Seirbhís Sláinte Níos Fearr á Forbairt | Building a Better Health Service

CRITICAL CARE

Multi-annual National Adult Critical Care Capacity Planning 2019, 2020 and subsequent years- Memorandum

HSE Critical Care Programme, National Clinical Programmes

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Contents

1. Summary

Adult Critical Care Model of Care

In the acute healthcare system in Ireland today there are many drivers- Sláintecare reform policy, acute care literature evidence, regulatory inputs, funding pressures, demographic changes- in addition to day-to-day operational surge challenges, workforce retention and plant legacy issues.

The HSE *Adult Critical Care Model of Care* (2014) defines an integrated '*hub-and-spoke*' provision framework designed to meet the complex acute specialty needs of critically ill patients, children, mothers and adults in the system of ICUs in the acute hospitals in Ireland today.

Adequate resource meets the needs of critically ill patients during surges occurring day-to-day all the time

Surge variances of critically ill patients occur day-to-day all the time throughout the year.

During normal operational surge variances, where critical care commissioned capacity is adequate, the needs of critically ill patients are met by resource and operational surge responses (McManus 2004). ICUs 'flex-up' and 'flex-down' with adequate resource to meet the need.

The needs of critically ill patients are not met during surges where resource is inadequate

Where critical care capacity resource is inadequate, normal variances in critically ill patient volumes are met instead with critical care access delay or critical care access failure.

There is ample evidence that critical care access delay or access failure are associated with poor patient outcomes and a tendency towards increased critically ill patient mortality (Harris 2015).

Accordingly, adequate critical care capacity resource is required to meet the needs of critically ill patients in busy ICUs with day-to-day surges.

NOCA *Irish National ICU Audit Report 2017* links poor outcomes with capacity

The first National Office of Clinical Audit (NOCA) National ICU Audit report, *Irish National ICU Audit Report 2017,* was launched 6th February 2019.

The *Irish National ICU Audit Report 2017* delivers on the requirement of the 2008 Madden Commission to report the "*assessed outcomes*" of patients.

The Report finds in a hospital where activity volume increases are not matched with critical care capacity resource, that patient outcome measures deteriorate.

The *Report* finds "*compelling evidence of the effect on mortality of admitting increased numbers of patients* [where the] *number of open staffed beds in the Unit* [is] *unchanged*" (p15).

Usefully, HSE Acute Operations has now directed providers to maintain resourced critical care capacity.
"*Hospitals with allocated funding for critical care services should continue to seek, maintain and open funded but closed critical care capacity*" (HSE Acute Operations Memo 4/1/19).

Multi-annual critical care capacity planning- Proposal

Multi-annual ICU capacity planning is required to secure adequate critical care capacity to reliably meet the need of critically ill patients in Ireland.

A reactive or contingency national critical care capacity planning approach, a 'stop-start' approach, occurring in the event of a critical care volume 'spike' is not a reliable approach. It is not feasible to 'turn-on' capacity reliably at short notice at many sites equally. Rather, critical care capacity planning is a continual multi-annual national-level process requiring monitoring, maintaining, commissioning, strengthening and building.

This Capacity Planning Memo's main point, then, is multi-annual critical care capacity planning and resource allocation should continue to follow NOCA *Irish National ICU Audit Report 2017* evidence to maintain and commission the required child, mother and adult critical care capacity in line with policy, science and regulatory drivers and in line with CCP '*hub-and-spoke' Adult Critical Care Model of Care.*

This Memo demonstrates how critical care capacity planning has been shown in Ireland to be a successful clinical strategy with successful commissioning and operation of additional critical care capacity occuring with additional resource allocations through the Government/DH/HSE Estimates/National Service Plan process (see section 5 below) to meet the needs of critically ill patients in Ireland.

Accordingly, using a multi-annual critical care capacity planning approach, Critical Care Programme provides its critical care resource allocation recommendation (see section 9 below) or submission to Estimates 2020 process and subsequent years as its input to clinical strategy formulation.

Major Emergency preparedness planning is ongoing

A critical care Major Surge may occur gradually over days and weeks e.g. the influenza A (H1N1) critically ill patient global pandemic in 2009.

Or, a critical care Major Emergency may occur suddenly over minutes and hours e.g. a mass casualty incident (2017 Manchester and London terror attacks).

A surge of critically ill patients from a single cause, when it occurs, occurs in addition to all other ongoing critical care operations.

Each acute hospital operates its Major Emergency preparedness planning including safe critical care contingency arrangements for major increases in critically ill patient volumes. These Major Emergency hospital responses align with HSE and National Ambulance Service Emergency Management structures and processes.

Conclusion and proposal- Multi-annual National Adult Critical Care Capacity Planning 2019, 2020 and subsequent years

In conclusion, this memo proposes a multi-annual critical care capacity planning approach is adopted across HSE, Department of Health, Sláintecare, Government, Hospital Groups, Hospital providers and professional bodies.

