

# International comparisons of selected service lines in seven health systems

ANNEX 3 – REVIEW OF SERVICE LINES: CRITICAL CARE

Evidence Report  
October 27<sup>th</sup>, 2014



# Executive summary for Critical Care

- **The provision of critical care is fairly similar across the regions considered.**
  - In England as well as internationally, critical care is provided through **intensive care units (ICUs)** that specialise in treating critical cases.
  - Many countries have defined **3 different levels** of intensive care units.
  - Like in England, in the Netherlands and Sweden almost all acute hospitals have ICU beds regardless of size
- **The types of standards for ICUs in England are fairly similar to other countries.** While the exact targets may differ, most countries have minimum nurse ratios, consultant availability targets, pharmacy and network requirements. The one exception is Arkansas, where there are only very basic requirements for ICUs
- The different levels of ICUs allows in for standards and **recommendations to be set according to these levels, and many countries have done this.**
  - Victoria, Ontario, the Netherlands, and Sweden all set different staffing and size requirements for the three ICU levels
  - In England only the nurse ratios are dependent on patient acuity.
- Where internationally comparable standards exist, England generally has **more lenient requirements**
  - England requires only 1 consultant per 15 patients, while Germany, the Netherlands and Sweden have set stricter standards.
  - Similarly, the minimum requirement for the availability of pharmacy services in England is Monday through Friday, while other countries require 24/7 access.
- This is **partly driven by the use of the acuity levels for ICU standards in other countries.** As standards in England are set once for all level 2/3 ICUs, they need to be achievable for both levels of care, thus generally lowering requirements. However, even the international standards for lower levels of ICU are similar or even stricter than in the NHS
- **Critical care networks** exist in England and abroad, but their degree of implementation varies.
  - In England, geographically remote ICUs should have an established review/referral relationship with a larger centre.
  - In Victoria and Ontario, the requirements for referral agreements only hold for lower level care units.
  - Critical care networks are mandatory in The Netherlands, however implementation varies and agreements can be unclear. To enable the delivery of a critical network, transportation agreement and resources are vital. In the Netherlands, six specialised mobile ICUs cover the transport of critically ill patients across the country.
- **Central coordination to optimise capacity utilisation** is seen in some countries.
  - Victoria has a central coordinating body working with all public and private hospitals in the state to coordinate critical care capacity.
  - In Ontario a real-time information system monitors all critical care admissions in the province
- Like in the NHS, other countries are considering or have implemented **centralisation of critical care**
  - In the Netherlands, insurers are looking to centralise critical care services and reduce the number of hospitals with ICUs from 91 to 50
  - In Toronto critical care services are centrally organised and rely on transfers – however the facilities operate at  $\geq 95\%$  occupancy and repatriation of patients is a major challenge



