Intensive Care Medicine Workforce Plan

Authors: National Doctors Training and Planning, Joint Faculty of Intensive Care Medicine of Ireland, National Clinical Programme for Critical Care

NOVEMBER 2020

Table of Contents

Stakeholder Participation in Report Development

Member	Role	Organisation
Stakeholder Advisory Group Membership		
Prof Frank Murray	Director	National Doctors Training and Planning
Dr Roisin Morris	Medical Workforce Planning Lead	Medical Workforce Planning, National Doctors Training and Planning
Ms Maeve Smith	Research Officer	Medical Workforce Planning, National Doctors Training and Planning
Dr Brian Marsh	Chair of Training Committee	Joint Faculty of Intensive Care Medicine of Ireland Board
Dr John Bates	Dean	Joint Faculty of Intensive Care Medicine of Ireland
Dr Michael Power	Clinical Lead	National Clinical Programme for Critical Care
Ms Una Quill	Programme Manager	National Clinical Programme for Critical Care
Mr Derek Cribbin	Nurse Lead	National Clinical Programme for Critical Care
Dr Cathy McMahon	Clinical Lead	Clinical Lead, Paediatric Critical Care
Dr Jeremy Smith	Clinical Lead	National Clinical Programme for Anaesthesia
Dr Vida Hamilton	National Clinical Advisory Group Lead	Acute Operations, HSE
Dr Brian Kinirons	President	College of Anaesthesiologists of Ireland
Mr Martin McCormack	CEO	College of Anaesthesiologists of Ireland
Prof Camillus Power	Director of Training	College of Anaesthesiologists of Ireland
Dr Catherine Motherway	Past President	Intensive Care Society of Ireland
Dr Colman O'Loughlin	President	Intensive Care Society of Ireland
Workforce Planning Working Group Membership		
Dr Roisin Morris	Medical Workforce Planning Lead	Medical Workforce Planning, National Doctors Training and Planning
Ms Maeve Smith	Research Officer	Medical Workforce Planning, National Doctors Training and Planning
Dr Brian Marsh	Chair of Training Committee	Joint Faculty of Intensive Care Medicine of Ireland Board
Dr Michael Power	Clinical Lead	National Clinical Programme for Critical Care
Ms Una Quill	Programme Manager	National Clinical Programme for Critical Care

GLOSSARY

Bed occupancy: Bed occupancy refers to the number of days a hospital bed was occupied, as percentage of available 365 days
Care Model: An approved normative healthcare delivery framework
Certificate of Satisfactory Completion of Specialist Training (CSCST): On satisfactory completion of Higher Specialist Training (HST), candidates will receive a Certificate of Satisfactory Completion of Specialist Training (CSCST) which allows him/her to enter the Specialist Division of the Register with the Irish Medical Council.
Consultant: A Consultant is defined as a registered medical or dental practitioner who by reason of his/her training, skill and expertise in a designated specialty, is consulted by other registered medical practitioners and who has a continuing clinical and professional responsibility for patients under his/her care, or that aspect of care on which (s)he has been consulted. The Consultant is clinically independent in relation to decisions on the diagnosis, treatment and care of individual patients. Consultants must also contribute to teaching, training, management of departments and development of local services through their Clinical Directorate while being continuously challenged to improve the quality and safety of their and their team's patient care.
Critical Care: Critical care refers to two related processes. Firstly, 'critical' refers to discernment or recognition of a crucial and a decisive turning point, the deterioration of the patient's condition, followed, secondly, by 'care' i.e. intervention including resuscitation and transport to a critical care service. Critical care resuscitation and treatment interventions include a complex range of general and specialty procedures, supports and diagnostic procedures. Thus, the critically ill patient benefits from appropriate and timely critical care in the health system with a greatly increased probability of survival.
Critical illness: is a life-threatening patient condition requiring critical care intervention for patient survival.
Doctors Integrated Management E-System (DIME): DIME is a live system that records information on doctors employed in the public health system in Ireland, it receives data from the Postgraduate Medical Training Bodies, the Medical Council of Ireland and each clinical site
Higher Specialist Training (HST): The final stage of postgraduate medical training. Higher Specialist Training provides structured, supervised clinical training at Specialist or Senior Registrar level, typically over 4-6 years. Trainees rotate through structured posts in their specialty every six or twelve months. There may be opportunities for developing a subspecialty interest, or arranging out of programme experience in research or clinical appointments overseas. In addition to supervised clinical training, HST requires trainees to undertake complementary courses to develop the management and analytical skills needed to provide excellent patient care.
Hospital Model: A tiered categorisation of the healthcare service delivery capability of the hospital system.
Hub and Spoke: An integrated delivery framework for healthcare
Intensive Care Medicine: This refers to the Irish Medical Council approved training programme for Consultants in Intensive Care Medicine.
Irish Medical Council: The regulatory body for doctors in Ireland. It has a statutory role in protecting the public by promoting the highest professional standards amongst doctors practising in the Republic of Ireland. The Council is funded by doctors' registration fees and maintains the Register of

Medical Practitioners - the Register of all doctors who are legally permitted to work as medical doctors in Ireland. The Council also sets the standards for medical education and training in Ireland. It oversees lifelong learning and skills development throughout doctors' professional careers through its professional competence requirements. It is charged with promoting good medical practice.
Joint Faculty of Intensive Care in Ireland (JFICMI): is the body responsible for higher professional training in Intensive Care Medicine in Ireland. It is a Joint Faculty of three post-graduate training bodies – the College of Anaesthesiologists f Ireland, the Royal College of Surgeons in Ireland, and the Royal College of Physicians of Ireland. The Intensive Care Society of Ireland is the Faculty's fourth constituent body.
Joint Faculty of Intensive Care of Ireland (JFICMI) Standards for Adult Critical Care: the minimum standards required in Ireland for an adult critical care unit.
Level 2 care: Active management by the critical care team to treat and support critically ill patients with primarily single organ failure.
Level 3 care: Active management by the critical care team to treat and support critically ill patients with two or more organ failures.
Level 3(s): care Level 3 with regional/national service.
Levels of Critical Care: The level of critical care is best defined by the patient's clinical condition and his/her level of need for critical care.
Major Surge: An unusually high increase in (critical care) demand that overwhelms the critical care resources of an individual hospital and/or region for an extended period of time.
Medical Workforce Planning (MWP): involves an analysis of the supply of specialists into the medical workforce today and analysis of whether or not that supply is appropriately matched to the demand for specialist health services and patient needs. It also involves the analysis of how supply should be planned for in light of future population, societal and health service change.
Model of Care for Adult Critical Care: is a 'hub-and-spoke' delivery model which sets out the pathway of care for critically ill adult patients within the Irish healthcare setting.
National Clinical Programme for Critical Care (NCPCC) Census: Annual enumeration of adult critical care bed stock and critical care staff establishment in acute hospitals in Ireland.
Non Consultant Hospital Doctor (NCHD): A term used in Ireland to describe qualified medical practitioners who work under the supervision of a consultant in a particular speciality. This encompasses all doctors below consultant level in the public health system including Interns, Senior House Officers, Registrars, Specialist Registrars, Senior Registrars and Fellows.
Non-Training NCHD: Any NCHD not enrolled on a specialist training scheme.
Outreach Services: Services provide pre-hospital emergency care and the links between hospitals including Critical Care Retrieval, National Ambulance Service and National Transport Medicine Programme transport services.
Retrieval: Safe and timely inter-hospital transfer and transport of the critically ill patient, based on critical care needs.
SupraSpecialist Training Programme: Training to become a specialist in Intensive Care Medicine is a minimum 7 year programme comprising completion of base specialty training (Anaesthesiology, Medicine, Surgery, and Emergency Medicine) followed by supraspeciality training programme of 2 years duration.
Surges: Variances in the volumes of critically ill patients requiring Level 2 or Level 3 care referred appropriately to a Critical Care Service.
The National Clinical Programme for Critical Care (NCPCC): is a collaborative multi-professional patient-centred initiative administered by National Clinical Programmes, Clinical Strategy and Programmes Directorate, HSE, in liaison with the Joint Faculty of Intensive Care Medicine of Ireland (JFICMI) and Intensive Care Society of Ireland (ICSI).

The National Clinical Programmes: are tasked with improving specific areas within the health service with a number of supporting initiatives. This is achieved by designing and specifying standardised models of care, guidelines, pathways and associated strategies for the delivery of clinical care.

EXECUTIVE SUMMARY

Intensive Care Medicine has been evolving as a specialty for many years, consistent with the population needs for a comprehensive critical care service delivered at the level of international best practice. Such a service requires an appropriately trained specialist medical workforce working in an appropriate clinical environment.

There is a major multidimensional deficit in critical care service capacity in Ireland which needs to be urgently addressed. That there is a deficit in critical care service capacity in Ireland is well recognised (Health Service Capacity Review, 2018, Dept. of Health), with the system usually operating at bed occupancies in excess of 90%, and particularly challenged when there is a surge in patient demand (eg.COVID-19 Pandemic 2020). Even during non-surge periods, this limited capacity frequently results in both cancellation of planned major surgery and delayed admission to ICU of critically ill unstable patients, a risk for adverse patient outcomes. The service capacity deficit has 2 main components: too few critical care beds and too few intensive care consultants.

The number of ICU beds in Ireland is very low by international standards. The average number of ICU beds per 100,000 of the population is 11.5 for European countries; this is compared with 6 beds per 100,000 of the population in Ireland. These figures reflect public and private bed availability (National Office of the Clinical Audit, 2020). Intensive care bed numbers at 255 pre-COVID-19 fall well short of the recommended 430 of the Health Service Capacity Review 2018, or the 579 recommended in the Prospectus Report 2009.

The proposed 2-phase expansion model of intensive care consultants informs the staffing model in this report, which aims to correct current staffing deficit and support the increase in ICU capacity in a timely manner. The October 2020 Exchequer allocations made to critical care bed capacity planning are a welcome investment and consistent with the projections in this report. The first phase of the expansion plan allows for an additional 66 critical care beds by the end of 2021. Phase 2 of the expansion plan is currently at scoping stage with the HSE and the Department of Health and is subject to funding. Should implementation of phase 2 expansion go ahead, it will allow for a further increase of 117 beds. This would result in a total of 438 adult critical care beds across the country.

It is important to note that the specialist critical care nursing workforce is equally challenged (National Clinical Programme for Critical Care, 2019). Plans for critical care expansion and configuration of such expansion needs to align with a similar focus on critical care nurse training and retention.

The purpose of this project and report is to determine the current consultant workforce in ICM, and to project future needs for ICM patient care in Ireland. The current consultant workforce in Critical Care in Ireland is among the lowest in the OECD. The ratio of consultants in intensive care in Ireland is low by international standards with 0.48 per 100,000 population compared with 2.4 per 100,000 in Australia.

The current Intensive Care Medicine consultant workforce configuration in Ireland is complex, having evolved to match the nature of the acute hospital configuration in Ireland, and also as an essential patient-centred response, which to date has stretched anaesthesia services in particular.

There are 3 groups of Consultants providing Intensive Care Medicine care in Ireland.

1. There are only 13 *full-time consultants in Intensive Care Medicine* in Ireland. This compares very poorly with international norms, particularly with countries such as Australia and New Zealand, where the majority of intensive care is delivered by consultants specifically trained in Intensive Care Medicine. Both the training programme of Faculty of Intensive Care Medicine (UK) and the training and medical staffing recommendations of the European Society of Intensive Care Medicine recommend a specialist workforce trained to the level of consultant in intensive care medicine. It is essential to increase this part of the workforce in Ireland.

2. There are 38 *consultants with a Special Interest (SI) in Intensive Care Medicine*. This is also too few to provide patient care for Irish population. This reflects the flexible approach to intensive care medicine service, whereby many consultants retain a practice in their core specialty (usually anaesthesiology) and have scheduled sessions in Intensive Care Medicine. This pattern will remain an important part of intensive care service delivery across the timeframe of this workforce planning model.

3. Anaesthesiologists providing either *sessional ICM activity* and/or roster support. The anaesthesiologist as outlined in the Model of Care for Anaesthesiology remains an essential to safe service and roster provision for Model 3 hospitals in particular with smaller volume intensive care patient volumes, lower acuity case-mix, and a need to provide for anaesthesia, critical care, and obstetric anaesthesia emergency care.

This project recognises the need for flexibility within the workforce planning model, recognising the need in different models of hospital for different balance of intensive care specialists, consultants with a Special Interest (SI) in Intensive Care Medicine, and Anaesthesiologists contributing to intensive care rosters. This report also recognises established practice and consultant posts within the system with varying scheduled commitment to Intensive Care Medicine through to retirement.

Increasing specialisation and expanding demand for Intensive Care Medicine create demands on the training system to ensure an appropriate “pipeline” of trained specialists to meet the consultant workforce projections outlined in this report. The workforce planning projections in this report are informed by the Model of Care of the National Clinical Programme for Critical Care (NCPCC), the Model of Care of the National Clinical Programme for Anaesthesiology, Joint Faculty of Intensive Care Medicine of Ireland (JFICMI), the CSCST programme of the JFICMI, and the CSCST programme of the College of Anaesthesiologists of Ireland. These are then aligned with the drivers of change within the healthcare system and recommendations of the National Clinical Programmes, the Health Service Capacity Review (2018) and recommendations on capacity expansion from the National Public Health Emergency Team (2020).

The roster arrangements of the Model of Care for Anaesthesiology are an important part of intensive care services for Model 3 hospitals, and these are presented and discussed. The development of the Intensive Care Medicine consultant workforce for Model 4 hospitals described herein retains that both strong affiliation with Anaesthesiology practice, and also slowly and increasingly with a pipeline of trainees from internal and emergency medicine.

A large and significant increase in the numbers of consultants and trainees is required to meet ICM requirements for the next 5-10 years. The full projection period for ICM workforce planning is 10 years in order to allow sufficient time for training and service developments. Projected demand

estimates align with both the recent commitment by Government to increased bed capacity by 66 beds by the end of 2021 as well as further increased bed capacity to bring total critical care bed numbers to 438 beds. The future demand for consultants to align with bed capacity requirements in Intensive Care Medicine is summarised in table 1. The required number of trainees to fill future recommended consultant posts is also summarised.

Table 1. Supply and Demand Analysis by Specialist Group for Scenario's 1 and 2									
Supply and Demand Analysis by Specialist Group for Scenario 1									
SCENARIO 1 – 5 DAY WORKING WEEK – PHASED EXPANSION PLAN									
	Consultants with rostered commitments to ICM			**Consultants with an SI in ICM**			**Consultant in ICM**		
	Current	**2026**	**2030**	**Current**	**2026**	**2030**	**Current**	**2026**	**2030**
Total Headcount Consultants	87	165	165	38	94	94	13	30	58
Total Whole Time Equivalent Consultants	26.2	47.1	47.1	13.9	43.9	43.9	5.2	18	34.8
	Known trainee completions to 2023	**Required trainee completions from 2023-2026**	**Required trainee completions from 2027-2030**	**Known trainee completions to 2023**	**Required trainee completions from 2023-2026**	**Required trainee completions from 2027-2030**	**Known trainee completions to 2023**	**Required trainee completions from 2023-2026**	**Required trainee completions from 2027-2030**
Trainees (Headcount)	11-14	17-18	17-18	1-2	13	13	1-5	4-5	5
Trainees (Whole Time Equivalent)	3.3-4.2	4-5	4-5	0.47 -0.94	6	6	0.4-2	1.6-2	3
Supply and Demand Analysis by Specialist Group for Scenario 2									
SCENARIO 2 – 7 DAY WORKING WEEK – PHASED EXPANSION PLAN									
	Consultants with rostered commitments to ICM			**Consultants with an SI in ICM**			**Consultant in ICM**		
	Current	**2026**	**2030**	**Current**	**2026**	**2030**	**Current**	**2026**	**2030**
Total Headcount Consultants	87	176	176	38	132	132	13	42	81
Total Whole Time Equivalent Consultants	26.2	51.4	51.4	13.9	61.5	61.5	5.2	25.2	48.7
	Known trainee completions to 2023	**Required trainee completions from 2023-2026**	**Required trainee completions from 2027-2030**	**Known trainee completions to 2023**	**Required trainee completions from 2023-2026**	**Required trainee completions from 2027-2030**	**Known trainee completions to 2023**	**Required trainee completions from 2023-2026**	**Required trainee completions from 2027-2030**
Trainees (Headcount)	11-14	21-22	21-22	1-2	21	21	1-5	5-7	8
Trainees (Whole Time Equivalent)	3.3-4.2	6	6	0.47 -0.94	10	10	0.4-2	2-3.2	4.8

This is a large but necessary expansion in consultant numbers. The increase in consultant anaesthesiologist from 87 to 165 is broadly aligned with the NDTP pipeline report 2020 (National Doctors Training and Planning, 2020). The increase in consultants with a Special Interest in Intensive Care Medicine (38 to 94 in the 5 day model) and Consultants in ICM (13 to 58) requires that 18 trainees complete their training per annum. This is close to sustainable with the current approved training posts of 6 for Special Interest and 4 for Consultant in ICM if the 6 added posts during COVID-19 have recurring funding. The investment in the Special Interest posts and Consultant in ICM posts effects the transition to a specialty specific workforce.