Accordingly, for the Government/Sláintecare/DH/HSE Estimates/NSP2020 process ongoing, CCP now submits the following national adult critical care capacity requirements table below-

Critical Care Programme
National Adult Critical Care Bed Capacity Requirements 2020

Priority	Hospital Group	Hospital	National / supra-regional critical care specialty service provision	Employment revenue funding 2020	Minor capital funding 2020	Major capital funding 2020
1.	RCSIHG	Beaumont Hospital	Level3s Critical Care- Neurocritical Care, Kidney Transplant Critical Care	Three extra general and neuro ICU beds	HDU expansion	New ICU/HDU block- existing facilities not built for purpose
2.	IEHG	Mater Hospital	Level3s Critical Care- Cardiothoracic Critical Care, Extra-Corporeal Life Support (ECLS), Heart Transplant Critical Care	Three extra general ICU beds, six extra HDU beds		
3.	IEHG	St Vincents	Level3s Critical Care – Liver Transplant Critical Care	Three extra general ICU beds	New HDU proposal- no existing HDU	
4.	DMHG	St James	Level3s Critical Care- Cardiothoracic Critical Care, Burns Critical Care	Three extra general ICU beds	New HDU proposal	Complete ICU renovation
5.	DMHG	Tallaght		Three extra ICU/HDU beds		New ICU build
6.	SSWHG	CUH	Level3s Critical Care- Neurocritical Care, Cardiothoracic Critical Care	Note- revenue funding allocated NSP 2018 to open CUH ICU beds 13, 14, 15, 16	ICU expansion proposal, HDU build proposal- no existing HDU	CUH critical care block
7.	ULHG	UHL		One extra ICU bed		
8.	SaoltaHG	UHG	Level3s Critical Care- Cardiothoracic	One extra ICU bed		

Table. Critical Care Programme submission to Sláintecare/DH/HSE Estimates/National Service Plan 2020- National Adult Critical Care Bed Capacity Requirements 2020

2. **Policy, evidence and regulatory drivers**

There are many ongoing policy, evidence and regulatory drivers and the many ongoing reform and operations initiatives across the acute healthcare system including-

2.1 *Sláintecare*
2.2 Regulatory drivers HIQA Investigation Reports Ennis 2009, Mallow 2011, Tallaght 2012, Galway 2013, Portlaoise 2015, 2016
2.3 Hospital Groups ('Higgins' Report)
2.4 *Smaller Hospital Framework*
2.5 Estimates/NSP2020 process
2.6 HSE Acute Operations reorganisation
2.7 DH/HSE *Capacity Review* 2018
2.8 Health capital development programme
2.9 Infection Prevention and Control initiatives (Multi-resistant bacteria- CRE/CPE)
2.10 National Trauma Strategy
2.11 National Maternity Strategy
2.12 National Paediatric Hospital service development
2.13 Critically ill patient transport initiatives
2.14 Emergency Management (Mass Casualty Incident e.g. terror attack) preparedness planning
2.15 Acute care literatures published evidence

2.1 *SláinteCare*

The Government *SláinteCare Implementation Strategy* 2018 defines the '*goal*' and '*action*' to "*develop and modernise the acute care system*" (p42).

(Goal 2: Provide High Quality, Accessible and Safe Care that Meets the Needs of the Population, Strategic Action 5: Develop and modernise the acute care system to address current capacity challenges…*SláinteCare* p42)

SláinteCare defines "[Clinical] *[s]ervices will be planned… and guided by a national clinical strategy for safe, high quality care. The work of the national clinical programmes and existing national strategies will act as core building blocks in the development of this national clinical strategy, which will provide an evidence-based framework for strategic planning by Hospital Groups"* (p44).

Capacity building is a cornerstone of *SláinteCare.*

Specifically, *SláinteCare* plans to "*introduce additional capacity of the order of 2,600 acute beds in line with the Health Service Capacity Review and National Development Plan…*" (p42).

This multi-annual critical care capacity planning Memo then is the Critical Care Programme input to the "*development of this [SláinteCare] national clinical strategy*".

2.2Regulatory drivers HIQA Investigation Reports Ennis 2009, Mallow 2011, Tallaght 2012, Galway 2013, Portlaoise 2015, 2016

The above six HIQA Reports contain much important content and recommendations which have informed CCP Model of Care thinking and implementation.

3. *'Hub-and-spoke'* model of care

The National Clinical Programmes published the HSE *Adult Critical Care Model of Care* in 2014. The *Model of Care* describes the '*hub-and-spoke*' model of critical care capacity provision. Increasingly, the volume-outcome evidence across acute care literatures, e.g. cancer control literature, favours the provision of complex acute specialty care at scale in *'hub'* hospital centres. Accordingly, the national *Adult Critical Care Model of Care* recommends commissioning of additional critical care capacity at regional and supra-regional *'hub'* hospitals with capacity maintenance at '*spoke*' hospitals (p38, *Adult Critical Care Model of Care*).

This '*hub-and-spoke*' model of care is the 'driver' for critical care capacity commissioning- additional critical care capacity at the '*hub*'; no additional critical care capacity at the '*spoke*'.