# Critical care – NHS core standards

NHS standards setting bodies	Core NHS standards <sup>1</sup>	Critical standards	
<ul style="list-style-type: none"> <li>Intensive Care Society</li> <li>British Association of Critical Care Nurses</li> <li>The Critical Care Networks</li> <li>National Nurse Leads</li> <li>Royal College of Nursing</li> <li>NICE</li> </ul>	<p><b>Input</b></p> <ul style="list-style-type: none"> <li>Care must be led by a Consultant in Intensive Care Medicine</li> <li>A Consultant in Intensive Care Medicine must be immediately available 24/7, be able to attend within 30 minutes and must undertake twice daily ward rounds</li> <li>In general, the Consultant/ Patient ratio should not exceed a range between 1:8 – 1:15</li> <li>Consultant led multi-disciplinary clinical ward rounds must occur every day, with input from nursing, microbiology, pharmacy and physiotherapy</li> <li>Level 3 patients require a registered nurse/patient ratio of a minimum 1:1 to deliver direct care; for level 2 this is 1:2</li> <li>A minimum of 50% of registered nursing staff will be in possession of a post registration award in Critical Care Nursing</li> <li>A supernumerary clinical co-ordinator, who is a senior critical care qualified nurse will be required for units of more than 6 beds</li> <li>Paediatric Intensive Care units should be co-located with other appropriate specialist children’s services and facilities</li> <li>There should be visual and sound separation from adult patients</li> <li>The unit should have appropriate equipment, including disposables, needed to care for children of different ages</li> <li>Critical care pharmacist for every critical care unit</li> <li>Clinical pharmacy services available 7 days per week (Monday to Friday as a minimum).</li> <li>Geographically remote ICUs should have an established review/referral relationship with a bigger centre.</li> </ul> <p><b>Process</b></p> <ul style="list-style-type: none"> <li>Assessment of the rehabilitation needs of all patients within 24 hours of admission to Critical Care</li> <li>Admission to and discharge from Intensive Care should occur within 4 hours of making the decision</li> <li>Patients should be reviewed in person by a Consultant in Intensive Care Medicine within 12 hours of admission to Intensive Care</li> <li>Discharges should be between 07:00 and 21:59h</li> </ul>	<p><b>Level achieved</b></p> <ol style="list-style-type: none"> <li>A Consultant in IC Medicine must be available 24/7 and attend within 30 minutes</li> <li>Consultant led multi-disciplinary clinical ward rounds must occur every day</li> <li>Level 3 patients require a nurse/patient ratio of 1:1; for level 2 this is 1:2</li> <li>A supernumerary clinical coordinator (senior critical care qualified nurse) if &gt;6 beds</li> <li>Consultant/ Patient ratio should not exceed a range between 1:8 – 1:15</li> <li>Mon-Fri pharmacy services available</li> <li>Remote ICUs should have an established review/ referral relationship with a bigger ICU</li> <li>Care must be led by a Consultant in Intensive Care Medicine</li> </ol>	<p>Met by 90% of London hospitals<sup>2</sup></p> <p>Met by 90% of London hospitals; 50% on weekends<sup>2</sup></p> <p>Met by all London hospitals, all the time<sup>2</sup></p> <p>Met by all London hospitals, all the time<sup>2</sup></p> <p>Not available</p> <p>Not available</p> <p>Not available</p> <p>Not available</p>

Note: London results have been quoted as there exist no general, national review

SOURCE: 1 Intensive Care Society, Royal College of Nursing, British Association of Critical Care Nurses et al.– Core Standards for Intensive Care Units, 2013; 2 London Quality Standards Self-assessment 2013, Pan-London Findings, March 2014



# Critical care – International standards

Topic of standards	Standard specifics							Tiered standards
	England <sup>1</sup>	Victoria	Ontario	Netherlands	Germany	Sweden	Arkansas	
<b>24/7 availability of IC consultant</b>	Available 24/7 and attend within 30 minutes	Specialist rostered at all times (L2/3)	Specified for units >14 beds	7 days a week, attend within 20min at night (L2/3)	24/7	Round the clock responsibility by anest/intensivist	No guideline	
<b>Multidisciplinary reviews</b>	MD clinical ward round daily	No guideline	No guideline	Daily MD patient reviews	No guideline	For complex and long stay patients	No guideline	
<b>Nurse ratios</b>	L3 patients 1:1; L2 1:2	1:1	1:1-1:1.5 (I3); 1:1.5-1:2 (I2); 1:2-1:3 (I1)	Per ventilator bed: 2.7 (L1); 3.5 (L2); 4.2 (L3)	1:2	No guideline	One registered nurse each shift	
<b>Supernumerary clinical coordinator</b>	Yes, if >6 beds	No guideline	No guideline	No guideline	No guideline	No guideline	No guideline	
<b>Consultant/ patient ratio</b>	<1:8 – 1:15	No guideline	No guideline	1:12 (L2); 1:6 (L3)	7 doctors at 40hr weeks for 8-12 patients	1:2-4 (L1); 1:2-6 (L2)	No guideline	
<b>Pharmacy services</b>	Min Mon-Fri clinical pharmacy services	24 hour access to pharmacy	Access to pharmacist 24/7 (L3) during day (L1/2)	No guideline	Pharmacist to do rounds weekly, available at all time	Round the clock pharmacy services	No guideline	
<b>Network requirements</b>	Established referral relationship if remote ICU	Incl. Mutual transfer policies and review process (L1)	Partnering arrangements for L2 with L3 facilities	Mandatory participation in care networks (if L1, coordination role)	No guideline	No guideline	No guideline	
<b>ICU is led by a specific specialist</b>	A consultant in intensive care Medicine	A fellow of The college of IC medicine (L2/3)	An intensivist	An intensivist	A specialist dedicated intensivist	Anesthetist or intensivist	No guideline	
<b>No NHS equivalent:</b>								
<b>Minimum ICU size</b>	No guideline	4 beds (L2) or 6 beds (L3)	No guideline	6 beds (L1) or 12 beds (L2/3)	8 to 12 treatment places	6 beds	No guideline	
<b>Minimum volumes</b>		Ventilation patients per year: 200/300 (L2/3)	No guideline	Bed days/yr 2,500/3,000 (L2/3); ventilation days 1,250/1,500 (L2/3)		No guideline	No guideline	

