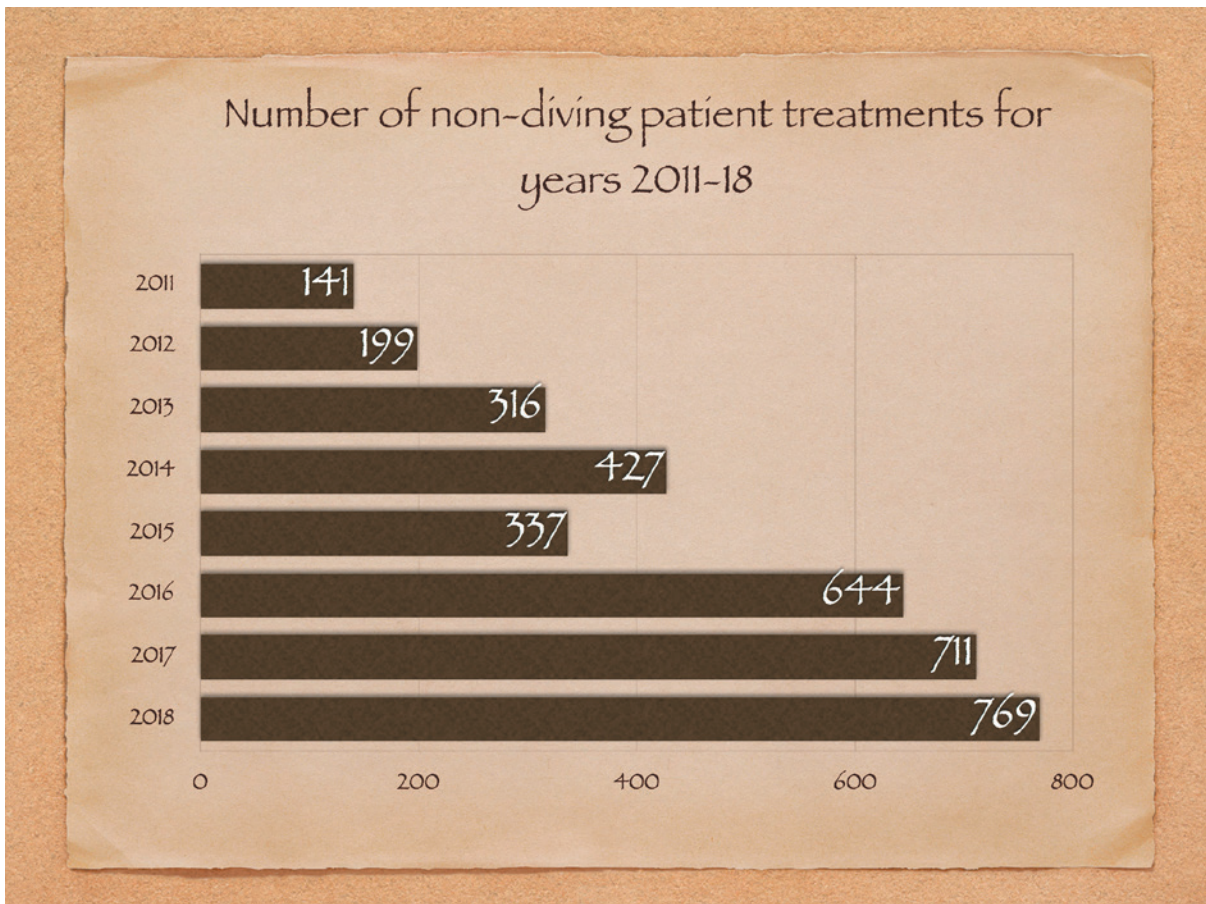
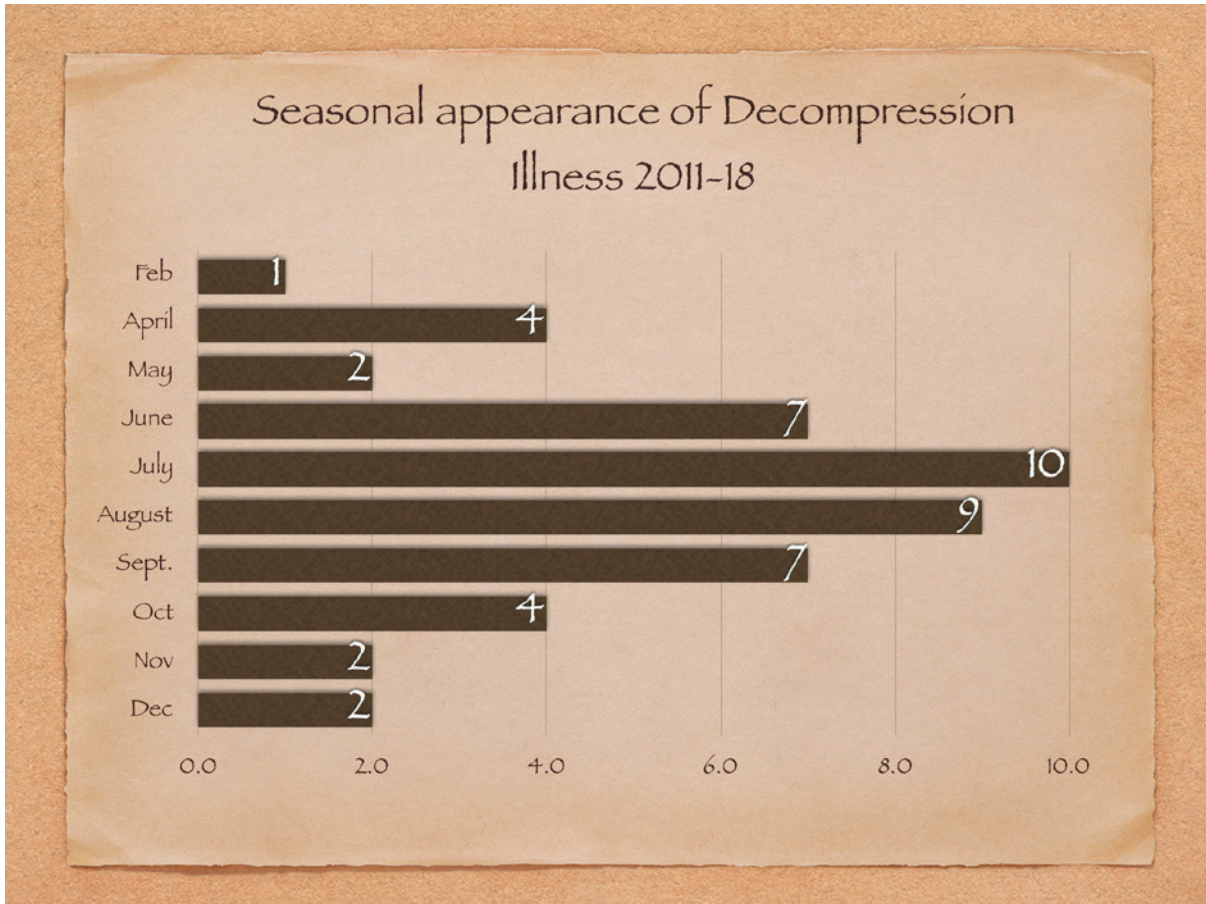
**Continue as is:** Another option is the continuation of a very limited and unpredictable service in Galway with the transfer of patients when necessary to Craigavon (non-critical patients only) or overseas. The medico-legal aspect of delays to treatment for acutely injured patients needs to be considered. Iatrogenic gas emboli are undoubtedly under-reported and under treated. Failure to provide timely HBOT will result in increased morbidity and costs. A separate discussion regarding the legal and ethical commitment to support the Garda Water Unit also needs to take place.