Happily, with resource allocation through Estimates in HSE *National Service Plans* in recent years, successful commissioning has seen the growth of additional adult critical care capacity at regional and supra-regional '*hub*' hospitals. Happily, too, critical care bed capacity is maintained at '*spoke*' hospitals.

'*Hub-and-spoke*' construct

The critical care '*hub-and-spoke*' construct, with resource, provides a delivery framework to meet the needs of critically ill patients arising across the acute care system.

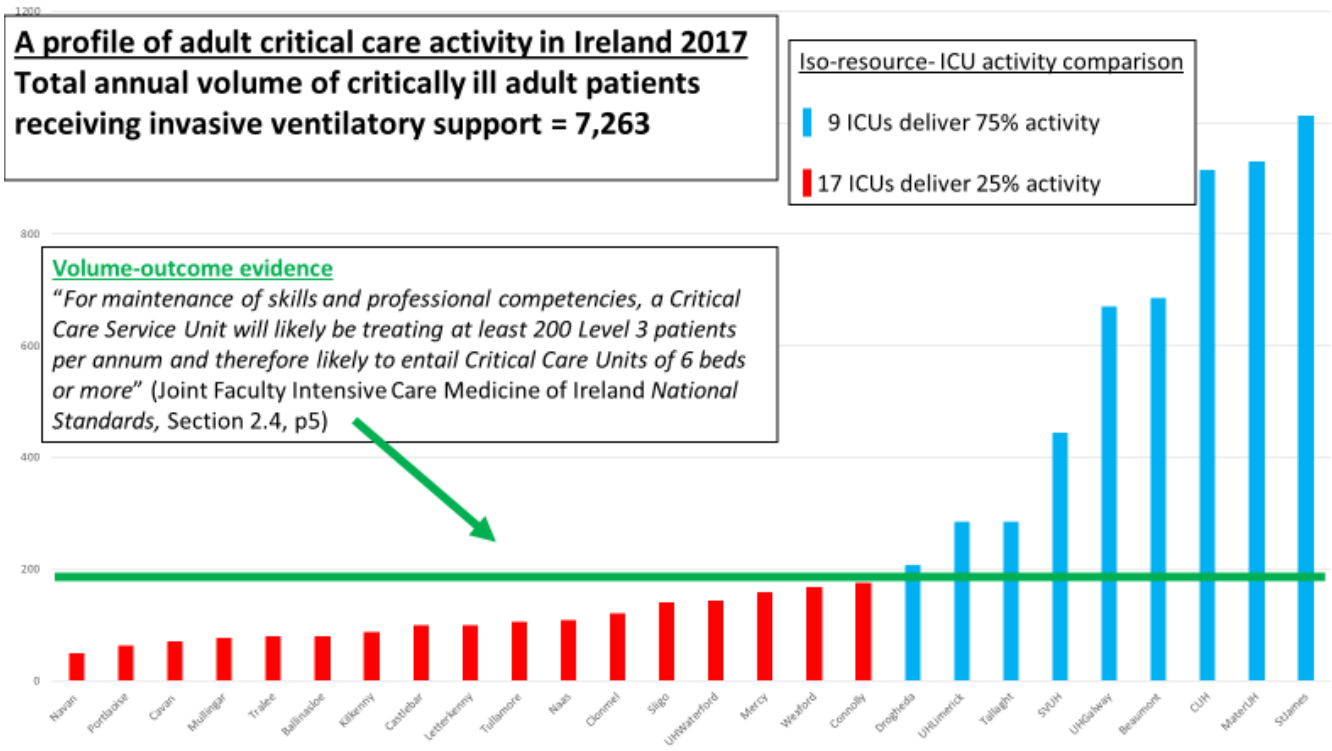
4.National adult critical care activity measurement

As part of the annual Census process, ICUs self-report activity for the prior year using the measure of episodes of invasive ventilatory support as a comparator*.

4a. Activity variance- nine ICUs in Ireland deliver 75% of activity

Of note, nine ICUs in Ireland deliver 75% of critical care activity with the remaining seventeen ICUs delivering 25% of activity.

There is a considerable variance in adult critical care activity across the acute hospital system. The hospital with the highest ICU activity is St James' Hospital exceeding 1,000 episodes of ICU care p.a. In contrast, nine hospitals deliver 100 or less episodes of ICU care p.a.



Graph. Comparative profile of adult critical care activity in Ireland 2017 (reported in 2018 National Adult Critical Care Bed Capacity Census)

*Limitation- Activity is estimated using the comparator- invasive ventilatory support of any duration- less than one day, overnight, one day, several days, several weeks = 1 episode = 1. The measure is

a crude comparator because non-invasive ventilatory support and other invasive organ supports (e.g. continuous renal replacement therapy, pharmacologic and mechanical circulatory supports, nutritional supports etc.) are also delivered to critically ill patients and for long durations in ICUs in Ireland.)

4b. '*Hub*' hospitals and '*Spoke*' Hospitals.