<sup>1</sup> For level 2 and 3 acuity patients



# Critical care – Comparison of standards

Stricter target than NHS  
Same target than NHS  
More lenient target than NHS  
 No target

	England	Victoria	Ontario	Netherlands	Germany	Sweden	Arkansas	NHS strict?
24/7 availability of IC consultant	✓ - 30 min	✓	✓ if >14p	✓ - 20 min	✓	✓	✗	
Multidisciplinary reviews	Daily	✗	✗	Daily	✗	✓ if complex	✗	
Nurse ratios (nurse to patients/beds)	1:2	1:1	1:2	1:3.5	1:2	✗	1:x	
Supernumerary clinical coordinator	✓ if >6p	✗	✗	✗	✗	✗	✗	
Consultant/ patient ratio	1:15	✗	✗	1:12	1:10	1:6	✗	
Pharmacy services	5 days	24/7	7 days	✗	24/7	24/7	✗	
Network requirements	✓	✓	✓	✓	✗	✗	✗	
ICU is led by a specific specialist	✓	✓	✓	✓	✓	✓	✗	
Minimum ICU size (beds)	✗	4-6	✗	6-12	8-10	6	✗	
Minimum volumes	✗	✓	✗	✓	✗	✗	✗	

Note: Targets based on level 2 care where applicable, or lowest standard where a range is given



# England and Victoria set the strictest requirements regarding the definition of an intensivist

	Standard on ICU clinical leadership	Definition of an intensivist	Summary requirements
England <sup>1</sup>	<b>A consultant in intensive care Medicine</b>	A Consultant in Intensive Care Medicine is a Consultant who is a Fellow/ Associate Fellow or eligible to become a Fellow/ Associate Fellow of the Faculty of Intensive Care Medicine; The indicative minimum duration for ICM CCT training is 7 years, including both core and HST (Higher Specialist Training)	<ul style="list-style-type: none"> <li>• <b>IC specialised consultant</b></li> <li>• <b>7 years IC training</b></li> </ul>
Victoria <sup>2</sup>	<b>A fellow of The college of IC medicine (L2/3)</b>	A Fellow of the College of Intensive Care Medicine. Training in intensive care medicine is 6 years	<ul style="list-style-type: none"> <li>• <b>IC specialised consultant</b></li> <li>• <b>6 years IC training</b></li> </ul>
Ontario <sup>3</sup>	<b>An intensivist</b>	Ideally, an intensivist has Royal College accreditation for critical care subspecialty (2 years additional training). Recognizing human resource issues and that this is a relatively new accredited specialty, specialists with at least a minimum of six post-graduate months of critical care training or experience are a reasonable alternative	<ul style="list-style-type: none"> <li>• <b>Consultant with IC subspecialty</b></li> <li>• <b>2 years IC training</b></li> <li>• <b>Trainee (6 months) allowed</b></li> </ul>
Netherlands <sup>4</sup>	<b>An intensivist</b>	An intensivist is a medical specialist with a registered interest area of intensive care medicine, awarded by their respective specialism and the General Intensivist Commission (GIC) after 2 years of post-specialisation training	<ul style="list-style-type: none"> <li>• <b>Consultant with intensive care interest</b></li> <li>• <b>2 years IC training</b></li> </ul>
Germany <sup>5</sup>	<b>A specialist dedicated intensivist</b>	An intensivist is a medical specialist with a registered interest area of intensive care medicine, requiring 2 years of post-specialisation training	<ul style="list-style-type: none"> <li>• <b>Consultant with intensive care interest</b></li> <li>• <b>2 years IC training</b></li> </ul>
Sweden <sup>6</sup>	<b>Anesthetist or intensivist</b>	A specialist in anesthesia and intensive care, or a resident physician in the same specialty. Specialisation takes 5 years. Resident physicians must have completed at least six months of service in the specialty	<ul style="list-style-type: none"> <li>• <b>IC specialised consultant</b></li> <li>• <b>5 years</b></li> <li>• <b>Trainee (6 months) allowed</b></li> </ul>
Arkansas <sup>7</sup>	<b>No guideline</b>		