**Close the HMU and transfer:** The other alternative is to create a pathway whereby patients are managed outside the Republic of Ireland. Even with the most efficient system in place, the issue of delay to treatment for acute patients (with the exception of a transfer to Craigavon) would remain a serious concern, both in terms of patient recovery and potential litigation. The costs of financing elective patients to travel to Europe versus treating them in Ireland needs to be explored.







### 12. QUALITY IMPROVEMENT IN ANAESTHESIOLOGY

Quality improvement in healthcare is the responsibility of all staff members. There are many improvement initiatives under way across the health sector. As a result of limited resources and the difficulty we are currently experiencing in staff recruitment, there is added pressure on all front-line staff. However, there is a need to focus on quality improvement and proactive care instead of crisis management and reactive care. The 2009 World Health Organization (WHO) recommended Safe Site Surgery Checklist is a well-recognised quality-improvement initiative. Any quality-improvement initiative project must have evidence that the change will, firstly, be an improvement and secondly, that it is sustainable. It is essential to have a multidisciplinary team approach to quality improvement, this contributes to ensuring that the right people are on each project team which is vital to success.

Measurement and monitoring of quality in healthcare is evolving and it is essential to maintain and improve evidence-based standards of care. Historically, improvements and changes have been made as a result of something that has gone wrong. Although all improvement involves change, not all changes result in improvement. An important aspect of quality improvement is the use of accurate and powerful measurement tools. These help to ensure that patient outcomes are improving because of the implemented change.

In 2016, the HSE's Quality Improvement Division developed the *Framework for Improving Quality in Our Health Service, Part 1: Introducing the Framework*<sup>47</sup> to influence and guide thinking, planning and delivery of care. The clear aim is to foster a culture of quality that continuously seeks to provide safe, effective, person-centred care across all services.

#### 12.1 What is quality improvement?

A useful definition of 'quality improvement' is the combined and unceasing efforts of healthcare professionals, patients and their families, researchers, payers, planners, and educators to make the changes that will lead to:

- Better patient outcomes (health)
- Better system performance (care)
- Better professional development (learning)<sup>48</sup>

Quality improvement involves measuring where you are currently and working as part of a team to make improvements using recommended and accurate measurement tools.

#### 12.2 What is quality assurance?

According to the Australian and New Zealand College of Anaesthetists' (ANZCA's) *Guidelines on Quality Assurance and Quality Improvement in Anaesthesia*, quality assurance (QA) can be defined as "an organised process designed to ensure the maintenance of a desired level of safety and quality in a service or product".<sup>49</sup>

### 12.3 The model for improvement

The PDSA (Plan, Do, Study, Act) cycle – also known as PDCA (Plan, Do, Check, Act) – is a well-recognised model for improvement tools in quality improvement.

The model comprises two parts:

- Three fundamental questions, which can be addressed in any order
- The PDSA cycle to test changes in real work settings. The PDSA cycle guides the testing of a change to determine whether the change is an improvement



Figure 10 – PDSA – Tribal Evaluation Institute



### Setting aims

Question 1: "What are we trying to accomplish?" This gives us our aim, which should be time specific and measurable, it should also define the specific population of patients or other system that will be affected.