The nine ICUs that deliver more than 200 episodes of invasive ventilatory support care of critically ill patients per year exceed the activity measure in JFICMI *National Standard* 2.4 and may be termed '*hub*' hospitals.

In contrast, seventeen hospitals deliver less than 200 episodes of invasive ventilatory support care of critically ill patients per year. These seventeen hospitals do not exceed the activity measure in JFICMI *National Standard* 2.4 and may be termed '*spoke*' hospitals.

4c. Employment iso-resource comparison mismatch

The HSE Acute Operations *National Adult Critical Care Bed Capacity Census* process measures annual critical care activity (number of episodes of invasive ventilatory support care of critically ill patients) in the twenty-six adult acute hospitals that operate ICUs.

Comparing the activities of the ICUs in the hospitals across Ireland, there is a twenty-fold difference in activity between the high-volume ICU in St James Hospital and the low-volume ICU in Portlaoise. These two hospitals are in Dublin Midland Hospital Group. There is a comparatively high employment cost in Portlaoise in comparison with St James quite apart from specialty service scale and complexity. Portlaoise and St James are 80km apart.

4d. Efficiency and effectiveness considerations in resource allocation to commission and operate additional critical care capacity in smaller hospitals

The needs of adult critically ill patients in Ireland today are met by a complex mix of activity with access to regional and supra-regional specialties across different

hospitals groups. Critical Care Programme considers the volume-outcome evidence and the activity evidence indicate that resource allocation to commission and operate additional critical care capacity in smaller ICU volume hospitals is inefficient and may be comparatively ineffective.

4e. Surge variance- *HSE/HPSC ICU Influenza Surveillance*- 2014-2018

On behalf of HSE, HPSC completes an annual ICU Influenza Surveillance process and publishes this report in *Epi-Insight,* the monthly *Disease Surveillance Report of HPSC Ireland.*

Influenza season (year)	**NVRL-positive Influenza patients admitted to ICU**	**Influenza serotypes**
2014-15	69	Influenza AH3, B predominant
2015-16	161	Influenza A (H1N1, late season 'spike')
2016-17	51	Influenza AH3 predominant
2017-18	191	Influenza B- 92 cases Influenza A(H3N2)- 68 cases Influenza A(H1N1)- 31 cases
2018-19	c. 150 patients with NVRL-positive influenza admitted to ICU	

Table. Annual volumes of influenza patients admitted to ICUs with annual predominant influenza serotypes. (Source- *Epi-Insight,* the monthly *Disease Surveillance Report of HPSC Ireland*).

The annual ICU influenza surveillance completed and published by HSE/HPSC shows the considerable seasonal variation in volumes of patients with influenza admitted to ICU and in the seasonal influenza subtypes.

The HSE Acute Operations Major Surge Committee structure is tasked with seasonal influenza surge preparedness planning.

5. Extract from National Adult Critical Care Bed Capacity Censuses 2016, 2017, 2018

Annually, the HSE Acute Operations *Adult Critical Care Bed Capacity Census* publishes Ireland's verified adult critical care bed capacity in tabular format (see below). An extract (see below) from the 2016, 2017 and 2018 Censuses shows annual adult critical care bed capacity gains and losses.

Annual National Adult Critical Care Bed Capacity Censuses 2016, 2017, 2018	**2016**	**2017**	**2018**
Total national adult critical care (ICU/HDU) bed capacity	237	241	249
ICU/HDU beds gained		+2 Beaumont +1 Connolly +2 Mater +1 StVincent's +2 CorkUH +1 Ballinasloe	+4 Beaumont +1 Naas +1 StJames' +3 Mater +1 CorkUH +1 UHLimerick
ICU/HDU beds lost		-1 Naas -4 Navan	-1 Connolly -2 UHGalway

Table. Extract from National Adult Critical Care Bed Capacity Censuses, 2016, 2017, 2018 to show critical care bed capacity gains and losses.

In 2017 there was a net gain of four critical care beds. In 2018 there was a net gain of eight critical care beds.

These net gains show a pattern of successful multi-annual adult critical care capacity commissioning in 'hub' hospital centres.

6. Annual National Adult Critical Care Bed Capacity Census 2018- complete table

The complete table of the annual National Adult Critical Care Bed Capacity Census 2018 (as at 30th September 2018) is copied below:

Critical Care Unit (ICU/HDU)	ICU (Level 3s)	ICU (Level 3)	HDU (Level 2)	Critical Care Bed Capacity 2018	Commissioned, non-operational critical care beds (funding allocated)	Empty bed spaces available
RCSI Hospital Group						
Cavan ICU		2	2	4		1
Drogheda ICU		5	3	8	1	6
Beaumont General ICU		9		9		2
Beaumont HDU			4	4		4
Beaumont Neuro ICU	8			8	1	
Connolly Hospital ICU		4		4	1	
Dublin Midlands Hospital Group						
Naas ICU		4		4	1	
Portlaoise ICU		2		2		
Tullamore ICU		4		4		3
Tallaght ICU		9	2	11		
Tallaght PACU			3	3		