SOURCES: 1. Intensive Care Society, Royal College of Nursing, British Association of Critical Care Nurses et al. – Core Standards for Intensive Care Units, 2013; 2. College of Intensive Care Medicine – Minimum standards for intensive care units 2010; 3. Ontario Critical Care Steering Committee – Final report, 2005 & Royal College.ca; 4. Nederlandse Vereniging voor Anesthesiologie – Richtlijn Organisation en werkwijze op intensive care-afdelingen voor volwassenen in Nederland; 5. Deutschen Interdisziplinären Vereinigung für Intensiv- und Notfallmedizin – Empfehlungen zur Struktur und Ausstattung von Intensivtherapiestationen 2010 & www.aerztekammer-bw.de; 6. Svensk Förening för Anestesi och Intensivvård – Riktlinjer för svensk intensivvård 2009; 7. Arkansas Department of Health – Rules And Regulations For Hospitals And Related Institutions In Arkansas 2007



# Critical care – Reasoning behind the critical standards

Standards	Why critical?
<b>24/7 availability of IC consultant</b>	<ul style="list-style-type: none"><li>24/7 availability of a specialised IC consultant requires a certain size of ICU to warrant the investment</li><li>In addition, trained IC consultants need to be recruited, which may be more difficult for remote/smaller hospitals, especially in countries where there is an IC consultant shortage</li></ul>
<b>Multidisciplinary reviews</b>	<ul style="list-style-type: none"><li>Daily multidisciplinary reviews require a significant investment in a large team, which ideally serves a reasonably sized ICU</li><li>The different disciplines need to be recruited</li></ul>
<b>Nurse ratios</b>	<ul style="list-style-type: none"><li>Nurse ratios may require additional investment in staff for smaller hospitals</li><li>Smaller ICUs may see more variation in occupancy rates, making staff planning to meet ratios more complex</li></ul>
<b>Supernumerary clinical coordinator</b>	<ul style="list-style-type: none"><li>Supernumerary clinical coordinators may require additional investment in staff for smaller hospitals</li><li>Smaller hospitals with fewer nurses available may struggle to keep one nurse exempt from nursing tasks</li></ul>
<b>Consultant/ patient ratio</b>	<ul style="list-style-type: none"><li>Consultant ratios may require additional investment in staff</li><li>Smaller ICUs may see more variation in occupancy rates, making staff planning to meet ratios more complex</li></ul>
<b>Pharmacy services</b>	<ul style="list-style-type: none"><li>Pharmacy services may not be available to smaller hospitals</li><li>Providing pharmacy services will require an additional investment</li></ul>
<b>Network requirements</b>	<ul style="list-style-type: none"><li>Networks are important for smaller hospitals because they provide a referral and escalation route</li></ul>
<b>ICU is led by a specific specialist</b>	<ul style="list-style-type: none"><li>24/7 availability of a specialised manager requires a certain size of ICU to warrant the investment</li><li>In addition, consultants need to be recruited, which may be more difficult for remote/smaller hospitals</li></ul>
<b>No NHS equivalent:</b>	
<b>Minimum ICU size</b>	<ul style="list-style-type: none"><li>In smaller hospitals the minimum size may exceed demand, resulting in expensive underutilisation</li></ul>
<b>Minimum volumes</b>	<ul style="list-style-type: none"><li>In smaller hospitals the minimum volumes may not be met</li></ul>