Paediatric Intensive Care Medicine needs to be considered as outlined by the Model of Care for Paediatric Critical Care of the National Clinical Programme for Critical Care & National Clinical Programme for Paediatrics. This is briefly outlined in Section 8 of this report. A further review is required to identify the pipeline of graduates required to ensure an appropriate Paediatric Intensive Care Medicine consultant workforce is in place to meet the needs of the Children's Hospital of Ireland, to support the resuscitate and transport strategy for the critically ill child, and support those regional university hospitals where paediatric intensive care is a part of the current and future service requirement.

Critical care bed capacity for Ireland is inadequate and requires immediate expansion. The National Clinical Programme for Critical Care, based on recommendations from both the Health Service Capacity Review (DoH, 2018) and the National Public Health Emergency Team (2020) propose a phased expansion of critical care capacity across the public health service from 255 pre-COVID-19 to 438 by 2031.This two phased expansion plan is outlined herein, along with the workforce requirements for current and expanded service. The hub and spoke model of critical care service delivery remains central to expansion. The expert guidance and engagement of the critical care community who have advised this report is essential to assist planning of such expansion. The model should be efficient, recognising that the workforce is expensive and ultimately finite. Clinical excellence requires appointment of a suitably trained ICM workforce. In addition, appropriate volume of practice and case-mix are essential to maintain those skills. Reconfiguration of some ICUs to meet this standard is essential to align with the recommendations of the clinical programmes. The National Emergency Medicine Programme and the National Maternity Strategy are specifically referenced in this report in terms of configuration of services and implementation of the findings of this report will enable and support the future development of both the Trauma Strategy and the National Maternity Strategy.

The current numbers of training posts for those pursuing a career in Intensive Care Medicine is inadequate to meet the needs of current workforce planning to meet all the above demands. This report and recommendations offer an opportunity to start to address that deficit.

1. INTRODUCTION

1.1 OVERVIEW OF MEDICAL WORKFORCE PLANNING WITHIN NDTP

This report is collaboration between the National Clinical Programme for Critical Care (NCPCC), the Joint Faculty of Intensive Care Medicine of Ireland (JFICMI) and HSE National Doctors Training and Planning (NDTP). The focus of the report is on adult critical care, an addendum will follow to focus on paediatric critical care. The ICM consultant and training recommendations herein are an update to those outlined in the NDTP report "Demand for Medical Consultants and Specialists to 2028 and the Training Pipeline to Meet Demand: A high level stakeholder informed analysis published 2020".

Within its Medical Workforce Planning (MWP) remit, NDTP is tasked with predicting and proposing, on an annual basis, the number of post-graduate trainees required for each medical specialty. In order to do this NDTP works with specialty stakeholders including National Clinical Programmes, Postgraduate Training Bodies and others to estimate the demand for consultants and specialists across the Irish healthcare system, both public and private. In this way, a population health approach is taken to MWP.

This information then feeds into the medical education and training role of NDTP via the commissioning of medical training required to meet workforce needs, ensuring that the training content and delivery is responsive to the changing needs of the Irish healthcare system, and supporting the retention of doctors upon completion of their training.

The approach taken to Medical Workforce Planning (MWP) is broadly based on the following principles as per existing Government policies:

- MWP should be aligned with Government policy e.g. Sláintecare (2017), the Health Service Capacity Review (2018), Smaller Hospitals Framework (2013) and others
- The Irish health service should be self-sufficient in the production of medical graduates, with reduced dependence on International Medical Graduates (IMG)
- More patient care should be consultant-delivered and there should be a reversal in the ratio of Non-Consultant Hospital Doctors (NCHDs) to consultants/ specialists
- MWP recommendations should be consistent with the WHO Global Code on the International Recruitment of Healthcare Personnel (World Health Organisation, 2010, 2011)
- MWP recommendations should encompass medical workforce requirements for the entire population to include both the public and private healthcare systems
- MWP recommendations should incorporate future health needs of the population
- MWP recommendations should include the incorporation of projections relating to, for example, demographic changes; alterations in disease incidence and prevalence; models of clinical care; medical and therapeutic innovations; policy initiatives and technological advances
- Trainee numbers for each specialty should be based on MWP projections for that specialty
- Training capacity should match the recommended training numbers. Where recommendations are made to increase the intake of trainees into a particular specialty, additional training posts may be required
- Where appropriate, innovative models of care should be explored, for example new team structures, new medical roles, skills transfer and task sharing

It is important to note that workforce planning is an inexact science and estimated demand and supply requirements are based on the best available data, expert opinion as well as policy and other related developments relevant to the health service at the time the workforce planning report is prepared.

1.2 Approach to Determining Demand

The approach to medical workforce planning for Intensive Care Medicine is based on the methodological framework 'NDTP Health Workforce Planning, Ireland: A Simple Stepwise Approach' (HSE NDTP, 2016). Typically, this methodology is applied to a medical specialty to determine the future medical workforce needs of the country's health system. In following the stepwise approach to MWP, this report is broken down as follows:

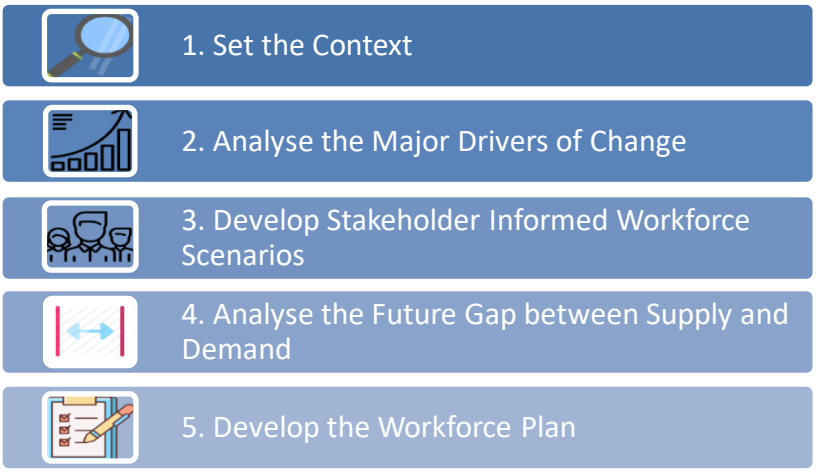

Figure 1 Stepwise Approach to MWP

1.3 Data Use and Limitations

It is important to outline a number of caveats attached to the analysis of consultant and specialist workforce and trainee requirements outlined herein. These include the following:

Data Sources

The data utilised in the analysis of the medical workforce are drawn from multiple sources, all of which have richness as well as limitations, as follows;

- HSE NDTP Doctors Integrated Management E-System (DIME), which receives data from the Postgraduate Medical Training Bodies, the Medical Council of Ireland and each clinical site that employs doctors in the public health system in Ireland;
- Census of Intensive Care Medicine Workforce, carried out by the NCPCC in May 2020
- Joint Faculty of Intensive Care Medicine of Ireland (JFICMI)
- International health research groups (Health Workforce Australia and equivalents in the NHS, New Zealand and Canada)

Variations between datasets (e.g. DIME and the NCPCC's census) can occur due to, for example variations in the time-point of data collection, differences in the variables collected (e.g. whole-time equivalents (WTE) versus headcounts), differences in the definitions of some variables (e.g. less than full-time versus part-time), absence of variable values (i.e. missing data) in datasets, and varying quality of data between sources, among other things.
In general, information on the current workforce outlined in this report has been sourced from the DIME and the NCPCC's Workforce Census 2020.
DIME is dependent on clinical sites inputting details on their consultant workforce. Currently there is an estimated 99% completion rate for DIME. As DIME is a live system it must be noted that there can be variances in the figures published dependent on the run date of the report and entries can be made with a retrospective date.

Demand Estimates

Research related to estimating the future demand for ICM consultants and specialists in Ireland has been carried out by the NCPCC and the JFICMI, College of Anaesthesiologists of Ireland. The Health Service Capacity Review also underpins demand estimates for consultants in Intensive Care Medicine. Approaches taken in determining demand range from consideration of multiple factors driving demand for consultants and specialists including bed capacity, population and epidemiological changes, NCPCC Model of Care, the Model of Care for Anaesthesiology, an extended consultant working week consistent with more consultant delivered care, changing technologies, among other things to simple international comparisons.

Private Sector

Data on the private sector medical workforce has been sourced from the workforce census carried out by the NCPCC in May 2020.

2. The Context of Intensive Care Medicine in the Irish Health Service

Critical illness is a life-threatening condition that requires critical care intervention in order to ensure a patient's survival. A critically ill patient who may have multiple organ failures requires timely specialty intervention and multiorgan treatment and support.

Historically many hospitals in Ireland are distributed according to geographic county boundaries with an additional layer of regional hospitals and a separate coexisting voluntary hospital sector providing the bulk of specialty care. In this context, critical care service planning models and workforce planning models are required to modernise the system of care for critically ill patients in Ireland today.

There are currently 255 permanent adult critical care beds in Ireland, across model 3 and 4 hospitals. Outreach services also form part of the service delivery.

- Model 3 hospitals provide 24/7 acute surgery, acute medicine, and critical care. There are currently seventeen Model 3 hospitals delivering Intensive Care Medicine across Ireland (National Clinical Programme for Critical Care, 2020)
- Model 4 hospitals have the same services as a model 3 hospital (usually on a larger scale) but provide tertiary care and, in certain locations, supra-regional care. There are nine model 4 hospitals in Ireland, all of which deliver Intensive Care Medicine (National Clinical Programme for Critical Care, 2020)
- Outreach services: Critical Care Retrieval , National Ambulance Service and National Transport Medicine Programme transport services provide pre-hospital emergency care and the links between hospitals. The existing retrieval service for critically ill adult patients, which is currently provided by Mobile Intensive Care Ambulance Service (MICAS) is currently only available between hospitals with ICU's to transfer patients between specific specialty services (Intensive Care or other)

Intensive care bed capacity in Ireland has been reviewed a number of times over the last decade (Prospectus Strategy Consultants, 2009; Department of Health, 2018)[2,3] and consistently deemed to be inadequate to meet patients' needs. This impacts on the capability of the acute hospital sector to meet the needs of critically ill patients in a safe, effective and timely manner, particularly during major surges' (National Clinical Programme for Critical care, 2014). The Critical Care 'hub-and-spoke' configuration (described in section 2.1) serves to reform this fragmented hospital system legacy.

2.1 Model of Intensive Care Service Delivery in Ireland

In recent years, the acute care volume-outcome literatures have demonstrated the patient benefits of specialty care provision at scale (Nguyen *et al*., 2015; Moran *et al*., 2018). In line with the volume-outcome evidence identifiable in the acute care literatures, the NCPCC published the Model of Care for Adult Critical in 2014 (National Clinical Programme for Critical care, 2014). This model of care defines the current system of ICM service delivery as a 'hub-and-spoke' critical care service arrangement for a regional hospital network or group. The 'hub-and-spoke' ICU arrangement is aligned with the models of care of the core national clinical programmes for Acute Medicine, Acute Surgery, Emergency Medicine and Obstetrics.

The hub and spoke model as described in the Model of Care for Adult Critical Care which underpins the current system of ICM, is displayed in figure 2, and encompasses:

1. The presence of critical care services in regional/supra-regional 'hub' and sub-regional 'spoke' hospitals
2. No critical care service in local hospitals
3. Connections provided via Critical Care Retrieval, National Ambulance Service and National Transport Medicine Programme transport services

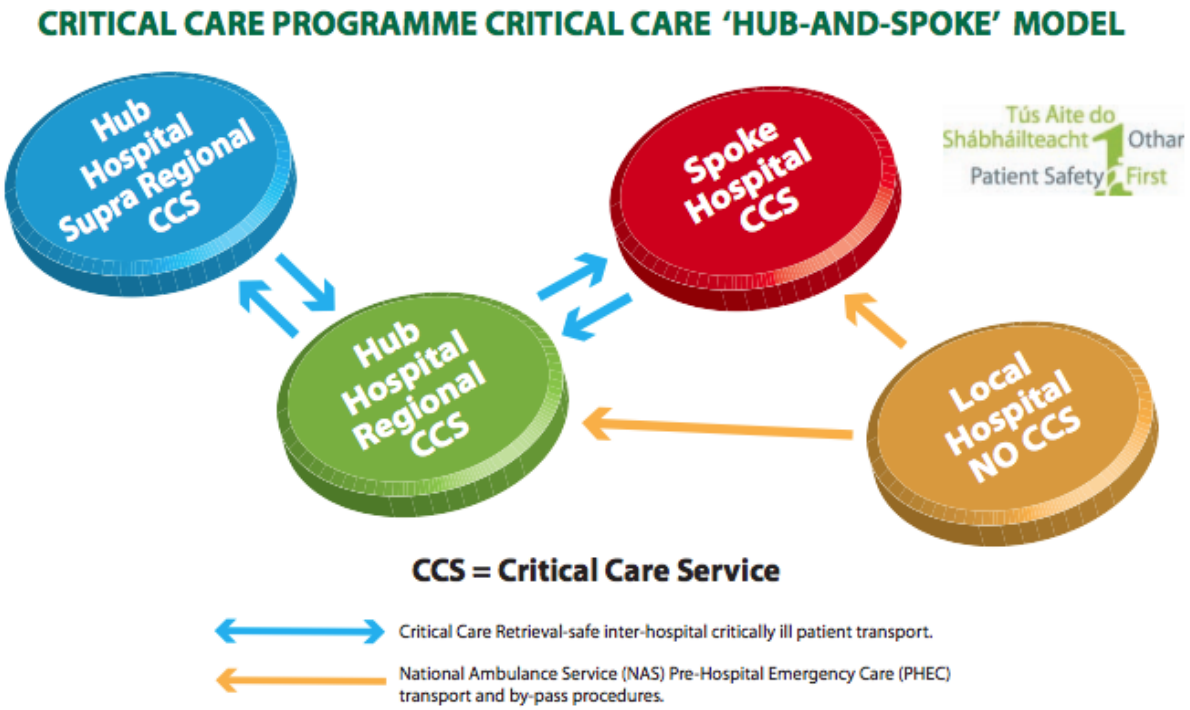

Figure 2. Critical Care Hub and Spoke Configuration (Prospectus Strategy Consultants, 2009)

Critical care for Ireland has evolved along a hub and spoke model both historically as part of the regional hospital system, but also continues to evolve as a natural implementation of the above Models of Care and the increasing centralisation of expensive critical care resource.

2.2 Specialty Consultant Staffing for Critical Care

The availability of sufficient ICM specialists leads to the improved survival of critically ill patients (Provonost *et al.*, 2002; Wilcox *et al.*, 2013; Gershengorn *et al.*, 2017). In 2011, the European Society of Intensive Care Medicine (ESICM) established guidelines for intensivist staffing of ICUs, recommending that trained Intensivists (Consultants in Intensive Care Medicine) be the responsible physicians in the care of critically ill patients (Valentin and Ferdinande, 2011).

These guidelines, the above noted research as well as recommendation of the College of Intensive Care Medicine of Australia and New Zealand 2016 (College of Intensive Care Medicine of Australia and New Zealand, 2016) and the Core Standards for Intensive Care Units 2013 of the Faculty of Intensive Care Medicine and Intensive Care Society UK (Faculty of Intensive Care Medicine; and Intensive Care Society UK, 2013) have all been considered in the development of the manpower and standards recommendations of the JFICMI (Joint Faculty of Intensive Care of Ireland, 2019). Section 6.1 of the JFICMI recommendations address medical staffing and rostering:

'Every Critical Care Unit should have 24 hour availability of a dedicated Consultant in Critical Care Medicine. During daytime hours, the consultant intensivist should have an exclusive sessional commitment to Intensive Care Medicine (ICM) and no conflicting clinical commitment. [15] For out of hours cover, larger units (>8 bed and/or > 400 level 3 admissions per year), should have a dedicated ICM consultant with no conflicting on-call duties. International recommendations suggest that this also applies to smaller units (6-8 beds and/or 200-400 level 3 admissions per year) [1] but the JFICMI recognizes the considerable manpower deficit for these units and recommends that hospitals work toward this standard over a 5 year cycle. In the interim, smaller units must have an appropriately trained specialist who is immediately available to attend critically ill patients. If they have conflicting on-call commitments, a second consultant must be available to release the ICU consultant to attend to critically ill patients at any time consistent with the 2+2 model of care.

It is desirable that consultant sessions be provided by a specialist who is a Fellow of the Joint Faculty of Intensive Care Medicine of Ireland. New appointments should fulfil the accreditation criteria of "Consultant with an Interest in Intensive Care Medicine" or "Consultant in Intensive Care Medicine" applicable to all base specialities as per the Higher Professional Training scheme endorsement of the Irish Medical Council.

At least one such specialist should be rostered to the Critical Care Unit at all times, predominantly present in the Unit during normal working hours, available by phone at all times and at all times available to the Unit in a timely manner.

The Critical Care medical team comprises the Intensive Care specialist(s) supported by appropriately trained (or in training) non-consultant hospital doctors.