St James' Burns ICU	2			2		
St James' ICU/HDU		19	0	19	1	4
St James' CT KS ICU	6			6		2
Ireland East Hospital Group						
Mater ICU/HDU	18		14	32		4
Mullingar ICU		5	1	6		
Navan ICU		2		2		
St Vincents ICU/HDU		10	6	16		
Kilkenny ICU		4		4		
Wexford ICU		5		5		
South-South West Hospital Group						
Clonmel ICU		4		4	1	
Waterford ICU		5	4	9	1	
Cork CUH CT ICU	6			6		4
Cork CUH General ICU		12		12		6
Cork CUH Gen HDU			0			12
Mercy ICU		5		5	1	3
Tralee ICU		5		5		

Saolta Hospital Group						
Letterkenny ICU		5		5		
Ballinasloe ICU		2	3	5		1
Castlebar ICU		2	2	4		
Sligo ICU		5		5	1	1
Galway UHG CT ICU	3			3	3	
Galway UHG General ICU/HDU		10	6	16	2	
ULimerick Hosp Group						
UHLimerick ICU/HDU		9	8	17	1	10
TOTAL				**249 commissioned operational critical care beds**	**15 funded, non-operational critical care beds**	

Table. Annual National Adult Critical Care Bed Capacity Census 2018- complete table.

Census Table Legend

ICM National Standard- in scope

ICM National Standard- outlier

7. Department of Health *Capacity Review 2018*

In 2018, the Department of Health published its *Capacity Review* Report recommending increased acute care capacity.

In particular, the *Review* recommends a 80% increase in national adult critical care bed capacity*.

(*An adult critical care capacity increase from 240 beds to 430 beds is recommended by 2031. Department of Health *HEALTH SERVICE CAPACITY REVIEW 2018: REVIEW OF HEALTH DEMAND AND CAPACITY REQUIREMENTS IN IRELAND TO 2031 Main Report,* Section 8.2 *Recommendations*, Section 8.2.1 *Baseline Recommendations,* Table 28 *Summary of Capacity Requirements with no Service Reconfiguration, 'Acute Care' 'Sector' 'ACC'* (Adult Critical Care) Beds, p106.)

Capacity building guidance is provided by Special Delivery Unit (SDU)- "*Technical Guidance Introducing Demand and Capacity Planning Special Delivery Unit*" and "*Unscheduled Care Strategic Plan*", both 2013.

8. Multi-annual critical care capacity building in HSE National Service Plans 2018, 2019

A pattern of multi-annual critical care capacity building can be identified in successive HSE National Service Plans.

8a. HSE *National Service Plan 2018*

8a1. NSP 2018 critical care resource allocation

For critical care, HSE *National Service Plan 2018* follows the available volume-outcome evidence-

"*Following the organisation of hospitals into Hospital Groups, it is clear that critical care capacity building is required in the 'hub' hospitals to meet the on-going and increasing critical care requirements of complex, multi-specialty, severely critically ill patients*" (p51).

The HSE *Acute Hospital Services Divisional Plan 2018* identifies one of its "*Priorities 2018"* is to- "*Increase critical care capacity*" (p8).

In particular, NSP 2018 allocated resource to Mater and Cork:

"*Enhance critical care capacity with the opening of additional capacity at Cork University Hospital and Mater Misericordiae University Hospital, Dublin"* (p53).

The NSP 2018 proposal to "*increase critical care capacity*" in "*'hub' hospitals*" to meet the "*complex*" "*requirements*" of "*severely critically ill patients*" is a welcome "*capacity building*" clinical strategy.

8a2. Commissioning response to NSP 2018 critical care resource allocation decision

In response to the HSE *National Service Plan 2018* allocation, Mater Hospital has increased its critical care bed capacity by five beds and CUH has increased its critical care capacity by three beds (see additional ICU/HDU capacity 2016-2018 table above, p4 above; see Census 2018 table, p6 above).

Furthermore, in 2018, CUH plans to commission and operate its ICU beds as follows- ICU bed no 13- Q1 2019, ICU bed no 14- Q2 2019, ICU bed no 15- Q3 2019, ICU bed no 16- Q4 2019.

8b. HSE *National Service Plan 2019*

For critical care, HSE *National Service Plan 2019*, however, turns away from the *Adult Critical Care Model of Care* and recommends increased capacity in '*spoke*' hospitals.

"*Winter 2019 / 2020 – Plan and prepare for a further increase in acute bed capacity of 202 beds (including 16 critical care beds) across 14 locations, to be operational by quarter 1, 2020"* (p68).

The proposal to increase capacity in '*spoke*' hospitals is counter to volume-outcome evidence and is also counter to hospital activity evidence.

Critical Care Programme provides the following clinical strategy input and comment.