### Establishing measures

Question 2: "How will we know that a change is an improvement?" Teams use quantitative measures to determine if a specific change actually leads to an improvement.

### Selecting changes

Ideas for change may come from those who work in the system or from the experience of others who have successfully made improvements

### Testing changes

The PDSA cycle is shorthand for testing a change in the real work setting – by planning it, trying it, observing the results and acting on what is learned. This is the scientific method adapted for action-oriented learning.

### Implementing changes

Following testing a change on a small scale, learning from each test and refining the change through several PDSA cycles, the team may implement the change on a broader scale – for example, for an entire pilot population or an entire unit.

### Spreading changes

Following successful implementation of a change or package of changes for a pilot population or an entire unit, the team can spread the changes to other parts of the organisation or to other organisations.

*'Science of Improvement: How to Improve'* - Institute for Healthcare Improvement<sup>55</sup>

## 12.4 Identifying areas for quality improvement

Quality improvement (QI) uses a structured approach to change and is ongoing, enabling the empowerment of all staff to deliver and sustain high-level quality care for all patients. Front-line staff are in the best position to identify areas of change. Ideas for QI can be obtained from the Royal College of Anaesthetists Guidelines or National Audit Projects (NAPs), Association of Anaesthetists of Great Britain & Ireland (AAGBI) Guidelines or National Institute for Health and Care Excellence (NICE) Guidelines. Another excellent document recently published is the NOCA GDPR Guidance for Clinical Audit (May 2019).

One way to decide which QI projects to implement is to agree as a multidisciplinary team, "What are the 10 things that matter to us most?" Once these have been identified, you can then collect data that will drive the quality improvement.

We are all familiar with time-consuming audits that have been conducted but where the information gathered has not always been utilised to improve patient care. The collection of data for QI can be determined locally, gathered over a short period of time within a small cohort and used rapidly to determine current status and enable decision-making on QI projects.

### **12.5 Theatre Quality Improvement Programme**

The Theatre Quality Improvement Programme (TQIP) is a HSE Integrated Care Programme Patient Flow initiative in collaboration with the National Clinical Programme for Anaesthesia (NCPA) and National Clinical Programme for Surgery (NCPS). This programme was established to support the development of sustainable theatre quality improvement projects on chosen hospital sites. The TQIP is supported and facilitated on the participating sites by the Royal College of Surgeons in Ireland's (RCSI's) Quality and Process Improvement Centre (QPIC).

The TQIP aims to support hospitals and multidisciplinary theatre teams who are committed to quality and process improvement to deliver:

- Improved patient experience and outcomes
- Improved safety, quality and reliability of care
- Improved team effectiveness and staff well-being
- Value and improved efficiency
- Organisational QI capability, enabling a culture of continuous improvement.

Implementing the TQIP within your hospital will improve patient flow and value for money through improved theatre efficiency (e.g. reduction of delays in start times, improved utilisation, and reduced overruns and inventory costs). It will also support the development of internal capability and confidence in the application of QI tools.

Participating sites will benefit from on-site facilitation training provided by the RCSI's experienced QPIC facilitators. Multidisciplinary team members who participate fully in the programme will be awarded an RCSI Certificate of Completion in Healthcare Process Improvement on completion of their training.

A set of agreed national key performance indicators (KPIs) will be reported from each hospital engaging with the programme. Each participating site must also put in place the appropriate resources and programme governance arrangements as set out by the TQIP Steering Group in the Programme Specification.

### **13. THE ROLE OF THE COLLEGE OF ANAESTHESIOLOGISTS OF IRELAND IN EDUCATION – Continuing Education and Professional Development (2018–2021) as the Model of Care Evolves**

The College of Anaesthesiologists of Ireland (CAI) will continue to support specialist anaesthesiology doctors, not only to uphold their legal duty to maintain continuing education and professional development (CEPD), but also to achieve the highest standards of professionalism throughout their careers. Accordingly, the CAI will continue to organise an Annual Congress that seeks to bring together the best international cutting-edge researchers, as well as local consultants with established expertise, to deliver a world-class CEPD event.

The CAI will build on the existing success of small group workshops in niche areas of expertise to provide a high-quality learning environment for updating consultants and senior trainees. This will include development of high-fidelity simulation-based courses, which will provide specialised training for rarely occurring events in a high-fidelity, realistic environment. Similar to the CAI Annual Congress, it is envisaged that these workshops and simulation offerings will be advertised to an international audience if they are undersubscribed by local consultants.

Clinical audit is also a mandatory CEPD requirement and the CAI will develop its IT infrastructure to enable it to assimilate encrypted data from multiple remote centres in order to facilitate coordination of large prospective audits, such as participation in UK-led national audit projects. We will enhance current ongoing education of active clinicians in patient safety measures, including a dedicated webpage within the CAI website and clinician e-alerts to mobile devices and email. Furthermore, we will facilitate an electronic, anonymised critical incident reporting service, which could be analysed independently by the CAI.

The CAI will expand e-learning infrastructure to encompass online availability of a documented syllabus for Fellowship examinations with an online repository of curricula for CAI-approved Fellowships in subspecialist areas.