And further addresses with regard to staff rostering and doctor to patient ratios:

'There should be one non-consultant hospital doctor (NCHD) for each six to eight critical care patients, depending on local case-mix. Out of hours staffing of the Critical Care Unit should be provided, at a minimum, by an experienced non-consultant hospital doctor appointed to the Critical Care team. The ratio of NCHD to patients out of hours will be determined by local case mix and activity, but should not exceed one NCHD to every twelve patients. Critical Care registrar(s) should not have any concurrent responsibilities and on-call accommodation should be provided in, or appropriately close to the Unit.

The consultant to patient ratio should be a minimum one consultant to twelve critical care patients during routine hours. A minimum of one consultant to thirty critical care patients must be provided out-of-hours, depending on case mix and where supported by appropriate trainee and NCHD staffing.

A separate layer of medical staffing will be required where significant periods of time required outside of critical care (e.g. Outreach commitment, MICAS service) such as assessing acute referrals and inter and intra-hospital transport.'

The Model of Care for Anaesthesiology from the National Clinical Programme for Anaesthesia (National Clinical Programme for Anaesthesia, 2019) has defined the 2+2 model of care to ensure consultant availability across Model 3 hospitals, in particular those where a concurrent obstetric commitment is mandated:

'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 the 2 plus 2 model 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 201 7 and the Intensive Care Society of Ireland (ICSI).'

2.3 The Current Configuration of the Medical Team Delivering Intensive Care Medicine

Currently, consultant expertise in adult Intensive Care Medicine is provided in the main by consultants in Anaesthesiology, with or without a special interest in Intensive Care Medicine, as well as a smaller number of Consultants in Intensive Care Medicine. A small cohort of consultants in General Medicine who have completed training in Intensive Care Medicine are also involved in the delivery of care (National Clinical Programme for Critical care, 2014). There is potential for consultants with their base specialty in Emergency Medicine to provide ICM if they have completed additional training, although no such consultants currently work in the Irish health service.

Below is a breakdown of the types of consultants who provide Intensive Care specialist services:

- **Consultant Anaesthesiologists with a number of hours or days committed to intensive care within a working week** - In general, these posts will have been a primary appointment to Anaesthesiology, with the dedicated hours to intensive care arising post-appointment, as a result of the hospital recognising a need for such dedicated hours.

- **Consultant Anaesthesiologists with a Special Interest in Intensive Care Medicine -** These consultants will have undergone dedicated specialty training and examination in Intensive Care Medicine, thus fulfilling specific job description appointment criteria. They will have been appointed with a specific requirement that they provide Intensive Care specialist services. During recent years, this type of post was the most common Intensive Care appointment in situations where an Intensive Care practice was being developed. A significant number of such post holders were trained and accredited to the level of Consultant in Intensive Care Medicine.

- **Consultants in Intensive Care Medicine** - These consultants have undergone further dedicated specialty training and examination in Intensive Care Medicine to a level which, internationally, would be consistent with that of a mono-specialist in Intensive Care Medicine. There are relatively few of these posts in the system, and the consultants who are appointed generally have other (non-conflicting) duties within their hospitals (e.g. Anaesthesiology)

The training pathway for these consultants is described as an overview in section 2.6 of this report.

2.4 Configuration of the Intensive Care Medical Team and Hospital Model

Model 4 Hospitals

Intensive Care consultant manpower in these hospitals is provided by a combination of all 3 types of consultants above. Twelve of the 13 contractually appointed specialist consultants in Intensive Care Medicine are appointed to these hospitals. These specialists have come through a dual specialisation pathway. The majority (10) have Anaesthesiology as a core specialty, and 3 of the 13 posts are appointments to ICM with a core specialty within Internal Medicine.

Consultant Anaesthesiologists with a Special Interest in Intensive Care Medicine comprise 23 appointments. Consultant Anaesthesiologists remain an important integrated part of the Intensive Care consultant team nationally both during routine hours and out-of-hours.

Model 3 Hospitals with Obstetrics On-Site

Intensive Care consultant manpower in these hospitals is provided primarily by consultant Anaesthesiologists. There are a further 6 permanent posts of Consultant Anaesthesiologists with a Special Interest in Intensive Care Medicine and 2 temporary posts.

A significant number of these hospitals do not have dedicated non-conflicting sessional commitments to Intensive Care at time or throughout the 5-day routine week schedule.

Model 3 Hospitals / no Obstetric Commitment On-Site

Intensive Care consultant manpower in these hospitals is provided primarily by consultant Anaesthesiologists. A number of these hospitals do not have dedicated non-conflicting sessional commitments to Intensive Care throughout the 5-day routine week schedule.

Section 2.2 outlines the current guidelines for consultant staffing for Intensive Care Units (ICUs), and Section 4, addresses the implications for the development of an appropriate workforce for the configuration of Irish hospitals. For all the above models, current staffing numbers are not aligned with best practice national and international standards (section 5).

2.5 Levels of Hospital Acuity and Current Consultant Appointments

The levels of critical care are defined by the patient's clinical condition and their level of clinical need. Some ICUs will only have resources to deal with level 2 patients whereas the larger centres will deal with all patient categories.

- **Level 2 care:** Active management by the critical care team to treat and support critically ill patients with primarily single organ failure
- **Level 3 care:** Active management by the critical care team to treat and support critically ill patients with two or more organ failures
- **Level 3(s) care** A critically ill patient requiring specialty critical care normally receives 'Level 3(s)' specialty critical care e.g. Neurocritical Care, Cardiothoracic Critical Care (CCC), Extracorporeal Life Support (ECLS / ECMO), Burns Critical Care, Solid Organ and Bone Marrow Transplantation Critical Care etc. Hospitals treating the most complex patients including national specialities will have Level 3s facilities and appropriate clinical expertise

The clinical sites providing adult ICM are described in table 2.1 along with the type of care available at that site and the categories of doctors delivering that care

Table 2.1 Types of Consultants Delivering ICM in Ireland by Principle Clinical Site and Hospital Acuity Level (HSE, 2020)

Hospital acuity level	Principle clinical site	Type of ICM delivered	Types of consultants delivering ICU care
Model 3 Hospital	Cavan General Hospital	Level 2 and 3	Anaesthesiologists with rostered commitment to ICM
	Our Lady of Lourdes Hospital, Drogheda	Level 2 and 3	Anaesthesiologists with rostered commitment to ICM
			Anaesthesiologists with SI in ICM
	Our Lady's Hospital, Navan	Level 2 and 3	Anaesthesiologists with rostered commitment to ICM
	Portiuncula Hospital, Ballinasloe	Level 2 and 3	Anaesthesiologists with rostered commitment to ICM
			Anaesthesiologists with SI in ICM
	Sligo General Hospital	Level 2 and 3	Anaesthesiologists with rostered commitment to ICM
	South Tipperary General Hospital Clonmel	Level 2 and 3	Anaesthesiologists with rostered commitment to ICM
			Anaesthesiologists with SI in ICM
	St. Luke's General Hospital, Kilkenny	Level 2 and 3	Anaesthesiologists with rostered commitment to ICM
			Anaesthesiologists with SI in ICM
	University Hospital Kerry	Level 2 and 3	Anaesthesiologists with rostered commitment to ICM
			Anaesthesiologists with SI in ICM
	Wexford General Hospital	Level 2 and 3	Anaesthesiologists with rostered commitment to ICM
	Connolly Hospital Blanchardstown	Level 2 and 3	Anaesthesiologists with rostered commitment to ICM
			Anaesthesiologists with SI in ICM
	Letterkenny General Hospital	Level 2 and 3	Anaesthesiologists with rostered commitment to ICM
	Mayo General Hospital	Level 2 and 3	Anaesthesiologists with rostered commitment to ICM
	Mercy University Hospital	Level 2 and 3	Anaesthesiologists with rostered commitment to ICM
	Midland Regional Hospital Mullingar	Level 2 and 3	Anaesthesiologists with rostered commitment to ICM
	Midland Regional Hospital Portlaoise	Level 2 and 3	Anaesthesiologists with rostered commitment to ICM
	Midland Regional Hospital Tullamore	Level 2 and 3	Anaesthesiologists with rostered commitment to ICM
	Naas General Hospital	Level 2 and 3	Anaesthesiologists with rostered commitment to ICM
Model 4 Hospital	Beaumont Hospital	Level 2, 3 and 3s	Consultants in Intensive Care Medicine
			Anaesthesiologists with SI in ICM

			Anaesthesiologists with rostered commitment to ICM
	Cork University Hospital	Level 2, 3 and 3s	Anaesthesiologists with SI in ICM
			Anaesthesiologists with rostered commitment to ICM
	University Hospital Limerick	Level 2, 3 and 3s	Anaesthesiologists with SI in ICM
			Anaesthesiologists with rostered commitment to ICM
	Mater Misericordiae University Hospital	Level 2, 3 and 3s	Consultants in Intensive Care Medicine
			Anaesthesiologists with rostered commitment to ICM
	St James University Hospital	Level 2, 3 and 3s	Consultants in Intensive Care Medicine
			Anaesthesiologists with SI in ICM
			Anaesthesiologists with rostered commitment to ICM
	St Vincent's University Hospital	Level 2, 3 and 3s	Consultants in Intensive Care Medicine
			Anaesthesiologists with SI in ICM
			Anaesthesiologists with rostered commitment to ICM
	Tallaght University Hospital	Level 2, 3 and 3s	Consultants in Intensive Care Medicine
			Anaesthesiologists with SI in ICM
			Anaesthesiologists with rostered commitment to ICM
	University Hospital Galway	Level 2, 3 and 3s	Consultants in Intensive Care Medicine
			Anaesthesiologists with SI in ICM
			Anaesthesiologists with rostered commitment to ICM
	University Hospital Waterford	Level 2, 3 and 3s	Anaesthesiologists with SI in ICM
			Anaesthesiologists with rostered commitment to ICM

*This information was accessed through DIME and is based on the titles of consultant posts approved through Consultant Applications Advisory Committee (CAAC).

2.6 Training in Intensive Care Medicine

Training to become a specialist in Intensive Care Medicine is a minimum 7 year programme comprising completion of core specialty training (Anaesthesiology, Medicine, Surgery, and Emergency Medicine) followed by supraspeciality training programme of 2 years duration.

Recognising that many consultants wish to retain clinical practice and a career encompassing both core speciality and Intensive Care Medicine, many doctors will choose to do one year of supraspecialty training plus the Fellowship Examination in Intensive Care Medicine (FJFICMI) followed by appointment as a Consultant (base specialty) with a Special Interest in Intensive Care Medicine. Such specialist will often afford 0.3 WTE of clinical session to ICM whilst the majority of their clinical sessions will be to core speciality (usually Anaesthesiology). This contrasts with a Consultant in Intensive Care Medicine who will more likely devote 0.5 or 0.6 WTE to ICM vs. base specialty.

A summary of the numbers that have completed JFICMI exam and fellowship over the past number of years can be found in Appendices 1 and 2.

Anaesthesiology trainees

Anaesthesiology remains the main provider of Intensive Care service delivery and core training is placed within the Anaesthesiology training scheme. The Anaesthesiology training scheme affords a minimum of 6 months dedicated training in Intensive Care Medicine across the 6 year training programme, and a provision of up to 18 months on-call commitment to Intensive Care Medicine over that period.

The number of Anaesthesiology trainees undergoing training in Intensive Care Medicine is therefore 100% of all Anaesthesiology trainees. Although all Anaesthesiology trainees undertake some training in Intensive Care Medicine, Anaesthesiology is a very broad specialty with many subspecialty career opportunities. Of the total Anaesthesiology trainees, it is estimated perhaps 30% retain a longer term career interest in Intensive Care Medicine.

The majority of Intensive Care service delivery in Ireland comes from Anaesthesiology consultants both with and without a Special Interest in Intensive Care Medicine, with a smaller number of consultants with dual ICM and Anaesthesiology specialist accreditation. Training for these doctors is as follows:

- Consultants in Anaesthesiology, as stated above, complete 6 months training and significant NCHD on-call time in ICM and many will go on to delivery ICM services though their weekly roster
- Consultants in Anaesthesiology with a special interest in ICM have completed CSCST in Anaesthesiology and have elected to include within that training programme one year of dedicated ICM training and Fellowship examination of the JFICMI. This is best achieved through a special interest ear within Specialist Anaesthesiology Training (SAT) scheme of the College of Anaesthesiologists of Ireland, and sustaining this scheme, or equivalent, is an essential component of the training of specialists for appointment to these posts. It is important to note that from July 2021, there is approval for 6 Year One post CSCST appointments. At this point special interest year training modules in ICM within CSCST Anaesthesiology will end and be replaced by these 6 Post CSCST Year 7 Fellow appointments
- A small number of those doctors with special interest training will progress post CSCST to take on a second year of ICM training and be eligible for dual CSCST in Anaesthesiology and Intensive Care Medicine

Non-Anaesthesiology Trainees

There is significant interest in advanced training in ICM from Non-Anaesthesiology trainees, with approximately 6 to 10 candidates per annum from Non-Anaesthesiology training programmes applying for Year 1 fellowship positions. Placement of these trainees within the recognised JFICMI training posts is a challenge, as all of these posts at Year 1 and Year 2 fellow level are seconded from Anaesthesiology, with no Non-Anaesthesiology funded posts to Q2 2020. Nonetheless, between one and two candidates per annum to the FJFICMI examination are trainees from Emergency Medicine, General Medicine or Surgery. To date, 3 Non-Anaesthesiology trainees have completed the Year 2 post-CSCST programme and are eligible for the post of Consultant in Intensive Care Medicine.

Training for these doctors is as follows

- Those with core specialty in Emergency medicine, Surgery or General medicine can apply for year 1 of dedicated ICM training and Fellowship examination of the JFICMI. Completion of this will qualify them as having a SI in ICM
- A small number of those doctors with SI training will progress post CSCST to take on a second year of ICM training and be eligible for dual CSCST in their base specialty and ICM. On completion of this they will be eligible for consultant in Intensive Care Medicine roles
- This access to post CSCST training in ICM is multi-disciplinary with a similar approach to the first year of training in ICM for RCPI and RCSI trainees “within base specialty” programme. Numbers in dedicated ICM training within this Non-Anaesthesiology cohort are small

A new HSE / JFICMI initiative has provided funding on a temporary basis for 6 Year 1 fellow training posts accessible to Non-Anaesthesiologists from Q3 2020.

For further information on the training pathways in ICM please refer to the Higher Specialist Training in Intensive Care Medicine (Joint Faculty of Intensive Care in Ireland, 2020) document available from the JFICMI and published within its website.

3. INTENSIVE CARE MEDICINE WORKFORCE IN IRELAND

For the purpose of this report, a review of the configuration of the **current** Intensive Care Medicine workforce in Ireland, across both the public and private sectors of the health service, is included to infer the baseline medical workforce as at Quarter 2 2020. In order to get a profile of the number and type of Intensive Care Medicine consultants working in the Irish health care system currently, data were analysed from the following sources:

- Census of the ICM workforce (National Clinical Programme for Critical Care, 2020)
- The Doctors Integrated Medical E-System (HSE and NDTP, 2020)

This analysis informed the baseline, current day understanding of the number and type of these specialists working across both the public and private health care systems. As mentioned in section 1, the remit of NDTP is to develop medical workforce plans to service the population health needs of the Irish population as a whole, accepting that data limitations outlined in Section 1.3 apply to the modelling.

3.1 Participation of Consultants/ Specialists in the Medical Workforce in Ireland

This section of the report outlines the demographic breakdown of the types of doctors working in ICM in Ireland currently. In terms of adult ICM service delivery, currently in Ireland there are approximately 138 consultants working in publicly funded services, with an estimated additional 3 consultants/specialists working exclusively in the private sector.

The following tables provide an overview of the estimated total adult ICM medical workforce.
It is important to note the following in relation to this section

- Headcount (HC) employed is the number of consultants working in publicly funded services (NDTP, 2020). Please note that HC also includes those that are employed but may have had their contractual hours reduced to 0 for a period of time, for example maternity leave or secondment to another post. Those consultants contributing to ICM are described in section 2.5; consultants with a commitment to ICM delivery will also have a commitment to another specialty which is usually Anaesthesiology. A consultants contract and local arrangements will determine how many dedicated hours consultants will contribute to ICM delivery
- Whole Time Equivalent (WTE) employed is the total number of consultants working in Whole Time Equivalent terms (as of May, 2020). WTE rates are adjusted to account for those who have had their hours reduced to 0 for some reason; this may be due to maternity leave, secondment to another post etc. As mentioned above consultants with a commitment to adult ICM will have a commitment to another specialty. The figures displayed in the following tables reflect the actual WTE commitments to adult ICM from the various categories of consultants involved in ICM delivery (described in section 2.5)
- Private sector data (those exclusively working in the private sector) is from the NCPCC's 2020 workforce census and supplemented with the public sector WTE rate to infer the total number whole time equivalent consultants working in the private sector, as there is no access to these numbers (NCPCC, 2019)
- DIME contains information on consultant posts and those assigned to posts. The number of hours dedicated to ICM is based on consultant's contract and local arrangements. Historically some consultant posts have been appointed with a requirement to support a critical care service, not defined in the contractual definition, but rather in the job description, or evolving post-appointment, this will not be captured on DIME if it is not reflected in contract type
- The data on gender, full time working and tenure are sourced from DIME, (2020)
- Data on age comes from DIME, (2020) and is used to infer coming retirements over the next 10 years using information collected by the NCPCC on average age of retirement. Also included in modelling is an expected proportion of consultants leaving the workforce for reasons other than retirement (estimate at 1% of males and 2% of females)
- Information on Anaesthesiologists without a Special Interest (SI) in ICM was collected by the NCPCC however demographic information was not available via the workforce census. For this group, information held on DIME was used to approximate values based on all Anaesthesiologists without a SI based at model 3 and 4 hospitals
- The information on ICM trainees is from the JFICMI and information on Anaesthesiology trainees was accessed through the College of Anaesthesiologists of Ireland

3.1.1 Number of ICM Consultants Working in Publically Funded Services

There were 138 consultants contributing to adult ICM in the public sector in 2020. They contributed a total of 45.3 WTE to adult ICM services (table 3.1).