8b1. Tralee Hospital

Tralee Hospital delivered 79 episodes of invasive ventilatory support to critically ill patients in 2017. Assuming an average length of stay of 7 days for a critically ill patient requiring invasive ventilatory support, this equates to approx. 560 ICU-days or 2 operational ICU beds operational for a calendar year (equals 730 days). Tralee operates 5 ICU beds currently. Hence the requirement for additional ICU capacity of 1 ICU bed (= 2 HDU beds) is not demonstrated at Tralee Hospital. Further, at this time, Tralee ICU does not operate continuous renal replacement therapy (CRRT) in the ICU setting. The allocation of scarce critical care resource thus is not supported nor recommended by Critical Care Programme to Tralee Hospital.

8b2. Tullamore Hospital

Tullamore Hospital delivered 105 episodes of invasive ventilatory support to critically ill patients in 2017. Assuming an average length of stay of 7 days for a critically ill patient requiring invasive ventilatory support, this equates to approx. 735 ICU-days or 2.5 operational ICU beds operational for a calendar year (equals 912.5 days). Tullamore operates 4 ICU beds currently. Hence the requirement for additional ICU capacity of 2 ICU beds (= 2 HDU beds) is not demonstrated at Tullamore Hospital at this time. In respect of acute hospital reform, it is recommended to commission additional capacity with a capital new ICU build at the 'hub' at Tallaght. The allocation of scarce critical care resource thus is not supported nor recommended by Critical Care Programme to Tullamore Hospital at this time.

8b3. *"Commission additional high dependency unit beds in the Mater Misericordiae University Hospital (MMUH) and Cork University Hospital (CUH)"* (p68)

The continuation of resource allocation from NSP 2018 through NSP 2019 to commission and operate additional ICU and HDU bed capacity at Mater and CUH is welcomed and supported by Critical Care Programme.

9. Critical Care Programme submission to DH/HSE Estimates/National Service Plan 2020 process- National Adult Critical Care Bed Capacity Requirements 2020

In line with the three inputs-

(i) '*hub-and-spoke*' HSE *Adult Critical Care Model of Care* 2014,
(ii) volume-outcome evidence,
(iii) hospital ICU activity evidence,

Critical Care Programme continues to provide the following clinical strategy input to the DH/HSE Estimates/ National Service Plan 2020 process- to prioritise resource allocation to '*hub*' hospitals- see table below.

Critical Care Programme
National Adult Critical Care Bed Capacity Requirements 2020

Priority	Hospital Group	Hospital	National / supra-regional critical care specialty service provision	Employment revenue funding 2020	Minor capital funding 2020	Major capital funding 2020
1.	RCSIHG	Beaumont Hospital	Level3s Critical Care- Neurocritical Care, Kidney Transplant Critical Care	Three extra general and neuro ICU beds	HDU expansion	New ICU/HDU block- existing facilities not built for purpose
2.	IEHG	Mater Hospital	Level3s Critical Care- Cardiothoracic Critical Care, Extra-Corporeal Life Support (ECLS), Heart Transplant Critical Care	Three extra general ICU beds, six extra HDU beds		
3.	IEHG	St Vincents	Level3s Critical Care – Liver Transplant Critical Care	Three extra general ICU beds	New HDU proposal- no existing HDU	
4.	DMHG	St James	Level3s Critical Care- Cardiothoracic Critical Care, Burns Critical Care	Three extra general ICU beds	New HDU proposal	Complete ICU renovation
5.	DMHG	Tallaght		Three extra ICU/HDU beds		New ICU build
6.	SSWHG	CUH	Level3s Critical Care- Neurocritical Care, Cardiothoracic Critical Care	Note- revenue funding allocated NSP 2018 to open CUH ICU beds 13, 14, 15, 16	ICU expansion proposal, HDU build proposal- no existing HDU	CUH critical care block
7.	ULHG	UHL		One extra ICU bed		
8.	SaoltaHG	UHG	Level3s Critical Care- Cardiothoracic	One extra ICU bed		

Table. Critical Care Programme submission to DH/HSE Estimates/National Service Plan 2020- National Adult Critical Care Bed Capacity Requirements 2020

Following this resource allocation rationale, outlined above, Critical Care Programme does not support resource allocation to commission and operate additional critical care capacity at '*spoke*' hospitals.

10. Critical Care Programme national adult ICU/HDU isolation room survey 2018- Report

10a. National ICU Isolation Room Survey 2018- Context

In 2017 the Minister for Health activated the Public Health Emergency Plan to address CPE (carbapenemase-producing enterobacteriaceae) in Ireland's health system. Accordingly, the *National Public Health Emergency Team (NPHET) for Carbapenem-producing Enterobacteriaceae (CPE)* is tasked with collating information concerning notifiable invasive CPE infection and CPE outbreaks and "*the development and implementation of a strategy to contain CPE*".

In this context and in the context of overall HCAI prevention and control in the ICU setting, CCP actioned a survey to quantify isolation capacity in (ICU/HDU)* in Ireland for critically ill patients.

In June 2018 then, following a teleconference 18/5/18 with Prof M Cormican, a national survey of adult ICU/HDU Infection Prevention and Control isolation rooms and facilities was commenced. The ICU Directors completed and returned a survey instrument for their hospitals' critical care facilities.