It will also build a comprehensive online library service, supported by a part-time professional librarian if necessary, where availability of major profession-wide journals (*The New England Journal of Medicine*, *The Lancet*, *JAMA*, and *BMJ*), anaesthesiology specialist journals, and other learning resources (online versions of major textbooks, e.g. *Oxford Textbook of Anaesthesia*, Hadzic's NYSORA Regional Anaesthesiology compendium) will be available freely to CAI members and Fellows in good standing.

The CAI will enhance its current support for Irish-based research involving CAI trainees in the specialty by joining a co-funding arrangement with the Royal College of Anaesthetists' *British Journal of Anaesthesia* (*BJA*) – the top-ranked journal in the field of anaesthesiology worldwide – whereby the CAI and the *BJA* will each provide €50,000 per year to fund research projects validated by international peer review. This is in addition to the annual CAI research project grant award of €70,000 initiated in 2015.

It is envisaged that the CAI's dynamic engagement in these areas may facilitate a clinical working environment where clinical anaesthesiology staff feel supported in their careers, therefore helping to attenuate the current difficulties of clinical staff retention.



### 14. ANAESTHESIOLOGY AND THE ELECTRONIC HEALTH RECORD

#### 14.1 Introduction

It is widely recognised that the persistence of paper-based medical records is unacceptable in modern medical practice. The increased geographical distribution of a patient's care, including primary care, dispensing pharmacies and general and specialised hospitals (both public and private), exposes the inadequacy of current clinical recording and communication infrastructure. Beyond simple inconvenience, the gaps in our IT systems pose clinical risks, including poor or absent information sharing and drug errors from handwritten orders or missed allergy checks. When defending our practice, we are also exposed by patently inaccurate or retrospective patient monitoring parameters, often impossible to record contemporaneously by hand. Electronic health records (EHRs) should no longer be regarded as a luxury in healthcare rather they are a fundamental component of modern medicine.

While the responsibility for developing comprehensive and accessible patient records lies with the broader healthcare community, the unique nature of episodes of anaesthesiology care places the onus firmly on Anaesthesiologists to engage directly with the process. Well-documented failings when e-health implementations go wrong are consistently found in retrospect to be largely attributable to the failure to engage the practitioners themselves, instead taking solutions 'off the shelf' or delegating the project to junior staff or allied healthcare professionals.

For a solution to meet the needs of medical practitioners, it needs to be designed and implemented by senior experienced members of the profession who are in a position to make executive decisions, prevent scope creep and understand how any local system sits within and interacts with the broader healthcare record. It is essential that those involved understand the capabilities and limitations of EHR systems. The CAI should lead and coordinate this to promote quality and consistency in anaesthesiology EHRs in Ireland.

#### 14.2 Scope

It is essential that the scope of an EHR is finite and well-defined. In anaesthesiology, we are fortunate in that this is relatively easy.

The patient journey starts with the decision to operate and ends when the patient leaves the theatre complex. It is reasonable and desirable to include perioperative care, acute post-operative pain and/or critical care in the record, if this is appropriate in a particular institution.

The point of entry into the EHR system (the point at which a record is created) depends on hospital workflows and must be capable of occurring at any of the following points in time:

- Decision to list for surgery at an outpatient clinic
- Decision to list for surgery while an inpatient
- Referral to a pre-admission unit
- An emergency when no other hospital record exists.

The ideal anaesthesiology EHR is fully integrated with the patient's core EHR and will import vital information, including allergies and known risks. In the absence of such integration, vital information must persist across episodes, so that when the same patient is readmitted, these are immediately visible within the new episode.

The record of pre-operative assessment is probably the most difficult part of the design process. It must allow both the rapid capture of essential information in an emergency situation and the comprehensive history, examination and workup, potentially including multiple reviews prior to an elective procedure.

Similar to the ideal of importing known allergies and risks from any existing EHR, any allergies, risks and other issues identified during the pre-operative assessment would ideally populate the relevant areas of existing EHRs to be readily viewed by other teams, rather than remaining in a 'silo' within the anaesthesiology system.

A pre-operative assessment should be capable of being updated repeatedly, and the time and source of those updates should be clear. A summary document should be produced by the system which is accessible to medical and surgical teams, e.g. a PDF or printed letter.

The patient's EHR should be seamless, from theatre reception to discharge from the post-anaesthesiology care unit (PACU) (or further, if incorporating pain medicine or critical care).

This means that every physiological measurement, procedure, drug or fluid administration and clinical note by an anaesthesiologist, anaesthesiology nurse or anaesthesiology assistant should be contained in the same record, so as to avoid information gaps or communication failures.

All physiological parameters that may need to be recorded automatically should be capable of being recorded automatically, with a minimum amount of user interaction. Liberating the user from transcribing observations to allow them to concentrate on patient care is a key advantage of an EHR.

Procedures (airway, vascular access, regional anaesthesiology, etc.), as well as details of equipment used and other predictable documentations, should be easily recordable in a consistent way, using tick boxes for example. Free text should be kept to a minimum in order to facilitate audit. Surgical events should be easily marked on the record.

Consideration should be given to the development of a drug library within the EHR to allow complete and accurate documentation of administered medications and fluids. Pharmacy input should be sought and, where possible, the drug library should align with that in the core EHR. To mitigate the occurrence of medication errors, generic medications names should be used and infusion concentrations and units of measure should be standardised.