Table 3.1 Number of Consultants Who Worked in Publicly Funded Services in Ireland in 2020 (Source: HSE, NDTP and NCPCC workforce census, May 2020)

Specialty	HC	WTE commitment to ICM	Inferred WTE Rate Mean*	WTE rate range
Intensive Care Medicine	13	5.2	0.4	0.1 – 0.65
Anaesthesiology with a SI in ICM	38	13.9	0.36	0.1 – 0.6
Anaesthesiology with rostered commitment to ICM	87	26.2	0.3	
Total	**138**	**45.3**		

*The inferred WTE rate reflects that most consultants in Ireland contributing to ICM have scheduled commitments also in core specialty, usually Anaesthesiology. As the commitment to ICM has grown with growth of departments and clinical demand, the WTE inferred rate is widely variable across the acute hospital sector. The NCPCC workforce planning survey, 2020 averages to the above inferred WTE rate per consultant category, with Consultants in Intensive Care Medicine in general scheduled to a greater WTE commitment to ICM. This configuration of service delivery varies greatly internationally. In Australia, New Zealand, USA, Canada the more usual model would that of a full time Intensive Care Medicine specialist, with no other specialty (e.g. Anaesthesiology) activity when not on the intensive care service. The practice across Europe and UK varies widely, but the JFICMI standard reflects a common direction that

"It is desirable to provide for blocks of Critical Care Unit time for each consultant of at least 3-4 days at a time rather than changing on a daily basis."

Retention of other specialty activity (e.g. departmental clinical leadership, Anaesthesiology, Medicine, academic and research lead, organ donation and transplant leadership etc.) will normally comprise a significant part of contractual commitment, and thus blocks of clinical scheduling to intensive care in a non-conflicting manner require scheduling into the total departmental activity over rotating time periods.

3.1.2 Number of Consultants Working Exclusively in the Private Sector

Private sector data (those working exclusively in the private sector) was accessed through the NCPCC workforce census (May 2020) and supplemented with the public sector WTE rate to infer the total number of WTE consultants contributing to ICM in the private sector.

There were 3 consultants working exclusively in the private sector in 2020, contributing a total of 0.9 WTE to ICM (table 3.2).

Table 3.2 Number of Specialists Who Worked Exclusively in Privately Funded Services in Ireland in 2020 (NCPCC workforce census, 2020)

	HC	WTE commitment to ICM	Inferred WTE Rate
Specialist registered doctors actively practicing ICM exclusively in the private sector 2020*	3	0.9	0.3

The major private hospitals have an intensive care service supported by type B and type C consultant Anaesthesiologists, consultants with a SI in ICM, and consultants in ICM.

3.1.3 Gender and working patterns

According to data from the DIME database, of the 138 consultants working in publicly funded services in 2020, 39% were female and 61% were male (table 3.3).

Table 3.3 Gender Breakdown of Consultants/Specialists Working in Ireland in 2020 (HSE, NDTP 2020)

Specialty	Male %	Male HC	Female %	Female HC	Total HC
Intensive Care Medicine	62%	8	38%	5	13
Anaesthesiology with a SI in ICM	50%	19	50%	19	38
Anaesthesiology with rostered commitment to ICM	66%	57	34%	30	87
Total	**61%**	**84**	**39%**	**54**	**138**

The WTE contributions of males and female consultants working in ICM are displayed in table 3.4.

Table 3.4 Working Patterns of Consultants/Specialists 2020 (HSE, NDTP 2020)

Specialty	Total HC	Male WTE	Female WTE	Total WTE
Intensive Care Medicine	13	3.2	2.0	5.2
Anaesthesiology with a SI in ICM	38	6.95	6.95	13.9
Anaesthesiology with rostered commitment to ICM	87	17.2	9	26.2
Total	**138**	**27.35**	**17.95**	**45.3**

Data from DIME, (2020) indicates that of those contributing to ICM, 8% work part time (table 3.5). It is important to note that although many of these consultants work full time they have commitments to other areas of medicine for example Emergency Medicine or Anaesthesiology. Table 3.5 outlines their working patterns as a whole but only a portion of their WTE will go towards ICM.

Table 3.5 Working patterns of Consultants/ Specialists			
Specialty	**Share of males working part time (%)**	**Share of females working part time (%)**	**Total part time (%)**
Intensive Care Medicine	0%	0%	0%
Anaesthesiology with a SI in ICM	18%	24%	21%
Anaesthesiology with rostered commitment to ICM	4%	11%	6%
Total	**7%**	**15%**	**8%**

3.1.4 Permanent/ Temporary Status of Consultant Contract

129 of the 138 consultants (93%) working in publicly-funded services held permanent contracts in 2020 (table 3.6). The remaining 7% held non-permanent contracts and were typically in locum positions or specified purpose contracts (HSE, NDTP 2020 and NCPCC workforce census 2020).

Table 3.6 Permanent / Temporary Status of Consultant Contract 2020 (HSE, NDTP 2020 and NCPCC census 2020)					
Specialty	**HC**	**Permanent (n)**	**Permanent (%)**	**Non-Permanent (n)**	**Non-Permanent (%)**
Intensive Care Medicine	13	12	92%	1	8%
Anaesthesiology with a SI in ICM	38	30	78%	8	22%
Anaesthesiology with rostered commitment to ICM*	87	87	100%	0	0%
Total	**138**	**129**	**93%**	**9**	**7%**

** Information came from NCPCC workforce census (2020) which only collected information on those with permanent contracts; information on those on non-permanent contracts for this group is not available*

3.1.5 Age profile of Consultants

Of the 138 consultants working in ICM in 2020, 2% were under the age of 35, 25% were between the ages of 35 and 44, 33% were between the ages of 45 and 52, 40% were aged over 53 years. The average age of retirement for consultants working in ICM is 63 years therefore these data indicate that, over the next 10 years approximately 55 (40%) specialists working in ICM are likely to exit the workforce due to retirement (Table 3.7).

Table 3.7 Age Profile of Consultants / Specialists (HSE, NDTP, 2020)					
	< 35	**35-44**	**45-52**	**53 and over**	**Total HC**
Intensive Care Medicine		54%	38%	8%	13
Anaesthesiology with a SI in ICM		29%	29%	42%	38
Anaesthesiology with rostered commitment to ICM	3%	18%	35%	44%	87
Total	**2%**	**25%**	**33%**	**40%**	**138**

Table 3.8 displays the projected exits from the ICM workforce due to retirement over the next 10 years

Table 3.8 Expected Retirements of Consultants/ Specialists Over the Next 10 Years*	
Intensive Care Medicine	1
Anaesthesiology with a SI in ICM	16
Anaesthesiology with rostered commitment to ICM	38
Total	**55**

* These are the anticipated retirements based on information captured on DIME. An average retirement age of 63 was assumed using information from the NCCP. The NCCP has indicated the anticipated retirements among consultants in Intensive Care Medicine may be higher however, as indicated in section 1.3, DIME provides information on consultant posts and those assigned to posts. Local arrangements may mean consultants fall into a different category based on further training and commitment to ICM. DIME provides information on consultant retirements for those in permanent and non-permanent posts.

3.2 Participation of Non-Consultant Hospital Doctors in the Medical Workforce in Ireland

Non Consultant Hospital Doctors (NCHD) is a term used in Ireland to describe qualified medical practitioners who work under the supervision of a consultant in a speciality. This encompasses all doctors below consultant level in the public health system including interns, senior house officers, registrars, specialist registrars, senior registrars and fellows.
An NCHD in training refers to a doctor who rotates through individually numbered identifiable training posts in a training scheme (Basic Specialist Training or Higher Specialist Training), recognised by the Medical Council of Ireland. Eligible doctors are entered onto the trainee specialist division of the Medical Council's register on receipt of confirmation of their training post from the HSE. A non-training NCHD refers to any NCHD not enrolled on a postgraduate training scheme.

3.2.1 Current NCHD Contribution to ICM

The NCHD workforce in ICM comprises NCHDs primarily appointed within Anaesthesiology nationally, both within the Anaesthesiology training programme and non-training posts.

Data from the NCPCC workforce census indicates that

- On a daily bases, 87 NCHDs are rostered to routine hours within intensive care across all sectors (adult, paediatrics and private). Of these, 81% are from Anaesthesiology. Three of the model 3 hospitals do not have a dedicated NCHD rostered to intensive care during routine hours. These figures include training and non-training NCHDs
- For the out-of-hours / on-call period, 30 NCHDs are rostered nationally. Of these 80% are from Anaesthesiology. Of note, the 6 non-Anaesthesiology NCHDs are absorbed in the Model 4 larger hospitals where their role is primarily supportive and not the lead NCHD in intensive care role. These figures include training and non-training NCHDs
- 12 of the Model 3 hospitals do not have a dedicated NCHD on-call out-of-hours for intensive care and hence the intensive care service is cross-covered from a parallel anaesthesiology on call service to the operating theatres. This would suggest that at a minimum, a further 12 European Working Time Directive (EWTD) compliant rosters are required to provide a dedicated intensive care service to these Model 3 hospitals out-of-hours

The majority of NCHDs contributing to ICM are from Anaesthesiology with a smaller cohort from other specialties, they have a dedicated commitment to ICM as well as another specialty. It is not possible to distinguish between those with or without a commitment from the information captured on DIME or other data sources and therefore it has not been possible to report on the demographic characteristics of NCHDs currently working in ICM as would usually be the case for these reports.

3.2.2 Non Training NCHDs

As outlined in section 3.2.1 the majority of NCHDs contributing to ICM are from Anaesthesiology, information is not available on non-training NCHDs contributing specifically to ICM. However, information on the NCHD Anaesthesiology cohort in model 3 and 4 hospitals is available and was extracted from DIME as of the 1st of July 2020; this is presented in table 3.9.

Table 3.9 displays the numbers of training and non-training NCHDs in anaesthesiology in model 3 and 4 hospitals only as they have ICU services.

Considering the information from the NCCP census (section 3.2.1) the NCHDs outlined in table 3.9

have the potential to contribute to ICM non-consultant rotas.

Table 3.9 Breakdown of Training and Non-Training NCHDs Practicing in Anaesthesiology (DIME, 2020)			
	Anaesthesiology NCHDs in training*	Anaesthesiology NCHDs not in training	Total
Number in model 3 and 4 hospitals	194	283	477
% of total NCHDs in model 3 and 4 hospitals	41%	59%	100%

*Excludes interns

3.2.3 NCHDs Working Exclusively in the Private Sector

The workforce census of those working in intensive care carried by the NCPCC out by the identified a total of 7 NCHDs working exclusively in the private sector (National Clinical Programme for Critical Care, 2020). None of these posts are recognised training posts in ICM. A limited number of training posts affiliated to the College of Anaesthesiologists of Ireland are recognised for training in anaesthesiology in the private sector.

3.2.4 Expected Specialist Training Completion Numbers

The trainees in Anaesthesiology and ICM training by year of training, as of April 2020, are displayed in table 3.10.

Table 3.10 Current Trainees by Stage of Training with the Potential to Contribute to ICM in the Future (CAI and JFICMI 2020)							
Higher Specialist Training/ Supraspecialist Training	**Year 3**	**Year 4**	**Year 5**	**Year 6**	**Total**	**Post CSCST Year 1**	**Post CSCST Year 2**
Total Anaesthesiology Trainees	46	30	43	36	155		
Anaesthesiology no SI – Estimated proportion who will work in ICM (30% of Anaesthesiology trainees)	14	9	13	11	41 (minus 6 SI trainees)		
SI trainees (from Anaesthesiology and other specialities)						6*	
ICM year 2 trainees (from Anaesthesiology and other specialities)							1**

*This is usually 4-6 per annum; all 6 of current trainees are from anaesthesiology
** This is usually 2-4 per annum

<u>Note on table 3.10:</u> There are currently 155 HST (or equivalent) trainees in Anaesthesiology, of these an estimated 30% (47) will contribute to ICM in the future and approximately 6 of these will do SI training either within their HST programme or post CSCST. The remaining 41 will potentially contribute to ICM rotas but without undertaking any additional training in ICM. After completing 1 year of SI training approximately 2-4 (or 1/3 of the SI training year) will complete a second year of training in ICM to be eligible to apply for Consultants in ICM posts.

According to information from CAI, attrition from HST for Anaesthesiology trainees is approximately 2% per annum. Year 1 and 2 of specialist ICM training do not experience attrition during the training years, but may be lost to the Irish system through appointment abroad.

An analysis of the number of doctors in HST training currently projects that a maximum of 5 and a minimum of 1 trainees annually will complete specialist training and be eligible for specialist registration in ICM over the next 5 years. A maximum of 6 trainees will complete Year 1 in ICM per annum. This may increase by up to 6 depending on the application interest to 6 new training posts (starting in Quarter 3 of 2020), and the level of interest these attract towards longer term career interest, and whether funding for same is recurring.

Table 3.11 displays the numbers projected to complete training with the potential to contribute to ICM in the future up to 2026.

Table 3.11 Numbers Projected to Complete Training with the Potential to Contribute to ICM in the Future

	2020	2021	2022	2023	2024	2025	2026
Anaesthesiology no SI – Estimated proportion who will work in ICM (30% of Anaesthesiology trainees)	11	13	9	14	14	14	14
SI trainees (from Anaesthesiology and other specialities) Year 1 ICM / Year 7 Fellow	6	6	6	6	6	6	6
COVID -19 funding of additional temporary ICM posts		6	6	6*	6*	6*	6*
ICM year 2 trainees (from Anaesthesiology and other specialities)	1	5	2	2	2-4	2-4	2-4

*Intake to these posts is secure through to one year appointments in July 2021. Funding for posts beyond that point has not been identified.

4. Current and Future Drivers of Demand for Intensive Care Medicine

Previous sections of this report have focused on the current system of intensive care service delivery in Ireland and the current medical workforce delivering ICM care today. The system of care delivery as it currently stands is not sufficient to deliver the levels of care appropriate to service the population of Ireland and that capacity within the service is below international standards. There are a number of significant drivers of change to the future of ICM service delivery in Ireland most notably levels of service requirements versus current capacity; new models of service delivery; government policy e.g. Sláintecare, recommendations of the Health Service Capacity Review (2018), the Trauma Strategy; population ageing and epidemiological trends; insufficient staffing levels and most recently the COVID-19 pandemic. The drivers of change impacting the future demand for consultants working in the area of Intensive Care Medicine are discussed in more detail below.

4.1 Drivers of Change for Medical Workforce Planning

The drivers of change to the health service of the future have a major influence on medical workforce planning. Consideration was given to the major drivers of change to the consultant Intensive Care Medicine workforce over a 10-year projection period i.e. to 2030.

While there are many drivers of change to the delivery of Intensive Care Medicine in Ireland, and internationally, figure 3 displays the major drivers underpinning the future delivery of services in the Irish health service, these are discussed in detail in the following sections and were considered in determining the future demand for consultants working in ICM in Ireland.

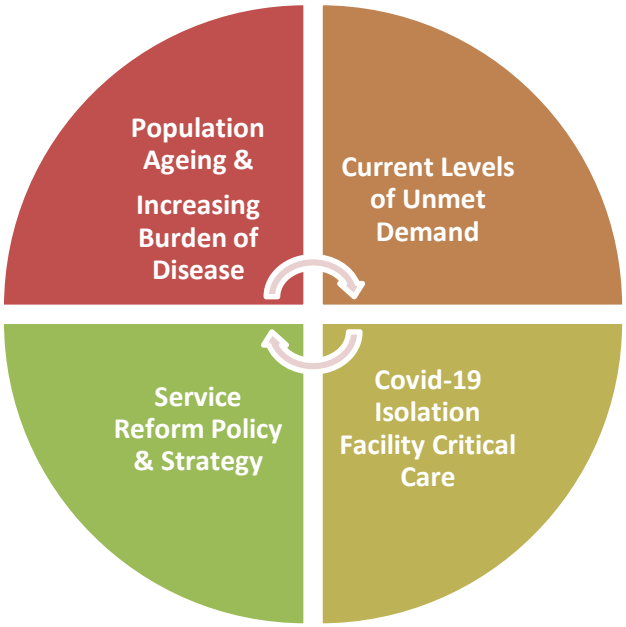

Figure 3. Drivers of Change relevant to ICM

4.2 Unmet Levels of Service Demand

ICU bed Capacity

The deficit in critical care capacity in Ireland has been well documented. The NCPCC has advocated for an increase in bed numbers over the past number of years, supported by the independent external 'Review of Adult Critical Care Services in the Republic of Ireland' (Prospectus Strategy Consultants, 2009) and the more recent Health Service Capacity Review (Department of Health, 2018) amongst others.