10b. National ICU Isolation Room Survey 2018- Theoretical background

In addition to effective hand hygiene and other infection control hygiene and decontamination practices, isolation capacity decreases transmission of bacteria including multi-resistant bacteria (MRB) among vulnerable critically ill patients in the ICU setting.

It is known hospital-acquired bacterial bloodstream infection has an attributable mortality of c. 15% in Ireland, with a higher attributable mortality for multi-resistant bacteria (*Attributable mortality of hospital-acquired bloodstream infections in Ireland*, M Brady, A Oza, R Cunney, K Burns, J Hosp Inf 2017).

Consequently, for the safety of for vulnerable critically ill patients, effective and sufficient ICU/HDU isolation facilities are required.

*ICU refers to Level 3 Critical Care (e.g. invasive ventilatory support) and HDU refers to Level 2 Critical Care (e.g. non-invasive ventilatory support for single-organ respiratory failure).

10c. National ICU Isolation Room Survey 2018- Findings

The survey finds fifty-two percent (52%) of ICU/HDU capacity in Ireland has no air management (air exchanges) or treatment (HEPA filtration) to decrease air-borne transmission of infection.

This proportion has worsened since the prior survey in 2013. The 2013 survey found "*Current isolation capacity in Irish critical care units is inadequate.*" Consequently, isolation capacity in ICUs in Ireland in 2018 has further deteriorated.

10d. National ICU Isolation Room Survey 2018- CCP Recommendation

In *National Standards 2011*, in the section *The Intensive Care Unit – Minimum Requirements* (p10), the Joint Faculty of Intensive Care Medicine of Ireland JFICMI requires appropriate infection control standards for ICU/HDU construction-

"*Infection Control standards need to be adhered to, with particular reference to the numbers of single rooms, neutral pressure rooms and airborne isolation rooms. The specialty case mix will help determine the numbers of airborne isolation rooms. Design and building standards and infection control standards as referenced below are subject to revision and up-dating. The HBN 57 and SARI guidelines are appropriate for 2010 and the most recent versions should be considered the standard of the day.*" JFICMI *National Standards 2011*.

The appropriate ICU/HDU infection control standard today is provided in UK Department of Health building code (HBN 04-02) published 2013. This ICU infection control standard is endorsed by Intensive Care Society *Guidelines for the Provision of Intensive Care Services 2013* (p22).

The ICU building code (HBN 04-02) recommends,

"6.4 *Single-bed rooms with lobbies are required for the isolation of patients to control the spread of infection or for the protection of immunosuppressed patients*" and

"6.6 *The ventilation system should be designed to provide simultaneous source and protective isolation*". (p11).

Critical Care Programme recommends this HBN 04-02 safety standard 6.4 and 6.6 is used now to commission and construct / 'retro-fit' sufficient effective critical care service isolation facilities in ICUs/HDUs in Ireland.

As in JFICMI *National Standards 2011*- "*The specialty case mix will help determine the numbers of airborne isolation rooms"*. Hence local hospital Clinical Microbiology, Infectious Disease, Infection Prevention and Control and Intensive Care Medicine expertise in conjunction with National Clinical Programme Healthcare Associated Infection Antimicrobial Resistance (HCAI-AMR) Clinical Programme expertise and with Critical Care Programme will advise and determine the quantum and location of isolation capacity required for a Critical Care Service.

The National Isolation Unit will have specific requirements for the management of patients with viral haemorrhagic fevers.

National adult ICU/HDU isolation room survey 2018- table

National Survey Adult ICU/HDU Infection Prevention and Control Isolation Rooms/ Facilities	Total number of ICU/HDU beds open/ operational	Total quantity of ICU/HDU bed-spaces closed/empty /non-operational	Total number of ICU/HDU beds and bed-spaces	Total number of open-plan open-floor beds/bed-spaces- No air management plant (No air filtration (HEPA)/ No air ventilation (12 air exchanges per hour)	Total number of open-plan open-floor beds/bed-spaces- Yes air management plant (Yes air filtration (HEPA)/ Yes air ventilation (12 air exchanges per hour)	Total number of cubicle/partition beds/bed-spaces- No air management plant (No air filtration (HEPA)/ No air ventilation (12 air exchanges per hour)) Ante-room with sink- No	Total number of cubicle/partition beds/bed-spaces- No air management plant (No air filtration (HEPA)/ No air ventilation (12 air exchanges per hour)) Ante-room with sink- Yes	Total number of Airborne Infection Isolation Rooms (AIIRs) with air management plant (Yes air filtration (HEPA)/ Yes air ventilation (12 air exchanges per hour)) WITH ante-room + sink	Total number of Airborne Infection Isolation Rooms (AIIRs) with air management plant (Yes air filtration (HEPA)/ Yes air ventilation (12 air exchanges per hour)) WITHOUT ante-room + sink
Dublin Midland Hospital Group									
StJames'	27	4	31	0	17	2 (Burns Unit)	0	12 (Comment 1)	
Portlaoise	3	0	3	3	0	0	0	0	0
Naas	4	0	4		3			1 (Comment 2)	
Tullamore	4	3	7	4	0	0	0	2	0
TUH	14	0	14	9	0	3	0	1	1
Ireland East Hospital Group									
Mater	29	7	36	0	0	25	10	1	
Navan	4	1	5	4	0	4	0	0	1
StVincent's	13	3	16	0	8	3	0	5	0
Mullingar	6	0	6	4	0	2	0	0	0
Kilkenny	4	0	4	4	0	3	0	0	0
Wexford	5	0	5	0	4 (Comment 3)	0	0	0	1