Allergy and interaction checking may be useful but it carries the risk of alert fatigue and perhaps more importantly, user complacency. In the latter case, the user expects the system to flag every possible problem, and consequently they continue their work if the computer does not generate an alert. Some hospitals have turned off all alerts for this reason.

Orders, including medication and fluid orders for the PACU, should be placed within the system and their administration should be recorded within the system in order to ensure clarity, calculation of totals and to avoid duplication (e.g. the same anti-emetics being repeated in the PACU because an intraoperative administration is not visible). The hospital's e-prescribing system (if it exists) should be accessible from the same computer as that containing the anaesthesiology EHR.

Medications for infusion should be prepared as standard concentrations, appropriately labelled using AAGBI standard colours and administered, where possible, via infusion pumps utilising dose error reduction software (smart-pumps).

Where a smart-pump drug library is being developed, for example in Paediatric Anaesthesia, concentrations should, where possible, be aligned with the national paediatric and neonatal smart-pump drug library of standard concentration infusions.<sup>1,2</sup>

1. Howlett MM. National Smart-Pump Drug Library of Paediatric and Neonatal Standardised Concentration Infusions: Health Service Executive (HSE); 2015 [Available from: <http://www.ehealthireland.ie/Case-Studies-/National-Smart-Pump-Drug-Library-of-Paediatric-and-Neonatal-Standardised-Concentration-Infusions-/>].
2. Howlett M, Curtin M, Doherty D, Gleeson P, Sheerin M, Breatnach C. Paediatric Standardised Concentration Infusions – A National Solution. Arch Dis Child. 2016; 101(9):e2.

All post-operative nursing assessments and notes should be facilitated within the system.

At the end of an episode of care, the ideal scenario would involve all drugs and fluids administered during that episode being exported to the hospital EHR system.

This is particularly important in the case of opioids, non-steroidal anti-inflammatory drugs (NSAIDs) and fluids. However, this is not always easily achieved and so the system must produce a clearly legible care summary for the post-operative ward. Drug and fluid totals must be easily appreciated.

It is essential that the data contained in the EHR are easily available to the clinical team for audit purposes.

The system must allow attributions through a username/password, but also allow for the fact that multiple doctors will be attending to the patient simultaneously. Delays for repeated username/password inputs are undesirable. Fingerprint or swipe card attributions are an option.

Careful consideration must be given to the hardware on which the system will run. This includes touchscreen computers, keyboards, trackballs and barcode scanners. The ergonomics of the operating theatre make the choice of hardware crucial to the successful adoption of the EHR.

### 14.3 Options

EHR systems can be expensive, especially when the transition is being made from a paper record as hardware may account for up to half of the associated cost.

Traditionally, three solution types exist:

1. Electronic recording built into the anaesthesiology machine – this is being phased out
2. A 'best of breed' solution highly tailored for anaesthesiology
3. The anaesthesiology record being a module of one of the large hospital-wide EHRs

In general, option 2 is better received by anaesthesiologists as it is user-friendly and suitable to the intraoperative workflow. However, these systems have generally developed as niche solutions and as such often do not integrate smoothly with hospital systems outside the theatre setting. The process of integration can be costly and may require constant support from vendors as updates occur in the hospital system.

Option 3 is increasingly being imposed on anaesthesiologists as hospitals adopt single-solution providers for their entire EHR system. These facilitate smoother integration with the hospital EHR system and e-prescribing/drug charts but are often poorly developed and less user-friendly.

### **14.4 Procurement**

No EHR is perfectly suited to every institution's processes, each solution requires some configuration in order to suit local workflows. However, anaesthesiology practice in Ireland is generally well-standardised and a system that is flexible in the documentation it facilitates should be relatively easily scaled up to a multisite infrastructure.

Consideration should be given to economies of scale in the procurement process, at least within Hospital Groups if not throughout Ireland. Therefore, prior to procurement, consideration must be given to the relative priority and funding that will be allocated for the following areas:

- Hardware, including secure servers (HSE server resources should be used where possible to bring the system into line with the HSE's data protection processes)
- Funding consultants' time to engage with local configuration for end users (or a team of representative consultants to make design decisions on behalf of a group of multiple end users)
- Funding local IT support staff for their role in the installation
- Integration with existing hospital systems, which can be problematic, expensive and time consuming, and which requires constant vendor support
- Maintenance costs, including software and hardware upgrades at regular intervals
- Training time and costs, including training new NCHDs and nursing staff
- Development and funding of a robust reporting process to facilitate audit, research and ongoing data quality assurance, which should be vendor-independent

### 15. PLANNING AND PROVISION OF FACILITIES FOR ANAESTHESIOLOGY

When planning the provision of surgical facilities, it is important that there is representation from the department of anaesthesiology at an early stage. This applies equally in the context of operating theatre refurbishment and in the extension or construction of a new facility. The principles that apply are no different and the most important and directly relevant are outlined here. There are comprehensive documents that are extremely helpful references when embarking on this type of project. The two most useful are:

1. Hospital Building Note (HBN) 26, Facilities for surgical procedures: Volume 1 (NHS Estates)
2. American Society of Anaesthesiologists Operating Room Design Manual

Both documents are comprehensive and readily available to download from the respective organisations' websites.

The particular aspects of the construction pertaining to the provision of anaesthetic care are outlined below, but it is clear that the anaesthesiologist will contribute to many other aspects of the development, including patient flow, security, on-call access, accommodation, rest areas, etc.