Based on these reports, and as presented by NCPCC, total critical care bed capacity remains inadequate, which impacts on the capability of the acute hospital sector to meet the needs of critically ill patients in a safe, effective and timely manner – particularly during major surges (National Clinical Programme for Critical care, 2014).

The Health Service Capacity Review (Department of Health, 2018) recommended an increase in critical care bed capacity to 430 based on projections to 2031. It is important to note that this report acknowledges that levels of adult critical care delivery have remained static over the years preceding the report, this flat demand was associated with capacity constraints in the critical care system. The 430 beds recommended in this report was projected on the basis of demographic growth only (Department of Health, 2018) and hence does not measure current unmet need.

The number of ICU beds in Ireland is very low by international standards. The average number of ICU beds per 100,000 of the population is 11.5 for European countries; this is compared with 6 beds per 100,000 of the population in Ireland. These figures reflect public and private bed availability (National Office of the Clinical Audit, 2020).

Bed occupancy rates in the acute hospital system in Ireland have been persistently high over the last number of years, they are running close to 100% across the system, this is above international norms and poses a substantial risk to patient safety (Department of Health, 2018). Operating at a high level of bed occupancy limits the system's ability to cope with surges in demand for example during flu season during winter months.

High critical care bed occupancy rates are associated with challenges in planning for surges in activity and for critical care surges are continual year-round features of critical care activity (National Clinical Programme for Critical care, 2014). The Covid-19 pandemic is an extreme example of a scenario that required significant surge planning and increases in capacity to deal with the numbers of patients requiring critical care.

In 2018 the overall bed occupancy rate for ICU beds was 88% with some units reporting averages of over 90% (National Office of the Clinical Audit, 2020). This is higher than the recommendation from the European Society of Intensive Care Medicine which cites optimal bed occupancy rates at 75% (Valentin and Ferdinande, 2011).

The Irish National ICU Audit (INICUA) Report 2018 (National Office of the Clinical Audit, 2020) reports risk adjusted outcome for critically ill adult patients, capturing approximately 70% of public hospital adult critical care, and an extrapolated estimate annualised volume of critically ill adult patients in Ireland of 12,500 patients (National Office of the Clinical Audit, 2020). This is based on data from 18 units in 15 centres, primarily level 3 critical care. As the penetration of INICUA extends, these figures will become robust. Data submitted to the workforce survey of the NCPCC (May 2020) identifies a further 5,935 level 2 (HDU) critical care patients under the governance of the critical care teams, and 5,504 patients in private hospital critical care (combined level 2 and level 3 usually) . Total adult

critical care volume is therefore up to 23,900 patients approximately. Of note, the paediatric hospitals report a throughput of 1,478 patients, which will be addressed in the Paediatric Critical Care Workforce Planning Review.

Inadequate critical care capacity in Ireland highlights a requirement for investment in greater critical care resource, the staffing for which requires a suitable body of medical professionals and a training pathway to ensure supply of an adequate number of medical professionals trained to an international and JFICMI standard.

4.3 Health Service Reform Policy and Strategy

The Model of Care for Adult Critical Care described in Section 2.1 outlines how the configuration of critical care services follows a hub and spoke model of service delivery. Data from the clinical programme indicates that 10 of the largest units in Ireland undertake 75% of all ICU activity nationally.

The Model of Care for Adult Critical Care, and the implementation of a number of national strategies in areas such as trauma care, maternity services and emergency medicine, reinforces the need to focus the development of critical care services to a smaller number of larger units. Consistent with such planning would be to reconfigure elements of existing capacity to such units as part of an integrated hub and spoke model of care.

Most of the current proposed expanded capacity outlined in the model of care is directed towards the model 4 hospitals; which is in line with increasing centralisation of advanced critical care services. It is also in line with wider Department of Health and HSE service reform policy and strategy. A number of ICM related reform policies, strategies and standards of care which are driving change to the delivery ICM in Ireland are outlined below.

Sláintecare

The Sláintecare Implementation Framework report(Department of Health, 2019) references the organisation of high complexity and low volume care in fewer centres across the country, so that the appropriate level of care and expertise can be provided. The report also recommends organising services in regional and local hospitals as clinically appropriate, with specialised complex care to be appropriately centralised to ensure it is safe and of high quality. The location of additional critical care beds into hub and spoke centres will drive progress on implementing the recommendations of Sláintecare (Houses of the Oireachtas, 2017).

Health Service Capacity Review, 2018

This report is key to informing reform of the health service in Ireland in general and ICM in particular. The Health Service Capacity Review (Department of Health, 2018) recommends an increase in Critical Care bed capacity to 430 based on projections to 2031.

Model of Care for Adult Critical Care, 2014

Defines and describes the hospital ICU 'hub-and-spoke' delivery model of care as based on the external review of critical care and continues to inform service development(National Clinical Programme for Critical care, 2014).

Smaller Hospital Framework, 2013

Defines the operation scope of the Smaller Hospital (i.e. no ICU) and the greater need for centralisation of critical care services. This Framework continues to impact on health service reconfiguration and change and is relevant to ICM reform (Department of Health and Health Service Executive, 2013).

The National Transport Service for Critically-Ill Adults and Children

(NAS-CCRS-MICAS, National Ambulance Service, Critical Care & Retrieval Service, Mobile Intensive Care Ambulance Service) operates to transport and transfer critically ill patients inter-ICU as needed and acts to sustain the hub and spoke model.

Model of Care for Anaesthesiology, 2019

Defines and describes the anaesthesia workforce model the '2+2' model of care for those model 3 hospitals with emergency obstetric, critical care and theatre services. This new model of care will impact the future delivery of Anaesthesiology and ICM in Model 3 hospitals with an obstetric service and on-site critical care (National Clinical Programme for Anaesthesia, 2019).

The National Maternity Strategy, 2016

Defines a risk-based maternity service delivery system where the critically ill mother is transferred to the adult ICU. In conjunction with the work done by NCPCC, it defines the pathway for clinically deteriorating women, within hospital group where appropriate– as well as the multi-professional staffing requirements arising from the new model of care (Department of Health, 2016).

The Trauma Strategy, 2018

Defines the tiered adult trauma service delivery system for Ireland and associated critical care services supporting same (Department of Health, 2018).

JFICMI National Standards for Adult Critical Care, 2019

Defines and describes the ICM Consultant workforce standard -"Every Critical Care Unit should have 24 hour availability of a dedicated Consultant in Critical Care Medicine. During daytime hours, the consultant intensivist should have an exclusive sessional commitment to Intensive Care Medicine (ICM) and no conflicting clinical commitment" (Section 6.1, p11, JFICMI Standards for Adult Critical Care, 2019).

The Guidelines for Critically Ill Women in Obstetrics, 2014

This document was completed and issued jointly by the National Clinical Programmes for Obstetrics, Anaesthesia and Critical Care. It defines that a critically ill mother is mandated to be admitted to an ICU (Obstetric & Gynaecology Anaesthetic and Critical Programmes, Clinical Strategy & Programmes Division and Health Service Executive, 2014).

4.4 Low Staffing Levels in ICM in Ireland

The JFICMI makes recommendations for minimal staffing of intensive care services, based on recognised international guidelines. The 2019 JFICMI guidelines describe that "The Critical Care medical team comprises the Intensive Care specialist(s) supported by appropriately trained (or in training) non-consultant hospital doctors." It is recommended that the consultant to patient ratio should be a minimum one consultant to twelve critical care patients during routine hours. A minimum of one consultant to thirty critical care patients must be provided out-of-hours, depending on case mix and where supported by appropriate trainee and NCHD staffing. The delivery of a safe service is built upon this principle of a consultant supervising and delivering care across a large cohort of critically ill patients, supported by a tighter NCHD doctor to patient ratio of 1:6 in hours and 1:12 out-of-hours, and thus a consultant to NCHD ratio of 1:2.

Shortages in staffing have created challenges such as:

- For 10 public sector ICUs there is no dedicated Intensive Care consultant manpower during routine hours. The consultants in Anaesthesiology provide that service through cross-covering from a concurrent Anaesthesiology operating theatre session.
- A further 9 public sector ICUs have either no dedicated ICU roster at night or periods of the week or weekends out of hours with no dedicated ICU consultant roster.
- Risk of delay to immediate patient care in ICU where a consultant is committed to an operating theatre and an urgent clinical event arises in ICU. It is not possible to abandon the operating theatre compromising safety for the anaesthetised patient.
- Risk of delay to immediate patient care in emergency department or wards where a consultant is committed to an operating theatre and an urgent clinical event arises in ICU.
- For 22 ICUs the consultant Anaesthesiologist is at times committed to at least 2 emergency services contemporaneously out-of-hours, usually theatre and ICU.
- For all 13 model 3 hospitals with an on-site obstetric unit, the rosters fall short of a dedicated 2+2 roster as per the Model of Care for Anaesthesiology (this roster ensures dedicated ICU, theatre and obstetric consultant roster for emergencies).
- Model 4 hospitals have dedicated sessional and out-of-hours Intensive Care consultant rotas. However all fall short of the international doctor: patient staffing ratios.
- The impact of all the above factors is an onerous duty requirement to intensive care making it difficult to attract trainees and specialists, perpetuating the staffing difficulty and the onerous nature of the speciality.

Over-Reliance on Non-Training NCHDs

The workforce in Ireland's hospitals at NCHD level comprises approximately 50% training (excluding interns) and 50% non-training scheme doctors. The proportion of trainees relative to non-training scheme doctors should be much higher. Other countries do not have such a high dependence on non-training scheme doctors to deliver clinical service. Non-training scheme doctors do not have adequate training and career pathway opportunities and Irelands over-reliance on this cohort of doctors has led to challenges in adhering to the WHO Global Code of practice related to ethical recruitment in health care and doctor migration.

Reliance on non-training NCHDs in model 3 and 4 hospitals is high for Anaesthesiology and therefore ICM. As outlined previously (section 3.2.2) 59% of Anaesthesiology NCHDs in model 3 and 4 hospitals

are not assigned to a training scheme (DIME, 2020). In breaking this figure down further it is noted that 78% of Anaesthesiology NCHDs in model 3 hospitals are non-training, while 48% of Anaesthesiology NCHDs in model 4 hospitals are non-training. As the majority of routine and on-call hours are provided by Anaesthesiology NCHDs, over-reliance on non-training NCHDs is an issue for ICM also.

4.5 Population Aging and Future Burden of Disease

Under the M2F2 CSO scenario for projecting population growth(Central Statistics Office, 2017) it is estimated that by 2030 the population of Ireland will have increased by over 400,000 (from around 4.9 million today to approximately 5.4 million). By 2030 there will be approximately 973,000 people in Ireland over the age of 65, representing an increase of almost 35% in the number of over 65s today. The over 80s population, which exerts the greatest pressures on the health service, is expected to increase from around 170,000 to over 270,000 or by around 58% over the next decade. Population ageing is directly linked to increasing chronic disease presentation and complexity of care requirements. The ageing of the population presents the health service with many resource challenges across the acute hospital, primary and social care sectors. Figures 4 and 5 display this increase.

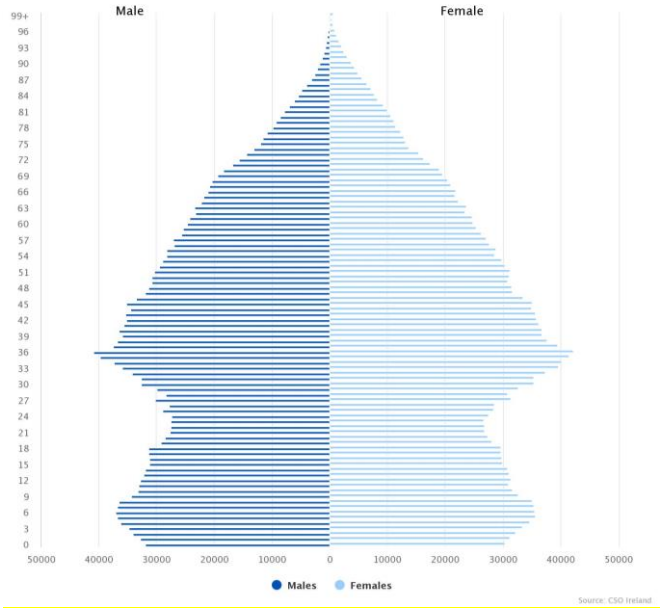

Figure 4 Population Pyramid by Single Year of Age (Central Statistics Office, 2017)

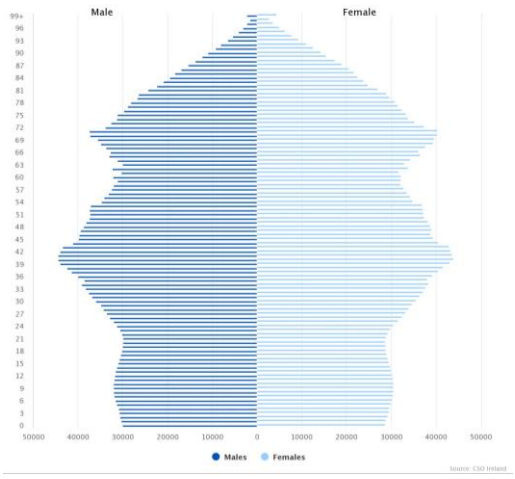

Figure 5 Population Pyramid by Single Year of Age M2F2, 2051 (Central Statistics Office, 2017)

Currently, very elderly patients (those > 80 years of age) already represent 10-20% of all ICU admissions (2-7) and it is estimated that the number of admissions will continue to increase in the future, thus increasing the burden of ICU requirement and associated health-care costs. In the USA up to 55% of ICU bed days are incurred by patients > 65 years (Angus *et al.*, 2004).

Results from a study by (Flaatten *et al.*, 2017) supports this, results from which are displayed in Figures 6 and 7 .

Author	Country	Published	Number (≥80 years old)	Period	Results
Docherty [56]	Scotland	2016	3865	2005–2009	Decrease from 10% to 8.4%
Haas [57]	Netherlands	2015	39,558	2005–2014	Increase from 13.4% to 13.9%
Nielsson [58]	Denmark	2014	6266	2005–2011	Increase from 11.7% to 13.8%
Ihra [59]	Austria	2012	17,126	1998–2008	Increase from 11.5% to 15.3%
Bagshaw [6]	Australia and New Zealand	2009	15,640	2000–2005	Annual increase 5.6%

Figure 6 Proportion of Very Old Intensive Care Patients (VOPs) in Recent Large Epidemiological Studies(Flaatten *et al.*, 2017)

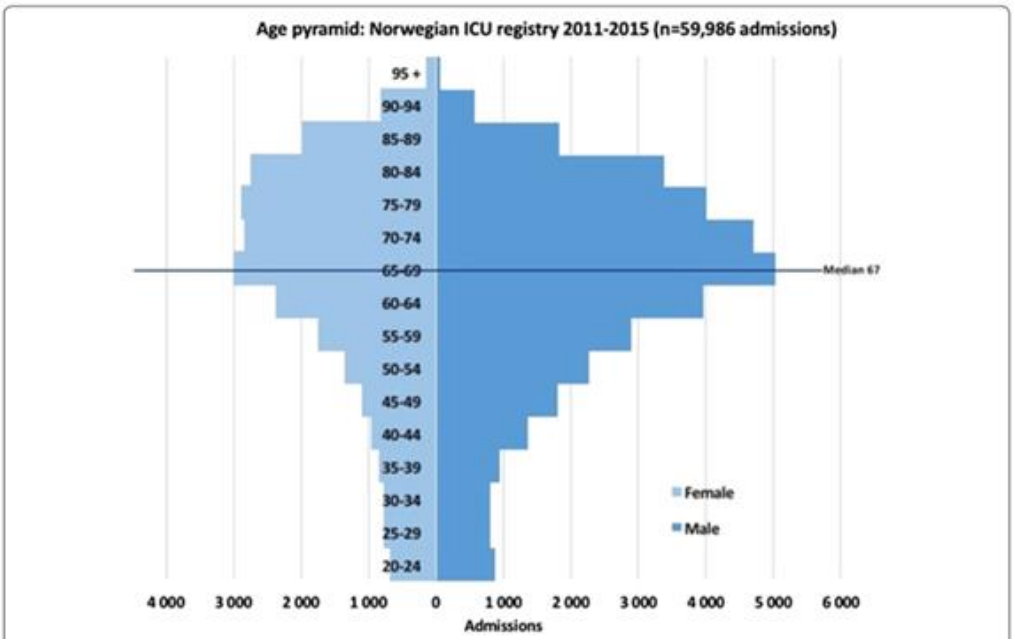

Figure 7 Age Distribution in Norwegian ICU patients from 2011 to 2015 (Flaatten *et al.*, 2017)

Using the more conservative CSO M2F2 population model, it should be anticipated that the critical care demographic for Ireland shall match the international trends above.