# Critical care – Sources

## Sources for standards

### England

- Intensive Care Society, Royal College of Nursing, British Association of Critical Care Nurses et al. – Core Standards for Intensive Care Units, 2013

### Victoria

- College of Intensive Care Medicine – Minimum standards for intensive care units 2010

### Ontario

- Ministry of Health Critical Care Secretariat – Standards for Critical Care Nursing in Ontario 2012
- Ontario Critical Care Steering Committee – Final report, 2005

### The Netherlands

- Nederlandse Vereniging voor Anesthesiologie – Richtlijn Organisation en werkwijze op intensive care-afdelingen voor volwassenen in Nederland

### Germany

- Deutschen Interdisziplinären Vereinigung für Intensiv- und Notfallmedizin – Empfehlungen zur Struktur und Ausstattung von Intensivtherapiestationen 2010

### Sweden

- Svensk Förening för Anestesi och Intensivvård – Riktlinjer för svensk intensivvård 2009

### Arkansas

- Arkansas Department of Health – Rules And Regulations For Hospitals And Related Institutions In Arkansas 2007



# Critical care – Standard setting context

## Standard setting context

### England

- A collective 'Core Standards for Intensive Care Units' was published by the Intensive Care Society, Royal College of Nursing, British Association of Critical Care Nurses and other organisations
- There exists no national monitoring against those standards, but local programmes like London Quality Standards do report their performance based on the recommendations
- The CQC is in the very early stages but are moving to make hospitals compliant against ICU standards, and to issue compliance orders and warnings based on them

### Victoria

- The College of Intensive Care Medicine sets definitions and standards for ICUs which are adopted and re-published by Victoria Department of Health
- There is no monitoring or direct enforcement of standards

### Ontario

- The Critical Care Strategy is based on the recommendations outlined in the Ontario Critical Care Steering Committee Final Report as presented to the Minister of Health and Long-Term Care
- Critical Care Services Ontario reviews services against the Strategy and published results
- Nursing specific standards in the Strategy were developed with the Nursing Practice of the College of Nurses of Ontario (CNO) and the Canadian Association of Critical Care Nurses (CACCN)

### Netherlands

- The main body setting and measuring performance standards is the Inspectie voor de Gezondheidszorg (IGZ; Inspection for Healthcare)
- Standards are set according to the three levels of ICU
- Audits are conducted on performance against these metrics by the IGZ, but no individual providers are mentioned

### Germany

- In 2010, the first version of German quality indicators in intensive care were published by the German Interdisciplinary Society of Intensive Care Medicine (DIVI), which were reviewed in 2013
- An increasing number of peer reviews are showing a high degree of implementation of the standards
- Fulfillment of certain prerequisites (e.g. continuous physician presence) can impact ICU cost reimbursement, which are highly variable

### Sweden

- The Swedish Society of Anaesthesiology and Intensive Care (SFAI) publishes national guidelines
- Founded in 2001 and made up by the ICUs in Sweden, The Swedish Intensive Care Register publishes guidelines and runs a national quality register