In so far as is possible, each anaesthetic room and each operating theatre in the department should be laid out in a similar fashion. While there may be a limited degree of variation needed to account for specialist care, drugs and disposables should be stocked in similar locations across all anaesthetic rooms and operating theatres. This is particularly relevant when there is regular turnover of staff as it will shorten the induction and familiarisation process.

#### 15.1 Holding bay

Most operating theatre departments will have a holding bay or greeting area where patients first present on arrival at the department. The area should be large enough to allow patient check-in, nursing handover, etc. to take place with some consideration for patient privacy and confidentiality. There should be access to hospital information systems and both a telephone and emergency call button should be available. There should also be access to hand-washing facilities in the area.

#### 15.2 Anaesthetic room

A number of hospitals in Ireland continue to use anaesthetic rooms. The minimum space required in each anaesthetic room is 19 m<sup>2</sup>. With the increasing complexity of modern medical care, more and larger equipment is needed and space becomes a limiting factor. In older facilities, the anaesthetic room will likely be considerably smaller and even in newer builds, the overall building footprint or the operating theatre department footprint/design may necessitate an anaesthetic room smaller than 19 m<sup>2</sup>. The rooms should be able to accommodate four people and allow access to the patient from all sides.

As recommended by the AAGBI, medical gas services (oxygen, nitrous oxide, air, vacuum and gas scavenging) should be wall mounted.

There should be one set of double doors leading from the corridor to the anaesthetic room and a second set of doors from the anaesthetic room to the operating theatre. The doors can be automatic or sliding and need a minimum clear opening width of 1600 mm. Glass panels in the doors should have privacy blinds.

There should be a ceiling-mounted examination lamp for clinical procedures. A clock, telephone, and emergency call unit are also necessary, with the emergency call unit being linked to the recovery unit and the staff rest area.

There should be a handwashing basin with non-touch taps at the opposite end of the room from the patient's usual head position.

There should be a clean, well-lit work surface, allowing for the preparation of drugs and other equipment. Drug storage will include shelving, a refrigerator and a lockable drugs cupboard to comply with the relevant legislation. Adequate storage for other equipment and disposables is also recommended.

The anaesthetic machine can be free standing or wall mounted but the position should be consistent for the majority of anaesthetic rooms within each hospital.

If considering a wall-mounted machine, a support plate will need to be positioned within the wall, as modern building techniques will not allow the machine to be supported without one, similarly, a support plate will also need to be used for wall-mounted cardiovascular and other clinical monitors. This is important for several reasons, not least of which is the standardisation of layout across all anaesthetic rooms in the facility. If the devices transmit data to an anaesthesiology information management system (AIMS), consistency of positioning reduces the likelihood of disconnection from the data port.

Electricity supplies should include several appropriately earthed sockets (blue), these should be clearly distinct from standard sockets which can be used for computers, phone charging, etc. There is a requirement that gas and electrical services should be appropriately separated in terms of supply and access.

While ventilation and heating are an important part of providing a comfortable environment for both the patient and the anaesthesiologist, the air handling for a given operating theatre typically includes the preparation rooms, clean/dirty utilities and the anaesthetic room. It may therefore not always be possible to adjust temperature and airflow independently of the operating theatre, although this would be a desirable feature.

### **15.3 Operating theatre**

When determining the positioning of equipment in an operating theatre, it is important to consider not only the type of surgery that will be performed but also issues related to patient flow. The patient will move from the anaesthetic room onto the operating table and at the end of the surgical procedure from the table to the recovery room. How a patient and trolley will progress is an important consideration allowing easy and safe movement.

It is not uncommon for theatres to be designed in pairs which are mirror images of each other. While this may have some advantages with regard to the provision of electrical and plumbing services, it can present challenges with regard to theatre layout and patient flow. The involvement of anaesthesiologists at the design stage can assist with optimising these issues.

The standard recommended size for an operating room is 55 m<sup>2</sup>. It should be approximately square, with the patient care activities taking place in the centre of the room.

Apart from some specialist surgery, the anaesthesiologist and the anaesthetic machine will be placed at the head of the operating table. It is suggested that the anaesthetic machine, monitors, and patient are all easily observed from one position. A trolley containing emergency and other drugs, fluids and necessary equipment for airway management should be available close to the anaesthetic machine.

In the operating theatre, a minimum number of standardised services should be available. At a minimum, this should comprise 12 electrical outlet sockets (blue) connected to the uninterruptible power supply (UPS)/interruptible power supply (IPS) systems, one oxygen outlet, one nitrous oxide outlet, one medical air outlet, one surgical air outlet, two medical vacuum points, and one anaesthetic gas scavenging point. It is recommended that the gas outlet points be of GEM 10 standard. [http://www.beaconmedaes.com/index.php?option=com\\_pipelinehtml&view=gemio&Itemid=139](http://www.beaconmedaes.com/index.php?option=com_pipelinehtml&view=gemio&Itemid=139)

It is also recommended that at least four data points should be available. All of these services should be provided via ceiling pendants, which are usually of a multi-arm articulated type with a variable height control. This is important, as the pendants need to move out of the way of the general work flow to prevent accidents, yet must be accessible to staff members of varying heights. The surgical and anaesthetic pendants should be similarly positioned allowing maximum flexibility in the operating theatre if the room needs to be re-orientated. Depending on the type of surgery being performed, there may be a requirement for additional pendants to service the needs of minimally invasive surgery, perfusion and other specialist equipment.