4.6 COVID-19 AND ISOLATION FACILITY CRITICAL CARE

Limited critical care capacity was a key risk factor in managing the public heath response to COVID-19. In the absence of a vaccine and in planning for a potential second wave of infection and for the probable emergence of other novel viruses in the future, modelling of additional capacity to manage COVID and non-COVID related healthcare supports the need to increase critical care capacity (NPHET, 2020).

5. International Comparisons of Consultant Numbers in ICM

Compared to other jurisdictions, the ICM workforce in Ireland is inadequate. In determining the appropriate demand for medical consultants and specialists in Ireland, it is informative to look at how Ireland compares across international jurisdictions with similar models of health service delivery and postgraduate training. In the developing this, NDTP has reviewed the workforce composition in a number of key comparable countries, England, Scotland, Australia, New Zealand and Canada. The results of this review are outlined in table 5.1.

Please note these figures include adult and paediatric consultants as most countries report an aggregated figure

Table 5.1 Comparison of Ireland with International Jurisdictions: Total Ratio Per 100,000 of the Population

Specialty	Ireland 2019	England 2019	Scotland 2019	Australia 2019	New Zealand 2019	Canada 2019
Population used for calculations	**4.9 m**	**56.3m[1]**	**5.5m[1]**	**25.5m[2]**	**5m[3]**	**37.8m[4]**
Intensive Care Medicine ratio per 100,000	*0.48*	*1.15[5]*	*0.34[6]*	*2.4[7]*	*1.82[8]*	*1.49[9]*

Sources:

[1]Population growth in England, Wales, Scotland and Northern Ireland available here

[2] Australian Bureau of Statistics available here

[3] New Zealand Government stats available here

[4] Statistics Canada available here

[5] NHS Workforce statistics September 2019 available here

[6]Public Health Scotland (Previously ISD Scotland) data tables June 2019 available here

[7]Australian Government Department of Health, Intensive Care factsheet 2016 available here

[8]Forecasting future medical specialty workforces supply with age distribution using health workforce annual practicing certificate data

[9]Canada Institute for Healthcare Information data tables 2018 available here

While there are limitations to benchmarking domestic workforce data against international data, for example, assumptions that the international standard is best practice; and potential complacency should the domestic value equal that of the international value, there is merit in this kind of comparison. These ratios are interesting in terms of contextualising the demand for consultants across international healthcare systems with similar training and healthcare delivery infrastructures to those in Ireland. Further, it provides an international baseline for comparison and can help identify areas for improvement. Irish doctors traditionally migrate to countries like the UK and Australia and so benchmarking against these countries is a useful exercise.

6. Estimating the Future Demand for Intensive Care Consultants in Ireland, A Scenario-Based Expanded Capacity Approach

This section of the report brings together information on the future of the ICM workforce as per a request for submissions to HSE NDTP from both the NCPCC and the JFICMI. Over the course of 2020 these key stakeholders worked with NDTP to inform planning for the future of the specialist and NCHD workforce.

Again, it is important to note that workforce planning is an inexact science and that proposed changes to staffing levels for consultants and trainees outlined herein are estimates based on best available data on staffing and bed capacity today and in the future.

A key message of this section is that there is an urgent need to dramatically increase the number of consultants in ICM to meet current and future healthcare needs for the population of Ireland.

6.1 Phased expansion model

As described in section 2.1 critical care follows a hub and spoke model of service delivery. The development of further capacity to meet current recommendations for population needs is proposed as a 2 phased expansion model. Most of the proposed expanded capacity is directed towards the model 4 hospitals with an increasing centralisation of advanced critical care services. This has been informed by the Health Service Capacity review (Department of Health, 2018) and a memo to government in 2020 outlining the need for an increase in ICU beds (NPHET minutes 26th June 2020) and there has been a recent commitment by Government to support phased this expansion.

As outlined in Table 6.1 below, the proposed phased expansion model details an increase in ICU beds by 66 in phase 1 and a further increase of 117 beds in phase 2. This phased expansion will need to be supported by an appropriate consultant workforce therefore it is reasonable that this proposed expansion informs the future demand for consultants.

Table 6.1 Phased Expansion model	
	Increase in ICU beds
Phase 1	+66 beds
Phase 2	+117 beds

This proposed expansion of ICU beds will bring the total number to 438 in Ireland, this is slightly higher that the figure of 430 cited in the Health Service Capacity review (Department of Health, 2018), but less than the 579 beds recommended in the Prospectus report (2009). As per advice and input from the NCPCC the consultant workforce requirements will be based on this phased expansion to 438 beds, subject to funding, and will consider two rota scheduling types which will underpin 2 different consultant demand scenarios as follows:

Scenario 1 A 5 day scheduled working week for consultants (currently in place)
Scenario 2 A 7 day scheduled working work for consultants

The figures in the following tables and scenario models have been underpinned by

- Standards set by the JFICMI on minimum WTE to service ICM clinical hours
- Future demand is based on a greater contribution from those specialists who have undertaken SI or fellowship training in ICM

- The requirement to address the Model of Care for Anaesthesiology multi-layered roster gap for emergency attendance to critical care, anaesthesia in theatre, and emergency obstetric care. The requirement for a critical care rota in integral to this and needs to be configured into ICM workforce planning, greatest impact at Scenario 1a.

Taking these national and international recommendations as a template, the consultant medical staffing to intensive care units can be identified as that required for up to 12 beds per unit, and multiples of 12 bed ICU "pods". Using a 10 hour clinical day as the norm in Model 4 hospitals, table 6.2 outlines the consultant staffing required:

Table 6.2 Consultant Staffing Required

ICU size	Consultants required per day	Consultants required per 5 day week
≤ 12 beds	1	2
13 – 24 beds	2	4
25-36 beds	3	6
37-48 beds	4	8
49-60	5	10

There may be local variations is case-mix and dependency which need to be considered and hence these values are used to guide the model for workforce planning rather than be considered absolute.

Of note, the number of consultants per pod of 12 beds has been rounded down to the nearest whole number. Again, local variation in case mix and dependency will determine appropriate consultant to patient ratio within the reference standards.

With regard to the out-of-hours commitment, it is also evident from the international standards that for an ICU configuration of >30 beds there will need to be (for the majority of case mix) the availability of 2 consultants on duty supporting a resident NCHD roster. Hence, for a unit of such a size the actual headcount to achieve such a rota will need to be greater than 14 consultants for a 1:7rota.

Consultant medical staffing to these models will be very challenging both in terms of training the right consultant skill mix, but also in attracting and retaining enough potential specialists into the Intensive Care Medicine higher specialist training programme.

The hospital models, JFICMI standards and models of care (NCPCC and MOCA) inform how best the consultant workforce needs to develop, referenced to international best practice and standards. Each of these reference documents are quite detailed. However a number of core standards / principles set the way forward:

1. Model 4 Hospitals – the JFICMI Standards for Adult Critical Care Services (described in Section 2.2 of this report) would require that these centers continue to develop a consultant staffing model serviced by consultants in ICM and consultants with a SI in ICM. It is likely that current scheduled and out-of-hours commitment from consultant Anaesthesiologists will become less prevalent with the implementation of these recommendations and with the pressure of expansion of core anaesthesiology services. The exact balance of consultants in ICM and consultants with a SI in ICM within an individual department will be influenced by case mix,

volume and complexity, and also the retirement pattern over the period addressed by this report.

2. Model 3 Hospitals with Obstetrics and a 2+2 Rota - the JFICMI Standards consultant staffing for critical care and the model of care for Anaesthesiology align towards the development of the 2+2 rota (described in section 2.2 of this report). This will provide a balance of scheduled and out of hours critical care consultant service provided by both consultants with a SI in ICM and consultant Anaesthesiologists. The exact balance of consultants with a SI in ICM and consultant Anaesthesiologists within an individual department will be influenced by case mix, volume and complexity, and also the retirement pattern over the period addressed by this report. A significant influence here will also be the building of the second rota tier. This is reflected in the scenario tables where the initial increase in headcount for consultant Anaesthesiologists occurs in Phase 1, without further expansion in Phase 2 as the rote tier sustains at this level. Some of these centers may seek to appoint a consultant in ICM to lead that service reflecting the significant demand and complexity in some of these centers. The model of care for Anaesthesiology defines anaesthesiology services for these hospitals.

3. Model 3 Hospitals – although these centers have smaller size intensive care units, the requirement to staff critical care with non-conflicting consultant sessions remains. Cross covering arrangements impact on patient safety as outlined in both the JFICMI standards and the model of care for Anaesthesiology. The same principles apply as per the model of 3 hospitals in (2) above and a 2+2 rota to address conflicting emergency , trauma and inter-hospital transfer requirements, and will need to be considered at a local level based on historical and predicted demand for these services. The same impact on phase 1 and phase 2 expansion is noted in the scenario tables below.

Note: within tables 6.3 and 6.4 below, consultant numbers by scenario are broken down by specialty and by WTE and headcount requirements. While the WTE commitment of these consultants to ICM are the main determinants of supply and demand, it is also important to consider the overall headcount requirements to staff ICM services and to inform resulting postgraduate training requirements to meet consultant demand. This point stands for all scenarios outlined below.

6.1.1 Scenario 1 – Phased expansion and 5 day scheduled working week

1a Phase 1 expansion and consultant demand

The NCPCC and JFICMI estimates that to accompany the increase in bed capacity for phase 1 within the current configuration of ICM services with a 5 day scheduled working week there is a demand for approximately 109 WTE consultants in total, in order to provide a safe level of intensive care. This represents an additional 63.4 WTEs over and above the current number (see table 6.3) WTE requirements are also broken down by specialty and headcount and detailed further in table 6.3.

1b Phase 2 expansion and consultant demand

The NCPCC and JFICMI estimates that to accompany the increase in bed capacity for phase 2 within the current configuration of ICM services with a 5 day scheduled working week there is a demand for approximately 125.8 WTE consultants in total, in order to provide a safe level of intensive care. This represents an additional 80.2 WTEs over and above the current number (table 6.3). WTE requirements are also broken down by specialty and headcount and detailed further in table 6.3.

Table 6.3 Scenario 1 – Phased expansion and 5 day scheduled working week				
Baseline Current System of Service Delivery model total as at May 2020	Total	Anaesthesia no SI ICM	Anaesthesia with SI ICM	Consultants in ICM
Total HC	138	87	38	13
WTE commitment to ICM (based on actual average commitment)	45.6	26.2	13.9	5.2
WTE rate – rate relates to ICM commitment rather than overall rate	0.33	0.30	0.36	0.40
Scenario 1a –Consultant demand to meet Phase 1 expansion with a 5 day scheduled working week	Total	Anaesthesia no SI ICM	Anaesthesia with SI ICM	Consultants in ICM
Total HC	289	165	94	30
WTE commitment to ICM (based on expected average commitment)	109	47.1	43.9	18
WTE Rate	0.38	0.29	0.47	0.60
Scenario 1b - Consultant demand to meet Phase 2 expansion with a 5 day scheduled working week	Total	Anaesthesia no SI ICM	Anaesthesia with SI ICM	Consultants in ICM
Total HC	317	165	94	58
WTE commitment to ICM (based on expected average commitment)	125.8	47.1	43.9	34.8
WTE Rate	0.40	0.29	0.47	0.60

Please note some numbers may not add up due to rounding

6.1.2 Scenario 2 – Phased expansion and 7 day scheduled working week

2a Phase 1 expansion and consultant demand

The NCPCC and JFICMI estimates that to accompany the increase in bed capacity for phase 1 within the current configuration of ICM services with a 7 day scheduled working week there is a demand for approximately 138.1 WTE consultants in total, in order to provide a safe level of intensive care. This represents an additional 92.5 WTEs over and above the current number (table 6.4). WTE requirements are also broken down by specialty and headcount and detailed further in table 6.4.

2b Phase 2 expansion and consultant demand

The NCPCC and JFICMI estimates that to accompany the increase in bed capacity for phase 2 within the current configuration of ICM services there is a demand for approximately 161.6 WTE consultants in total, in order to provide a safe level of intensive care. This represents an additional 116.1 WTEs over and above the current number (table 6.4). WTE requirements are also broken down by specialty and headcount and detailed further in table 6.4.

Table 6.4 Scenario 2 – Phased expansion and 7 day scheduled working week				
Baseline Scenario: Current System of Service Delivery model total as at May 2020	**Total**	**Anaesthesia no SI ICM**	**Anaesthesia with SI ICM**	**Consultants in ICM**
Total HC	138	87	38	13
WTE commitment to ICM (based on actual average commitment)	45.6	26.2	13.9	5.2
WTE rate – rate relates to ICM commitment rather than overall rate	0.33	0.30	0.36	0.40
Scenario 2a - Consultant demand to meet Phase 1 expansion with a 7 day scheduled working week	Total	Anaesthesia no SI ICM	Anaesthesia with SI ICM	Consultants in ICM
HC for 7 day rota	349	176	132	42
WTE for 7 day rota (based on actual average commitment)	138.1	51.4	61.5	25.2
WTE rate 7 day rota - rate relates to ICM commitment rather than overall rate	0.40	0.29	0.47	0.60
Scenario 2b - Consultant demand to meet Phase 2 expansion with a 5 day scheduled working week	Total	Anaesthesia no SI ICM	Anaesthesia with SI ICM	Consultants in ICM
HC for 7 day rota	389	176	132	81
WTE for 7 day rota (based on actual average commitment)	161.6	51.4	61.5	48.7
WTE rate 7 day rota - rate relates to ICM commitment rather than overall rate	0.42	0.29	0.47	0.60

Please note some numbers may not add up due to rounding

7. Analysis of the Gap between the Current and Future Supply and Demand for Consultants in ICM in Ireland

7.1 Modelling Process and Assumptions

In order to project the supply and demand for consultants and specialists in ICM over the next 10 years, the statistical forecasting model developed by the Expert Group on Future Skills Needs and Solas was used (Behan *et al.*, 2009).

It is important to highlight that variables used to estimate the **supply** of doctors include adjustment for part-time working patterns, as all consultants in ICM contribute to both ICM and base specialty rotas over the course of their working week. As table 3.1 outlines, on average consultants spend approximately 33% of their working week in ICM.

A number of further assumptions underpin the workforce planning methodology as follows:

- In order to estimate the demand for consultants and specialists over the next 10 years, stakeholder-informed recommendations are used. These estimates represent the views and recommendations of stakeholders rather than NDTP and are outlined in tables 6.3 and 6.4. Supply and demand projections are based on recommendations from the JFICMI and the NCPCC, which are based on both recommendations of the Health Service Capacity Review (2018) and the NPHET (2020) as well as a recent commitment by Government to support a phased increase in critical care bed capacity.
- Variables used to estimate the **supply** of consultants and specialists include the number of doctors currently delivering services, in headcount and WTEs; the part-time and full-time working adjustment rates, as well as projected retirements and gender breakdown of doctors
- Within the statistical forecasting model, the inflow of overseas specialists is set to zero to isolate the domestic supply of consultants/ specialists and assess the extent to which the national education and training system can meet estimated future demand
- Entrants in to the consultant/ specialist workforce are based on the number of doctors who complete postgraduate training and enter on to the specialist division of the Medical Councils of Ireland's register
- The number of consultant/ specialists retiring and the assumed proportion of those exiting the workforce for reasons other than retirement are also estimated. On average, 1% of males and 2% of females are estimated to leave the workforce for reasons other than retirement while consultants are expected to retire at an average age of 63
- In general, emigration among consultants/specialists is not accounted for in the scenarios outlined, although the model can be manipulated to assess the impact of different rates of emigration
- Attrition from training is accounted for based on information from the JFICM
- All graduates of specialist training enter the workforce, with a WTE ratio estimated for the consultant/ specialist workforce as of 2020
- WTE rates are kept static over the projection period and can be manipulated to infer the impact of changes in working patterns
- The projection timelines used are to 2026 and 2030 to account for the time it takes to train a consultant in Ireland

7.2 Implications of Gap Analysis on Training

The workforce planning projections are estimated separately for the different groups of specialists working in ICM. Projection findings are outlined in tables 7.1-7.8 and can be interpreted as follows:

- **Required employment** represents the increase in doctors to 2030 to meet the recommendations of both the Health Service Capacity Review (2018), NPHET (2020) as well as commitment by Government to support phased expansion in critical care bed capacity. The required increase is estimated per specialty group i.e. those specialists without an SI in ICM who contribute to the ICM rota; those specialists with an SI in ICM and consultants in ICM.
- **Expansion demand required employment** represents the number of additional consultants required annually to bring the workforce in line with recommendations by 2030
- **Replacement demand** represents the number of consultants exiting the workforce due to retirement, and for other reasons per year to 2030
- **Recruitment requirement** represents the number of consultants required as per expansion demand and replacement demand
- **Graduate supply** represents those specialists expected to complete specialist training and enter the workforce where known, and the required per year trainees thereafter to meet projected demand
- **Gap to supply** represents the difference between the recruitment requirement and the newly registered (graduate) supply. This gap is reduced to in order to determine the required number of trainees to meet the demand for consultants by 2030

7.3 Results of Supply and Demand Analysis – Scenario 1

7.3.1 Supply and Demand Analysis for Scenario 1: Demand for consultants contributing to the ICM Roster, without a Special Interest qualification in ICM, to meet the recommendations of the Health Service Capacity Review and NPHET as well as recent commitment by Government to support an increase in bed capacity, under a 5 day working week

In this scenario the number of trainees projected to complete training is set at 11, 13, 9 and 14 up to 2023 (this is based on those currently in training). Thereafter, the required trainee completions to meet consultant demand would need to increase to 17/18 per year to 2026. The demand for consultants in this scenario is 165 headcount and 47 WTEs by 2026, with a WTE rate of .29 (see table 7.1).