RCSI Hospital Group									
Beaumont	17	5	22	0	14	0	6	2	0
Drogheda	8	1	9	0	0	5	0	1	0
Cavan	4	1	5	4	0	0	0	1	0
Connolly	4	1	5	0	4	0	1	0	0
Saolta Hospital Group									
UHGalway	20	4	24	0	18	2	0	4	
Ballinasloe	5	1	6	0	3 (Comment 4)	0	0	0	5 (Comment 5)
Letterkenny	5	0	5	4	4	0	0	1	0
Castlebar	4	0	4	4	0	4	0	0	0
Sligo	5	0	5	3	0	1	0	1	0
South South West Hospital Group									
CUH- GICU	11	5	16	0	12	4	0	0	0
CUH- Cardiac ICU	6	14 (Comment 6)	20	0	10	0	6	0	4
Waterford	9	1	10	0	8 (Comment 7)	0	0	2	0
Mercy	5	1	6	4		2	0	0	0
Tralee	5	0	5	5	0	2	0	0	0
Clonmel	4	1	5	0	4	0	0	1	0
University Limerick Hospital Group									
UHL	17	11	28	0	0	0	0	13	15
Total	225	45	270	52	83	57	16	48	23

Survey returns comments box

Comment 1. StJames- "Note 6 of these rooms cannot be used for immunocompromised patients because of persistently high aspergillus counts considered related to poor infrastructure conditions"

Comment 2. Naas- "9.5 air exchanges per hour"

Comment 3. Wexford- "6 [air] exchanges per hour achievable"

Comment 4. Ballinasloe- "12 air exchanges"

Comment 5. Ballinasloe- "5 isolation rooms (not official AIIR's or HEPA but with 12 [air] exchanges per hour and none of which have ante-rooms)"

Comment 6. CUH Cardiac ICU. "4 operational depending on case mix, other 10 currently used as Pre Op assessment, Vascular assessment and Office spaces"

Comment 7. Waterford- "4 open plan ICU spaces have a ducted ventilation system (12 to 15 air exchanges per hour) 4 open plan HDU spaces have air filtration HEPA"

11. References

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McManus M et al; *Queuing Theory Accurately Models the Need for Critical Care Resources*; Anesthesiology 100:1271, 2004.

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Appendix 1

National adult ICU/HDU isolation room survey 2018

Survey instrument forwarded to 26 hospitals

National Survey of Adult ICU/HDU Infection Prevention and Control Isolation Rooms/Facilities	
Hospital name:	Name of unit (e.g. CT/ICU, HDU etc):
Name of ICU Director completing form: Date of completion: __/__/__	
Total number of ICU/HDU beds and bed-spaces in your unit (open/operational + closed/empty/non-operational) = Row A = Row B + Row C	
Total number of ICU/HDU beds open/operational = Row B	
Total number of bed-spaces closed/empty/non-operational = Row C	
Total number of open-plan open-floor beds/bed-spaces- No air management plant (No air filtration (HEPA)/ No air ventilation (12 air exchanges per hour)) = Row D	
Total number of open-plan open-floor beds/bed-spaces- Yes air management plant (Yes air filtration (HEPA)/ Yes air ventilation (12 air exchanges per hour)) = Row E	
Total number of cubicle/partition beds/bed-spaces- No air management plant (No air filtration (HEPA)/ No air ventilation (12 air exchanges per hour)) Ante-room with sink- NO = Row F	
Total number of cubicle/partition beds/bed-spaces- No air management plant (No air filtration (HEPA)/ No air ventilation (12 air exchanges per hour)) Ante-room with sink- YES = Row G	
Total number of Airborne Infection Isolation Rooms (AIIRs) with air management plant (Yes air filtration (HEPA)/ Yes air ventilation (12 air exchanges per hour/ Yes positive and negative room pressure)) WITH ante-room + sink = Row H	
Total number of Airborne Infection Isolation Rooms (AIIRs) with air management plant (Yes air filtration (HEPA)/ Yes air ventilation (12 air exchanges per hour/ Yes positive and negative room pressure)) WITHOUT ante-room + sink = Row I	

Confirm Row A = Row B + Row C = Row D + Row E + Row F + Row G + Row H + Row I = Row A = Total number of ICU/HDU beds/bed-spaces in unit (open/operational + closed/empty/non-operational)	Yes/No

Dr M Power, Critical Care Programme, National Clinical Programmes, 24/4/19.

Ends.