The positioning of the pendants in the room should be decided at the design stage. While historically it has been commonplace to position the anaesthetic pendant at the midpoint between the two side walls of the operating theatre, consideration should be given to offsetting the pendant to one side by about 25%. This will increase the working space available to the anaesthesiologist.

While it is possible to mount the anaesthetic machine, monitors, pumps, etc. on pendants, this would limit the flexibility of the operating theatre. Particular attention to the load-bearing capacity of the pendants and also to the mounting plates in the ceiling is necessary in this instance.

When considering patient flow from the holding bay via the anaesthetic room to the operating theatre and recovery room, the doors through which the patient trolley passes need to be wide enough to allow easy passage of a hospital ICU bed with attachments. There also needs to be enough space to allow the bed to be safely manoeuvred around corners. Doors can be manual or automatic, however, automatic doors should be openable in case of a power failure. Increasingly, lead-lined doors are being used throughout the operating theatre suite, and appropriate mechanisms to handle the weight need to be installed or problems will ensue.

Daylight is desirable in the operating theatre complex, but it is important to ensure that blinds are fitted on the windows. Simple blinds should prevent glare and facilitate the observation of monitors, but laser-blocking blinds will be required in some rooms.



### 15.4 Recovery room

This should be a dedicated unit located centrally in the operating theatre department. As an initial guide, there should be two recovery beds for each operating theatre. The final decision on recovery unit bed numbers will depend on the type of surgery being undertaken (e.g. some patients may go to the ICU immediately post-operatively, rather than to the recovery room).

Each bed space should allow full 360° access to the patient. The space should also be provided with 12 electrical outlets (blue), one oxygen outlet, one medical air outlet, two vacuum outlets (GEM 10), an emergency call button and suitable lighting. Appropriate monitoring equipment is also necessary.

While these services are usually provided via wall-mounted units, a rail or pendant system does provide more flexibility, although these solutions will increase demands on space. The recovery unit should allow each patient appropriate privacy. It should be possible to provide care for patients who need isolation and it should also be possible to safely perform post-operative X-rays.

The recovery room nursing/communications station should allow direct line-of-sight observation of the clinical areas.

If consideration is being given to the concept of a 24-hour recovery room with the possibility of running an outreach ICU service in some of the bed spaces, the particular needs of such a service should be agreed at the planning stage. The specifications in terms of services, monitoring, ventilation and space will be greater and it is both difficult and costly to retrofit this equipment.

The operating theatre department should also contain at least one blood storage refrigerator which is easily accessible from both operating theatres and the recovery unit. This should be wired and connected centrally, with barcode locks and should comply with the requirements of current legislation governing blood storage and transfusion. It may be convenient to house other point-of-care testing equipment arterial blood gas (ABG) machine, thromboelastogram in close proximity.

### 15.5 Monitoring

Recommendations for standards of monitoring during anaesthesiology and recovery have been well-described in guideline documents from the AAGBI (2015)<sup>28</sup>, the European Board of Anaesthesiology (2012)<sup>56</sup>, the American Society of Anaesthesiologists (2011)<sup>57</sup> and ANZCA (2013)<sup>58</sup>. These recommendations inform the choice of monitors and anaesthetic machines in any given environment. It is strongly suggested that the same models of anaesthetic machine and monitor are used across all locations, both within and outside the operating theatre suite. This standardisation ensures staff familiarity with the equipment and reduces the potential for errors.

It is important to emphasise that the same minimum standards apply regardless of where anaesthesia is administered, including anaesthesia administration in locations outside the operating theatre department and during patient transfer.

Both the anaesthetic machine and monitors should be configured in a standard fashion, with departmental agreement on alarm limits and frequencies, which should not deviate from accepted norms.

### 16. USEFUL INFORMATION & LINKS

#### Emergency anaesthesiology equipment

In all areas where anaesthesia is administered, emergency drugs and equipment must be readily available. The exact equipment required in these areas will be agreed at local level following guidance and maintaining minimum standards from the AAGBI, the CAI, and the Royal College of Anaesthetists (RCOA).

#### Anaesthesiology machine

It is mandatory to do a full machine check prior to the start of every list. The AAGBI has produced safety guidelines for checking anaesthetic equipment.

- *Checking Anaesthetic Equipment 2012* ([https://www.e-lfh.org.uk/e-learning-sessions/rcoa-novice/content/e\\_library/aagbi/practice/3%20Checking%20Anaesthetic%20Equipment%20-%202012.pdf](https://www.e-lfh.org.uk/e-learning-sessions/rcoa-novice/content/e_library/aagbi/practice/3%20Checking%20Anaesthetic%20Equipment%20-%202012.pdf))
- Checklist for anaesthetic equipment 2012 ([https://www.e-lfh.org.uk/e-learning-sessions/rcoa-novice/content/e\\_library/aagbi/practice/4%20Checklist%20for%20Anaesthetic%20Equipment%20-%202012.pdf](https://www.e-lfh.org.uk/e-learning-sessions/rcoa-novice/content/e_library/aagbi/practice/4%20Checklist%20for%20Anaesthetic%20Equipment%20-%202012.pdf))

#### Emergency drugs

It is recommended by the RCOA that the following emergency drugs are drawn up, labelled and ready to use before each case:

- Suxamethonium (100 mg in 2 mL), and
- Atropine (1 mg in 1 mL).