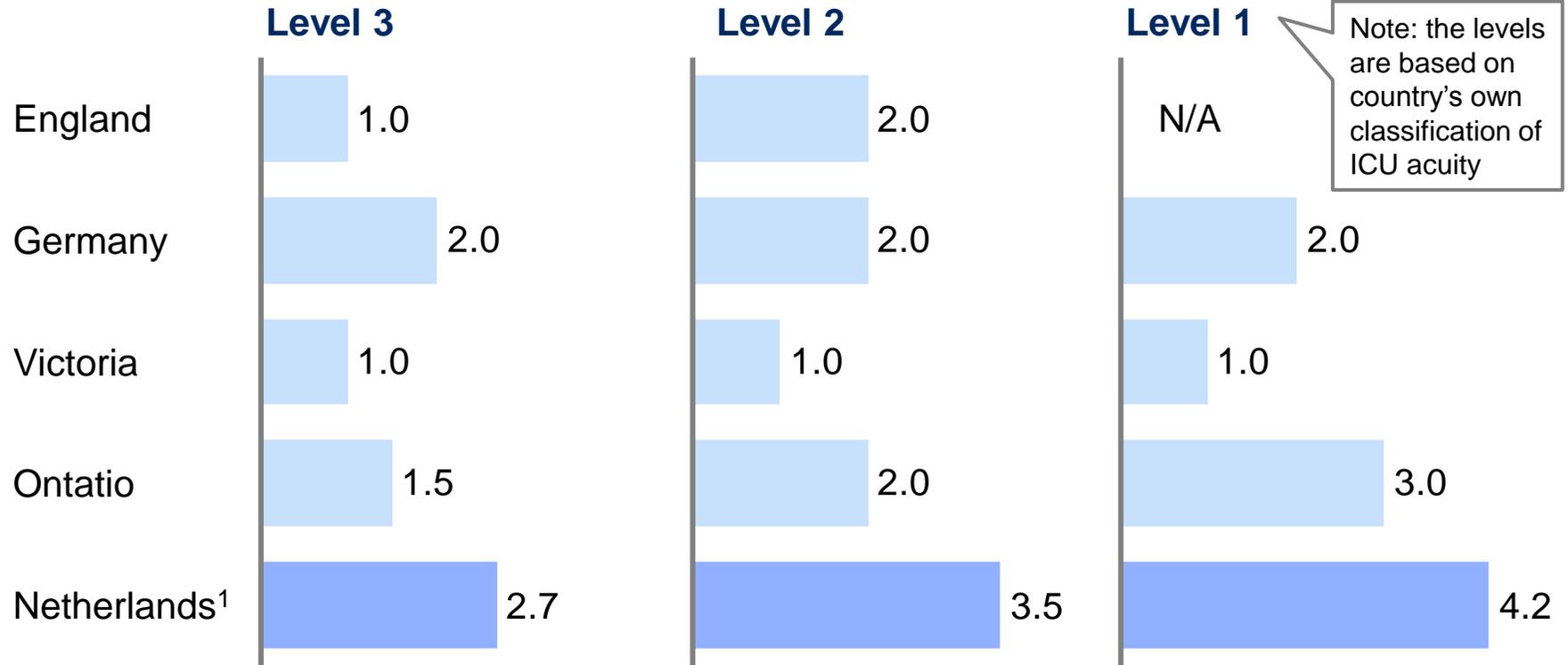
### Arkansas

- The State Health Department sets "Rules and Regulations for Hospitals and Related Institutions in Arkansas" which hospitals have to comply with to get certification
- The Society of Critical Care Medicine publishes national guidelines
- There is no monitoring of standards



# Nurse ratios for ICUs vary between countries

## Patients per nurse



<sup>1</sup> Netherlands: IC qualified nurses per ventilator bed

# Critical care services in the Netherlands

## Service line definition

- In the Netherlands ICUs are split in 3 levels:
  - Level 1: Care after an operation or support of one or more vital organs (43 hospitals)
  - Level 2: Level 1 care plus specific medical treatments like neurosurgery (25 hospitals)
  - Level 3: Very complex patients requiring continuous presence of a specialist (23 hospitals)