Table 7.1 Demand for Post CSCST Trainees to Meet Consultant Demand for Those Without a Special Interest Qualification in ICM for Scenario 1

HEADCOUNT	2020	2021	2022	2023	2024	2025	2026	Total end 2026
Required employment	90	101	112	123	134	144	154	165
Expansion demand	11	11	11	11	10	10	11	75
Replacement demand	4	3	3	3	3	4	4	25
Recruitment requirement	15	14	14	14	13	14	15	100
Graduate supply	11	13	9	14	17	18	18	100
Gap to graduate supply	**4**	**1**	**5**	**0**	**-4**	**-4**	**-3**	**0**
WTE	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**Total end 2026**
Required employment	26	29	32	35	38	41	44	47
Expansion demand	3	3	3	3	3	3	3	21
Replacement demand	1	1	1	1	1	1	1	7
Recruitment requirement	4	4	4	4	4	4	4	29
Graduate supply	3	4	3	4	5	5	5	29
Gap to graduate supply	**1**	**0**	**1**	**0**	**-1**	**-1**	**-1**	**0**
WTE Rate	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29
Please note some figures may not add up due to rounding, the total values are correct								

7.3.2 Supply and Demand Analysis for Scenario 1: Demand for consultants contributing to the ICM Roster, with a Special Interest qualification in ICM, to meet the recommendations of the Health Service Capacity Review and NPHET as well as recent commitment by Government to support an increase in bed capacity, under a 5 Day working week

In this scenario the number of trainees projected to complete training is set at 1 in 2020 and 2 in 2021, thereafter, the required trainee completions from training to meet SI consultant demand would need to increase to 13 (see table 7.2).

Table 7.2 Demand for Post CSCST Trainees to Meet Consultant Demand for Those with a Special Interest Qualification in ICM for Scenario 1

HEADCOUNT	2020	2021	2022	2023	2024	2025	2026	Total end 2026
Required employment	38	46	54	62	70	78	86	94
Expansion demand	8	8	8	8	8	8	8	56
Replacement demand	4	2	1	1	3	1	3	12
Recruitment requirement	12	10	9	9	11	9	11	68
Graduate supply	1	2	13	13	13	13	13	68
Gap to graduate supply	**11**	**8**	**-4**	**-4**	**-2**	**-4**	**-2**	**0**
WTE	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**Total end 2026**
Required employment	18	21	25	29	33	36	40	44
Expansion demand	4	4	4	4	4	4	4	26
Replacement demand	2	1	0	0	1	0	1	6
Recruitment requirement	5	4	4	4	5	4	5	32
Graduate supply	0	1	6	6	6	6	6	32
Gap to graduate supply	**5**	**4**	**-2**	**-2**	**-1**	**-2**	**-1**	**0**
WTE Rate	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47
Please note some figures may not add up due to rounding, the total values are correct								

Consultants with a SI in ICM train one year post-CSCST. Consultant in Intensive Care Medicine train with SI trainees one year post CSCST before going on to train for one more year post-CSCST. As such, in this particular scenario the graduate supply to meet the SI demand estimates should be approximately 17 from 2022 to 2026. In addition an extra 20 trainees over and above those required for SI posts will need to train in year 1 posts-CSCST and go on to year 2 post-CSCST over the next 10 years before going on to train for a second year to become Consultants in ICM (see Tables 7.3 and 7.4).

Table 7.3 Demand for Year 1 Post CSCST Trainees to Meet Both SI and Consultant in ICM Demand for Scenario 1

HEADCOUNT	2020	2021	2022	2023	2024	2025	2026	Total end 2026
Required employment as per S1	38	46	54	62	70	78	86	94
Expansion demand	8	8	8	8	8	8	8	56
Replacement demand	4	2	1	1	3	1	3	12
Recruitment requirement	12	10	9	9	11	9	11	68
Graduate supply	1	2	17	17	17	17	17	88
Gap to graduate supply	**11**	**8**	**-8**	**-8**	**-6**	**-8**	**-6**	**-20**
WTE	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**Total end 2026**
Required employment as per S1	18	21	25	29	33	36	40	44
Expansion demand	4	4	4	4	4	4	4	26
Replacement demand	2	1	0	0	1	0	1	6
Recruitment requirement	5	4	4	4	5	4	5	32
Graduate supply	0	1	8	8	8	8	8	41
Gap to graduate supply	**5**	**4**	**-4**	**-4**	**-3**	**-4**	**-3**	**-9**
WTE Rate	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47
Please note some figures may not add up due to rounding, the total values are correct								

7.3.3 Supply and Demand Analysis for Scenario 1: Demand for Consultants in ICM to meet the recommendations of the Health Service Capacity Review and NPHET as well as the recent commitment by Government to support an increase in bed capacity, under a 5 Day working week

In this scenario the number of trainee completions is set at 1 in 2020 and 5 in 2021, thereafter, the required numbers completing training to meet consultant demand would need to remain at approximately 4 per annum to meet recommendations to 2026 of 30 consultants. This aligns with the extra 20 trainees outlined in Table 7.3. The required trainee completions would need to be approximately 5 per annum thereafter, to meet recommendations to 2030 of 58 consultants. The WTE rate for this scenario is .6 inferring a requirement of 18 WTE at 2026 and approximately 35 at 2030 (see table 7.4).

Table 7.4 Demand for Post CSCST Trainees to Meet Consultant Demand for Those with a Specialist Qualification in ICM for Scenario 1

HEADCOUNT	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	Total
Required employment	13	16	19	22	25	27	30	37	44	51	58	**58**
Expansion demand	3	3	3	3	2	3	7	7	7	7	0	**45**
Replacement demand	0	0	0	0	0	0	1	0	0	0	0	**1**
Recruitment requirement	3	3	3	3	2	3	8	7	7	7	0	**46**
Graduate supply	1	5	4	4	4	4	4	5	5	5	5	**46**
Gap to graduate supply	**2**	**-2**	**-1**	**-1**	**-2**	**-1**	**4**	**2**	**2**	**2**	**-5**	**0**
WTE	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**Total**
Required employment	8	10	11	13	15	16	18	22	26	31	35	**35**
Expansion demand	2	2	2	2	1	2	4	4	4	4	0	**27**
Replacement demand	0	0	0	0	0	0	0	0	0	0	0	**0**
Recruitment requirement	2	2	2	2	1	2	5	4	4	4	0	**28**
Graduate supply	1	3	2	2	2	2	2	3	3	3	3	**28**
Gap to graduate supply	**1**	**-1**	**-1**	**-1**	**-1**	**-1**	**3**	**1**	**1**	**1**	**-3**	**0**
WTE Rate	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	**0.6**
Please note some figures may not add up due to rounding, the total values are correct												

7.4 Results of Supply and Demand Analysis – Scenario 2

7.4.1 Supply and Demand Analysis for Scenario 2: Demand for consultants contributing to the ICM Roster, without a Special Interest qualification in ICM, to meet the recommendations of the Health Service Capacity Review and NPHET as well as recent commitment by Government to support an increase in bed capacity, under a 7 Day working week

In this scenario the number of trainees projected to complete training is set at 11, 13, 9 and 14 up to 2023 (this is based on those currently in training). Thereafter, the required trainee completions to meet consultant demand would need to increase to 21/22 per year to 2026. The demand for consultants in this scenario is 176 headcount and 50 WTEs by 2026, with a WTE rate of .29 (see table 7.5)

Table 7.5 Demand for Post CSCST Trainees to Meet Consultant Demand for Those Without a Special Interest Qualification in ICM for Scenario 2

HEADCOUNT	2020	2021	2022	2023	2024	2025	2026	Total end 2026
Required employment as per S1	90	103	116	128	140	152	164	176
Expansion demand	13	13	12	12	12	12	12	86
Replacement demand	4	3	3	3	3	4	4	25
Recruitment requirement	17	16	15	15	15	16	16	111
Graduate supply	11	13	9	14	21	21	22	111
Gap to graduate supply	**6**	**3**	**6**	**1**	**-6**	**-5**	**-6**	**0**
WTE	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**Total end 2026**
Required employment as per S1	26	29	33	37	40	43	47	50
Expansion demand	4	4	3	3	3	3	3	25
Replacement demand	1	1	1	1	1	1	1	7
Recruitment requirement	5	5	4	4	4	5	5	32
Graduate supply	3	4	3	4	6	6	6	32
Gap to graduate supply	**2**	**1**	**2**	**0**	**-2**	**-1**	**-2**	**0**
WTE Rate	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29
Please note some figures may not add up due to rounding, the total values are correct								

7.4.2 Supply and Demand Analysis for Scenario 2: Demand for consultants contributing to the ICM Roster, with a Special Interest qualification in ICM, to meet the recommendations of the Health Service Capacity Review and NPHET as well as recent commitment by Government to support an increase in bed capacity, under a 7 Day working week

In this scenario the number of trainees completing training is set at 1 in 2020 and 2 in 2021, thereafter, the required trainee completions to meet consultant demand would need to increase to 21. The demand for consultants within this scenario is 132 headcount, 61 WTE at a WTE rate of .47 (see table 7.6).

Table 7.6 Demand for Post CSCST Trainees to Meet Consultant Demand for Those with a Special Interest Qualification in ICM for Scenario 2

HEADCOUNT	2020	2021	2022	2023	2024	2025	2026	Total end 2026
Required employment	38.0	52	66	80	93	106	119	**132**
Expansion demand	14	14	14	13	13	13	13	**94**
Replacement demand	2	2	2	2	2	2	2	**14**
Recruitment requirement	16	16	16	15	15	15	15	**108**
Graduate supply	1	2	21	21	21	21	21	**108**
Gap to graduate supply	**15**	**14**	**-5**	**-6**	**-6**	**-6**	**-6**	**0**
WTE	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**Total end 2026**
Required employment	18	24	31	37	43	49	55	**61**
Expansion demand	7	7	7	6	6	6	6	**44**
Replacement demand	1	1	1	1	1	1	1	**7**
Recruitment requirement	7	7	7	7	7	7	7	**50**
Graduate supply	0	1	10	10	10	10	10	**50**
Gap to graduate supply	**7**	**7**	**-2**	**-3**	**-3**	**-3**	**-3**	**0**
WTE Rate	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47
Please note some figures may not add up due to rounding, the total values are correct								

As per Scenario 1, the training pathways for both SI and ICM specialist training require that Consultants in ICM train with SI trainees for one year post-CSCST. Table 7.7 incorporates an extra 4 trainees per year from 2022 to 2026, required to go on to specialist ICM training. The 20 additional trainees in post-CSCST year 1 required to go on to post-CSCST year 2, specialist ICM training, are outlined in Table 7.8.

Table 7.7 Demand for Year 1 Post CSCST Trainees to Meet Both SI and Consultant in ICM Demand for Scenario 2

HEADCOUNT	2020	2021	2022	2023	2024	2025	2026	Total end 2026
Required employment as per S1	38.0	52	66	80	93	106	119	132
Expansion demand	14	14	14	13	13	13	13	94
Replacement demand	2	2	2	2	2	2	2	14
Recruitment requirement	16	16	16	15	15	15	15	108
Graduate supply	1	2	25	25	25	25	25	128
Gap to graduate supply	**15**	**14**	**-9**	**-10**	**-10**	**-10**	**-10**	**-20**
WTE	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**Total end 2026**
Required employment as per S1	18	24	31	37	43	49	55	61
Expansion demand	7	7	7	6	6	6	6	44
Replacement demand	1	1	1	1	1	1	1	7
Recruitment requirement	7	7	7	7	7	7	7	50
Graduate supply	0	1	12	12	12	12	12	60
Gap to graduate supply	**7**	**7**	**-4**	**-5**	**-5**	**-5**	**-5**	**-9**
WTE Rate	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47
Please note some figures may not add up due to rounding, the total values are correct								

7.4.3 Supply and Demand Analysis for Scenario 2: Supply and Demand Analysis for Consultants in ICM to meet the recommendations of the Health Service Capacity Review and NPHET as well as recent commitment by Government to support an increase in bed capacity, under a 7 day working week

In this scenario the number of trainee completions is set at 1 in 2020 and 5 in 2021, thereafter, the required numbers completing training to meet consultant demand would need to increase to between 5 and 7 per annum to meet recommendations to 2026 and to approximately 8 per annum thereafter, to meet recommendations to 2030.

Table 7.8 Demand for Post CSCST Trainees to Meet Consultant Demand for Those with a Specialist Qualification in ICM for Scenario 2

HEADCOUNT	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	Total to end 2030
Required employment	13	17	21	26	31	36	42	52	62	71	81	**81**
Expansion demand	4	4	5	5	5	6	10	10	9	10	0	**68**
Replacement demand	0	0	0	0	0	0	1	0	0	0	0	**1**
Recruitment requirement	4	4	5	5	5	6	11	10	9	10	0	**69**
Graduate supply	1	5	7	7	7	7	7	7	7	7	7	**69**
Gap to graduate supply	**3**	**-1**	**-2**	**-2**	**-2**	**-1**	**4**	**3**	**2**	**3**	**-7**	**0**
WTE	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**Total to end 2030**
Required employment	8	10	13	16	19	22	25	31	37	43	49	49
Expansion demand	2	2	3	3	3	4	6	6	5	6	0	41
Replacement demand	0	0	0	0	0	0	1	0	0	0	0	1
Recruitment requirement	2	2	3	3	3	4	7	6	5	6	0	42
Graduate supply	1	3	4	4	4	4	4	4	4	4	4	41
Gap to graduate supply	**2**	**-1**	**-1**	**-1**	**-1**	**-1**	**3**	**2**	**1**	**2**	**-4**	**0**
WTE Rate	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	**0.6**
Please note some figures may not add up due to rounding, the total values are correct												

7.5 Summary of Supply and Demand Analysis for Scenario's 1 and 2

Table 7.9 provides a summary of the supply and demand analysis for consultants contributing to ICM under both scenarios.

Table 7.9 Supply and Demand Analysis by Specialist Group for Scenario's 1 and 2

Supply and Demand Analysis by Specialist Group for Scenario 1

SCENARIO 1 – 5 DAY WORKING WEEK – PHASED EXPANSION PLAN

	Consultants with rostered commitments to ICM			Consultants with an SI in ICM			Consultant in ICM		
	Current	2026	2030	Current	2026	2030	Current	2026	2030
Total HC Consultants	87	165	165	38	94	94	13	30	58
Total WTE Consultants	26.2	47.1	47.1	13.9	43.9	43.9	5.2	18	34.8
	Known trainee completions to 2023	Required trainee completions from 2023-2026	Required trainee completions from 2027-2030	Known trainee completions to 2023	Required trainee completions from 2023-2026	Required trainee completions from 2027-2030	Known trainee completions to 2023	Required trainee completions from 2023-2026	Required trainee completions from 2027-2030
Trainees (HC)	11-14	17-18	17-18	1-2	13	13	1-5	4-5	5
Trainees (WTE)	3.3-4.2	4-5	4-5	0.47 -0.94	6	6	0.4-2	1.6-2	3

Supply and Demand Analysis by Specialist Group for Scenario 2

SCENARIO 2 – 7 DAY WORKING WEEK – PHASED EXPANSION PLAN

	Consultants with rostered commitments to ICM			Consultants with an SI in ICM			Consultant in ICM		
	Current	2026	2030	Current	2026	2030	Current	2026	2030
Total HC Consultants	87	176	176	38	132	132	13	42	81
Total WTE Consultants	26.2	51.4	51.4	13.9	61.5	61.5	5.2	25.2	48.7
	Known trainee completions to 2023	Required trainee completions from 2023-2026	Required trainee completions from 2027-2030	Known trainee completions to 2023	Required trainee completions from 2023-2026	Required trainee completions from 2027-2030	Known trainee completions to 2023	Required trainee completions from 2023-2026	Required trainee completions from 2027-2030
Trainees (HC)	11-14	21-22	21-22	1-2	21	21	1-5	5-7	8
Trainees (WTE)	3.3-4.2	6	6	0.47 -0.94	10	10	0.4-2	2-3.2	4.8

8. PAEDIATRIC CRITICAL CARE

Finally, as noted previously, Paediatric Critical Care workforce and training requirement analysis will follow-on from the publication of this report. The Model of Care for Paediatric Critical Care(National Clinical Programme for Critical Care National Clinical Programme for Paediatrics, 2019) details the model of care, training programme, systems pressures, and workforce planning for paediatric critical care.