In addition to this, many anaesthesiologists also prepare vasopressor agents for use in hypotension which may be associated with induction or spinal/epidural anaesthesiology:

- Ephedrine (30 mg in 10 mL of saline)

<https://www.e-lfh.org.uk/e-learning-sessions/rcoa-novice/content/started/theatre.html>

#### Difficult airway trolley

The Difficult Airway Society (DAS) recommends that, ideally, one trolley is required per area where anaesthesiology is delivered. It needs to be agreed locally how many trolleys might be required, but the emphasis should be on conformity so that all trollies are the same.

The DAS provides algorithms and a recommended list of trolley contents at the URL below:

[https://www.das.uk.com/content/difficult\\_airway\\_trolley](https://www.das.uk.com/content/difficult_airway_trolley)

### **Malignant hyperthermia management kit**

Successful treatment of a malignant hyperthermia (MH) crisis depends on early diagnosis and aggressive treatment. Guidelines for the management of an MH crisis are available at the following URL:

[http://www.e-safe-Anaesthesiology.org/e\\_library/13/Management\\_of\\_MH\\_Update\\_2009.pdf](http://www.e-safe-Anaesthesiology.org/e_library/13/Management_of_MH_Update_2009.pdf)

A list of recommended contents for an MH kit is available on the AAGBI website through the following URL:

<https://www.aagbi.org/sites/default/files/MH%20recommended%20contents%20for%20web.pdf>

### **Anaphylaxis**

The AAGBI provides a guideline document, *Management of a Patient with Suspected Anaphylaxis during Anaesthesia*, which should be readily available in all departments. The document is available at the URL below:

[https://www.aagbi.org/sites/default/files/ana\\_laminate\\_2009.pdf](https://www.aagbi.org/sites/default/files/ana_laminate_2009.pdf)

### **Latex allergy**

All perioperative departments should have a latex-free equipment box/trolley with a list of safe consumables and clear, locally developed guidelines to care for a patient with latex allergy. Most equipment consumables are now latex free however, there may be a requirement to contact the manufacturer for clarity and confirmation.

Patients with a latex sensitivity should be managed and cared for in a latex-free environment and be first on the operating list.

The HSE provides guidelines on the prevention and management of an allergic reaction to latex, available at the URL below:

<https://www.hse.ie/eng/staff/resources/hrppg/policy-on-prevention-and-management-of-latex-allergy.html>

### **Local anaesthetic toxicity**

The AAGBI provides safety guidelines on the management of severe local anaesthetic toxicity. All staff should be made aware of the location of 20% lipid emulsion. The guideline document is available at the following URL:

[https://www.aagbi.org/sites/default/files/la\\_toxicity\\_2010\\_0.pdf](https://www.aagbi.org/sites/default/files/la_toxicity_2010_0.pdf)

### 17. ACKNOWLEDGEMENTS

#### MODEL OF CARE FOR ANAESTHESIA WORKING GROUP

Dr Jeremy Smith, Clinical Lead, National Clinical Programme for Anaesthesia

Dr Kevin Bailey, Convenor, Irish Standing Committee of the AAGBI

Dr David Mannion, Consultant Anaesthesiologist, Our Lady's Children's Hospital, Crumlin

Dr Michael Power, Clinical Lead, Critical Care Programme

Dr Ehtesham Khan, Consultant Anaesthesiologist, CAI Representative

Mr Ken Mealy, Clinical Lead, National Clinical Programme in Surgery

Ms Una Quill, Programme Manager, National Clinical Programme for Anaesthesia

Ms Aileen O'Brien, Nurse Lead, National Clinical Programme for Anaesthesia

Dr Georgina Flood, Consultant Anaesthesiologist, Mater Misericordiae University Hospital

Dr Colman O'Loughlin, Consultant Anaesthesiologist, Mater Misericordiae University Hospital

Dr Eilis Condon, Consultant Anaesthesiologist, Deputy Director of Training, CAI

Dr Declan O'Brien, Consultant Anaesthesiologist, Cork University Hospital

Dr Dermot Doherty, Clinical Lead, National Clinical Programme in Transport Medicine

Dr Jeanne Moriarty, Dean, Joint Faculty of Intensive Care Medicine of Ireland

Dr Colin Black, Trainee, CAI

Dr Mags Bourke, Consultant Anaesthetist, Beaumont Hospital

Dr Philip Hu, Consultant Anaesthesiologist, Faculty of Pain Medicine

Dr Niamh Feely, Consultant Anaesthesiologist, University Hospital Kerry

Dr Jennifer Whyte, Consultant Anaesthesiologist, Mercy University Hospital

Dr. Padraig Sheeran, Consultant Anaesthesiologist

Dr. Brendan Conroy, Consultant Anaesthesiologist, Faculty of Pain Medicine

Dr. Peter Lee, Consultant Anaesthesiologist, Cork University Hospital

Dr. Edel Duggan, Consultant Anaesthesiologist, Beaumont Hospital

Dr. Roisin Ni Mhuircheartaigh, Consultant Anaesthesiologist

Dr. Harry Frizelle, Consultant Anaesthesiologist, Mater Misericordiae University Hospital

Dr. Pauline Whyte, Consultant Anaesthesiologist, Galway University Hospital

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