Assumptions around consultant service, consultant to patient ratios, NCHD to patient ratios are similar to those of adult critical care medicine, in section 9.2 of the Model of Care for Paediatric Critical Care it outlines

'This model of care describes the ideal model for the provision of safe, effective care to critically ill children. The staffing with respect to PCCM is clearly outlined in section L3-202 of the Quality Standards for the Care of Critically Ill Children18 and in section 4.5 of the National Standards for Paediatric Critical Care Services.5 These outline the training qualifications for:

1. *WTE consultants in paediatric critical care should have a minimum of two years continuous core PCCM training (of which one year should be in paediatric cardiac critical care) and successful completion of a third pre-approved specialist year. This will allow dual CSCST in the base specialty and in Intensive Care Medicine.*
2. *Consultants with a special interest in PCCM should have successfully completed two years core training in PCCM.*

Consultant in normal daytime hours and out of hours
We recommend that there should be a minimum of one consultant available to the unit per 10–12 PCCU beds in daytime hours and a minimum of one for every 25 beds out of hours, according to the national standards.5 Units of 16–24 beds should normally have two consultants working on the unit during normal working hours.

NCHD in normal daytime hours and out of hours
During normal working hours, one trainee should normally be allocated no more than five to six patients. Outside of normal working hours, for every eight beds, we should aim to have one senior trainee available.

Although rotas may vary depending on unit size, number of consultants, number of junior staff, length of shifts and implementation of EWTD, the rotas of Intensivists and trainees should be organised to maximise continuity of patient care in PCCU. It is desirable to provide for blocks of CCU time for each consultant and, if possible trainee, rather than changing on a daily basis. Further recommendations for staffing of PCCU are available in section 4.5 of the national standards.'

Staffing recommendations for the Children's Hospital of Ireland are noted and displayed in table 8.1.

Table 8.1: NCH PCCU bed numbers and staffing recommendations (National Clinical Programme for Critical Care National Clinical Programme for Paediatrics, 2019)

	NCH PCCU	NCH CCCU	Total
Beds	20	22	42
WTE Consultants in ICM	8	8	16
WTE NCHDs	16	16	32
24-hour retrieval NCHDs	+4	+4	40*
Retrieval Consultants in ICM	+2	+2	20†

* Total NCHDs + Retrieval 24/7.
† Total Consultants in ICM.

Paediatric critical care is also delivered across a number of regional Model 4 hospitals – Cork University Hospital and Galway University Hospital.

A model of training programme graduate supply addressing scenarios pertinent to the longer term best practice delivery of paediatric critical care needs to be developed with the NDTP. It has been agreed with NDTP that a specialty specific workforce plan should be a continuation of this current report recognising the immediacy of the workforce requirements of the National Children's Hospital in particular.

9. CONCLUSION

Currently in Ireland, there is a substantial deficit of Intensive Care beds and Consultants.

The current acute hospital configuration and proposed phased expansion programme for critical care beds within that configuration forms the template for this workforce planning analysis.

Critical care is an expensive resource and demanding of manpower commitment and manpower numbers. The international reference standards which have informed the JFICMI standards for adult critical care set a consultant to patient ratio both during the scheduled day and out-of-hours. Such ratios need to be considered at a local level in terms of case mix complexity in particular. A model built around units (or pods) of 12 ICU beds, and multiples thereof, is consistent with good practice in terms of

- Consultant to patient ratio
- Patient safety and quality of care
- Efficiency (access to broader speciality services, cost).

Tables 6.3 and 6.4 outline the required expansion in ICU bed capacity required to underpin the recommendations of stakeholders involved in the delivery of ICM in Ireland namely the National Clinical Programme for Adult Critical Care and the Joint Faculty of Intensive Care Medicine in Ireland. In turn, these recommendations are aligned with national and international standards as well as recommendations related to capacity expansion outlined in the Health Service Capacity Review (2018) and recent NPHET recommendations. Government has committed to an initial increase of 66 beds to 2021 and is scoping out the potential for a further increase of 117 beds. As such, it is timely that the number of consultants required to deliver increased ICM services is comprehensively analysed.

Table 7.1 to 7.9 outline both the consultant and trainee demand to 2026 and 2030 as per the phased expansion demand scenarios of a 5 and a 7 day working week examined in the analysis in Section 7 of this report. In order to implement the phased expansion plan, a significant increase in the number of both consultants and trainees contributing to ICM will be required over and above those currently working within the system.

The Model of Care for Critical Care Medicine emphasizes the progressive development of a hub and spoke configuration of critical care services. This is consistent with long established medical practice with the referral and transfer of critically ill patients from smaller centres to larger academic centres with greater specialised critical care capacity and specific access to regional and national specialty services as required for the comprehensive care of the critically ill.

The minimum size of an intensive care unit is not defined in terms of bed count alone but also in terms of bed use. As outlined by the JFICMI *'For maintenance of skills and professional competencies, a Critical Care Service should be treating at least 200 Level 3 patients per annum and therefore will entail Critical Care Units of 6 beds or more [1, 2, 11]. "Hub" hospitals, as defined in the Critical Care program Model of Care [12] will require larger units of > 8 beds and will expect to be treating > 400 level 3 patients per year. (JFICM)*

All of the Model 4 hospitals are captured within this definition. The workforce planning model in this report identifies an expansion in the consultant categories of Consultant in Intensive Care Medicine and Consultant with a Special Interest in Intensive Care Medicine to meet the demands of the

current and phased expansion model in these centres – a number of which will have multiples pods of 12 ICU beds and multiple consultant rosters. This model is well developed internationally.

The Model 3 hospital configuration presents different challenges. Although the volume of Level 3 critical care patients may be less than the above threshold, the service provided to that region is essential and may be further underpinned by the demands of an on-site obstetric service. A number of Model 3 hospital critical care units have less than 6 ICU beds. It is outside the remit of this workforce planning review to make recommendations around changes in acute hospital configuration. However there is an inter-dependence on the desired acute hospital configuration and the ability to meet current and / or expansion of services with the availability of a trained specialist workforce. Thus the consolidation of critical care services to a minimum volume of practice should be considered to ensure maintenance of skills and quality care, alongside the ability to attract, train, and sustain a skilled workforce.

Workforce planning to sustain these services within the recommendations of the models of care and reference standards mandates significant ongoing investment in training and retaining a specialist workforce. Challenges to retaining such a workforce would include the likely greater career appeal of a larger centre for such a specialist workforce. Drivers of change to this aspect of the workforce model would include in particular any proposed reconfiguration of services in some of the Model 3 hospitals with smaller intensive care units.

Examples of this might include the significant interface between emergency medicine and critical care medicine, such that to operate a Type A emergency medical unit would mandate on-site critical care service. The Model of Care for Emergency Medicine (The National Emergency Medicine Programme, 2012) recommendation for 15 Type A units in Ireland informs the above considerations re Model 3 hospitals.

Similarly, access to critical care is an essential for an obstetric service. The National Maternity Strategy Implementation Plan(*National Maternity Strategy Implementation Plan* , 2017), Recommendations 46, 53, 70 highlight the need to review with the clinical programme for critical care the pathways for all critically ill women intra-network and inter-network, review of HDU capacity, review of obstetric anaesthesia staffing, and retrieval services.

Whether such patient services and acute medical and surgical services can be safely and efficiently addressed through a greater centralisation of critical care, amalgamation of a number of smaller Model 3 critical care services, or review of model of critical care for the smaller Model 3 hospital remain challenges to be considered alongside the challenge of sustaining a specialised workforce across such a network.

NEXT STEPS:

1. Graduate supply – this report should inform Service Level Agreement development process with the training bodies to ensure the pipeline of appropriate specialist consultant workforce for intensive care medicine.

2. Develop the implementation phase of workforce planning for intensive care medicine with the Assistant National Director at National Doctors Training and Planning, HSE

3. Engagement of stakeholders to this report with Department of Health and Health Service Executive as to the appropriate configuration of critical care services in the context critical care phased expansion planning and manpower demands to current and expanded service.

4. National Clinical Programme for Critical Care on-going engagement with National Clinical Programmes informed by the identified deficit in critical care beds, workforce planning and delivery challenges, and configuration of acute hospital services as outlined in this report.

5. National Clinical Programme for Critical Care on-going engagement with critical care capacity and nursing workforce requirements, engagement with Office of the Nursing and Midwifery Services Director (ONMSD), engagement with Hospital Group nursing workforce planning.

6. JFICMI and CAI engagement with trainees, trainee representatives, post graduate training bodies to foster career development and career prospect in intensive care medicine.

7. The specialty specific workforce planning review for Paediatric Critical Care Medicine needs to progress informed by the Model of Care for Paediatric Critical Care and relevant stakeholders tasked with the supply and training of graduates in this field.

8. A review of progress in relation to increased critical care bed capacity and ICM consultant staffing should be conducted every 2 years

10. KEY REFERENCES

1. Angus, D. C. *et al.* (2004) 'Use of intensive care at the end of life in the United States: An epidemiologic study', *Critical Care Medicine*, 32(3), pp. 638–643. doi: 10.1097/01.CCM.0000114816.62331.08.
2. Behan, J. *et al.* (2009) *Report by the Skills and Labour Market Research Unit, FÁS on behalf of the Expert Group on Future Skills Needs A Quantitative Tool for Workforce Planning in Healthcare: Example Simulation*. FAS: Dublin. Available at: https://docs.google.com/fileview?id=0Bx_D46UWx7b6NTFiMmFkNWUtN2Q3My00YmViLWFlODItZjg5NDFjNDRkOGYx&hl=es.
3. Central Statistics Office (2017) *Population Projections Results*. Available at: https://www.cso.ie/en/releasesandpublications/ep/p-plfp/populationandlabourforceprojections2017-2051/populationprojectionsresults/ (Accessed: 26 April 2019).
4. College of Intensive Care Medicine of Australia and New Zealand (2016) *MINIMUM STANDARDS FOR INTENSIVE CARE UNITS SEEKING ACCREDITATION FOR TRAINING IN INTENSIVE CARE MEDICINE*.
5. Department of Health (2016) *National Maternity Strategy – Creating a Better Future Together 2016-2026*. Available at: https://www.gov.ie/en/publication/0ac5a8-national-maternity-strategy-creating-a-better-future-together-2016-2/ (Accessed: 5 October 2020).
6. Department of Health (2018a) *A Trauma System for Ireland: Report of the Trauma Steering Group*. Available at: https://www.gov.ie/en/publication/c8640e-a-trauma-system-for-ireland-report-of-the-trauma-steering-group/ (Accessed: 5 October 2020).
7. Department of Health (2018b) *Health Service Capacity 2018 Executive Report. Review of Health Demand and Capacity Requirements in Ireland to 2031 - Findings and Recommendations*.
8. Department of Health (2019) *Sláintecare Implementation Strategy*.
9. Department of Health and Health Service Executive (2013) *Securing the Future of Smaller Hospitals: A Framework for Development*. Available at: http://hdl.handle.net/10147/623977 (Accessed: 14 January 2020).
10. Faculty of Intensive Care Medicine; and Intensive Care Society UK (2013) *Core Standards for Intensive Care Units*. doi: 10.1097/CCM.0b013e3.
11. Flaatten, H. *et al.* (2017) 'The status of intensive care medicine research and a future agenda for very old patients in the ICU', *Intensive Care Medicine*, 43(9), pp. 1319–1328. doi: 10.1007/s00134-017-4718-z.
12. Gershengorn, H. B. *et al.* (2017) 'Association of intensive care unit patient-to-intensivist ratios with hospital mortality', *JAMA Internal Medicine*, 177(3), pp. 388–396. doi: 10.1001/jamainternmed.2016.8457.
13. Houses of the Oireachtas (2017) *Houses of the Oireachtas Committee on the future of healthcare, Houses of the Oireachtas Committee on the Future of Healthcare Sláintecare Report*.
14. HSE and NDTP (2020) *DIME data. Unpublished*.
15. Joint Faculty of Intensive Care in Ireland (2020) *Training | Joint Faculty of Intensive Care Medicine*. Available at: https://jficmi.anaesthesia.ie/training/ (Accessed: 16 August 2020).
16. Joint Faculty of Intensive Care of Ireland (2019) *National Standards for Adult Critical Care Services* . Available at: https://jficmi.anaesthesia.ie/wp-content/uploads/2019/09/National-Standards-for-Adult-Critical-Services-2019.pdf (Accessed: 7 August 2020).
17. Moran, C. G. *et al.* (2018) 'Changing the System - Major Trauma Patients and Their Outcomes in the NHS (England) 2008-17', *EClinicalMedicine*, 2–3, pp. 13–21. doi: 10.1016/j.eclinm.2018.08.002.
18. National Clinical Programme for Anaesthesia (2019) *Model of Care for Anaesthesiology*.
19. National Clinical Programme for Critical care (2014) *Model of Care for Adult Critical Care*. Available at: https://www.hse.ie/eng/services/publications/clinical-strategy-and-programmes/model-of-care-for-adult-critical-care.pdf (Accessed: 31 May 2020).
20. National Clinical Programme for Critical Care (2019) *Critical Care Nursing Workforce Report 2018*.
21. National Clinical Programme for Critical Care (2020) *Workforce Census*.
22. National Clinical Programme for Critical Care National Clinical Programme for Paediatrics (2019) *Model of Care for Paediatric Critical Care* .
23. National Doctors Training and Planning (2016) *NDTP Medical Workforce Planning in Ireland: A Stepwise Approach*.

24. National Doctors Training and Planning (2020) *Demand for medical consultants and specialists to 2028 and the training pipeline to meet demand: A high level stakeholder informed analysis*. Available at: www.hse.ie/doctors (Accessed: 5 October 2020).
25. *National Maternity Strategy Implementation Plan* (2017).
26. National Office of the Clinical Audit (2020) *Irish National ICU Audit Annual Report 2018*. Dublin. Available at: https://www.noca.ie/publications (Accessed: 13 June 2020).
27. Nguyen, Y. L. *et al.* (2015) 'The volume-outcome relationship in critical care: A systematic review and meta-analysis', *Chest*, 148(1), pp. 79–92. doi: 10.1378/chest.14-2195.
28. NPHET (2020) *National Public Health Emergency Team – COVID-19 Meeting Minutes*.
29. Obstetric & Gynaecology Anaesthetic and Critical Programmes, Clinical Strategy & Programmes Division and Health Service Executive (2014) *Guidelines for the Critically Ill Woman in Obstetrics*.
30. Prospectus Strategy Consultants (2009) *Towards Excellence in Critical Care Review of Adult Critical Care Services in the Republic of Ireland*. Available at: https://www.hse.ie/eng/services/publications/clinical-strategy-and-programmes/towards-excellence-in-critical-care-report.pdf (Accessed: 20 June 2020).
31. Provonost, P. *et al.* (2002) 'Physician Staffing Patterns and Clinical Outcomes in Critically Ill Patients', *Jama*, 288(17), pp. 2151–2162.
32. The National Emergency Medicine Programme (2012) *A strategy to improve safety, quality, access and value in Emergency Medicine in Ireland*.
33. Valentin, A. and Ferdinande, P. (2011) 'Recommendations on basic requirements for intensive care units: Structural and organizational aspects', *Intensive Care Medicine*, 37(10), pp. 1575–1587. doi: 10.1007/s00134-011-2300-7.
34. Wilcox, M. E. *et al.* (2013) 'Do Intensivist Staffing Patterns Influence Hospital Mortality Following ICU Admission? A Systematic Review and Meta-Analyses*', *Critical Care Medicine* . doi: 10.1097/CCM.0b013e318292313a.
35. World Health Organisation (2010) *User's Guide to the WHO Global Code of Practice on the International Recruitment of Health Personnel*. Available at: https://apps.who.int/iris/bitstream/handle/10665/70525/WHO_HSS_HRH_HMR_2010.2_eng.pdf;jsessionid=46216E50107FAEA81AEB9B6E077E2D50?sequence=1 (Accessed: 2 May 2019).
36. World Health Organisation (2011) *WHO Global Code of Practice on the International Recruitment of Health Personnel*. Available at: https://www.who.int/hrh/migration/code/code_en.pdf?ua=1.

11. Appendices

Appendix 1: Summary of FJFICMI Exam Candidates

Table 9.1 displays the number of doctors who successfully completed year 1 of ICM training and passed the FJFICMI exam over the past ten years.The successful completion of one year of ICM allows eligibility (in Ireland) for a 'consultant with a special interest in ICM' position provided also that CSCST in base specialty is achieved. This career option is only utilised / available in Anaesthesiology at present.

Table 11.1 FJFICMI exam candidates	
Year	**Successful candidates**
2009	7
2010	9
2011	10
2012	10
2013	11
2014	10
2015	9
2016	11
2017	8
2018	15
2019	9

From 2021, 6 posts at Year 1 Fellow / Year 7 CAI training are approved as ICM training posts.

Appendix 2: Summary of Post CSCST ICM Year 2 Fellow's

Table 2.4 displays those trainees that have completed a second 'supra-specialist' year of ICM Training this will allow accreditation as a completed trainee in ICM. Such status will allow eligibility for specialist registration in ICM with the Medical Council of Ireland and eligibility to apply for a Consultant in Intensive Care Medicine position.

Table 11.2 Year 2 fellow's	
Year	Successful candidates
2015	1
2016	2
2017	2
2018	2
2019	1

Post CSCST / Year 2 Fellow ICM training posts have been approved by NDTP since 2015. No dedicated funding was allocated to same and each post has been internally funded by the recognized training hospital. For 2020, there are 5 such posts appointed.