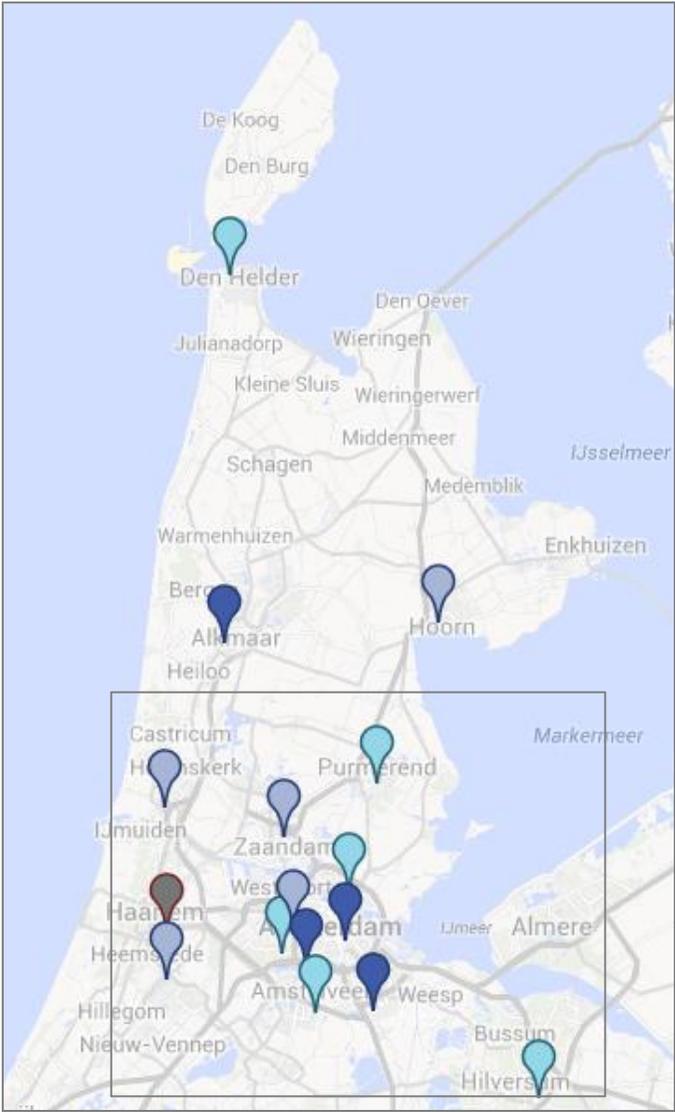
## Service delivery model

- Critical care networks are mandatory but not well developed<sup>1</sup>
  - ICUs are required to form networks to provide care of all levels to patients
  - One ICU takes on the coordinating function in the network
  - Level 1 ICUs are required to consult with the coordinating ICU on complex, longer duration cases
  - While the networks are mandated and have been agreed everywhere, implementation is facing problems around repatriation of patient, lack of financial incentives and capacity issues in larger ICUs
- ICU have specific standards and requirements
  - ICUs in the Netherlands require dedicated intensivists or IC-trained consultants
  - Availability of other specialist (pharmacists, physiotherapists) is required for daily multidisciplinary reviews
  - There are minimum staffing, size and volume requirements based on the level of the ICU
- There are plans to centralise the current ICU landscape<sup>2</sup>
  - Currently almost all hospitals (91) have an ICU
  - There are discussions on whether to reduce the number of ICUs to 50 hospitals across the country, to increase volume and quality

## Comparison to NHS

- Like the NHS, the Netherlands have been looking at setting up critical care networks
- However, the results are mixed and agreements are unclear
- Critical care in the Netherlands is currently provided by many hospitals, but all with different levels of acuity
- Like in England, there is a move to centralise care in the future but the plans are in an early stage

# All hospitals in Noord-Holland have an ICU but their level of acuity varies



- Level 1 ICU (Lowest level of acuity)
- Level 2 ICU
- Level 3 ICU
- Level unknown

# Critical care networks are supported by mobile ICUs, providing specialised ICU transport across the country



- In 2008 six hospitals, or groups of hospitals, got a license to provide regional mobile intensive care unit (MICU) services for the transport of critically ill patients between hospitals
- All MICUs operate 7 days a week, with two providing 24hr services while others operate from 8am to 6pm during the initial phase of the programme
- Each center transports between 175 to 500 patients per year
- The MICUs are staffed by specially trained intensivists and IC nurses
- Special trolleys are used by the MICUs, which are equipped with full IC technologies

- University hospital providing MICU services
- General hospital providing MICU services
- Hospitals collaborating to provide one MICU service



# Critical care services in Ontario

## Service line definition

- In Ontario, there are two types of critical care units:
  - Level 2 units provide detailed observation or intervention, short-term non-invasive ventilation or post-operative care (50 hospitals)
  - Level 3 units are capable of providing the highest level of service (76 hospitals)
- 48 hospitals have no critical care capacity

## Service delivery model

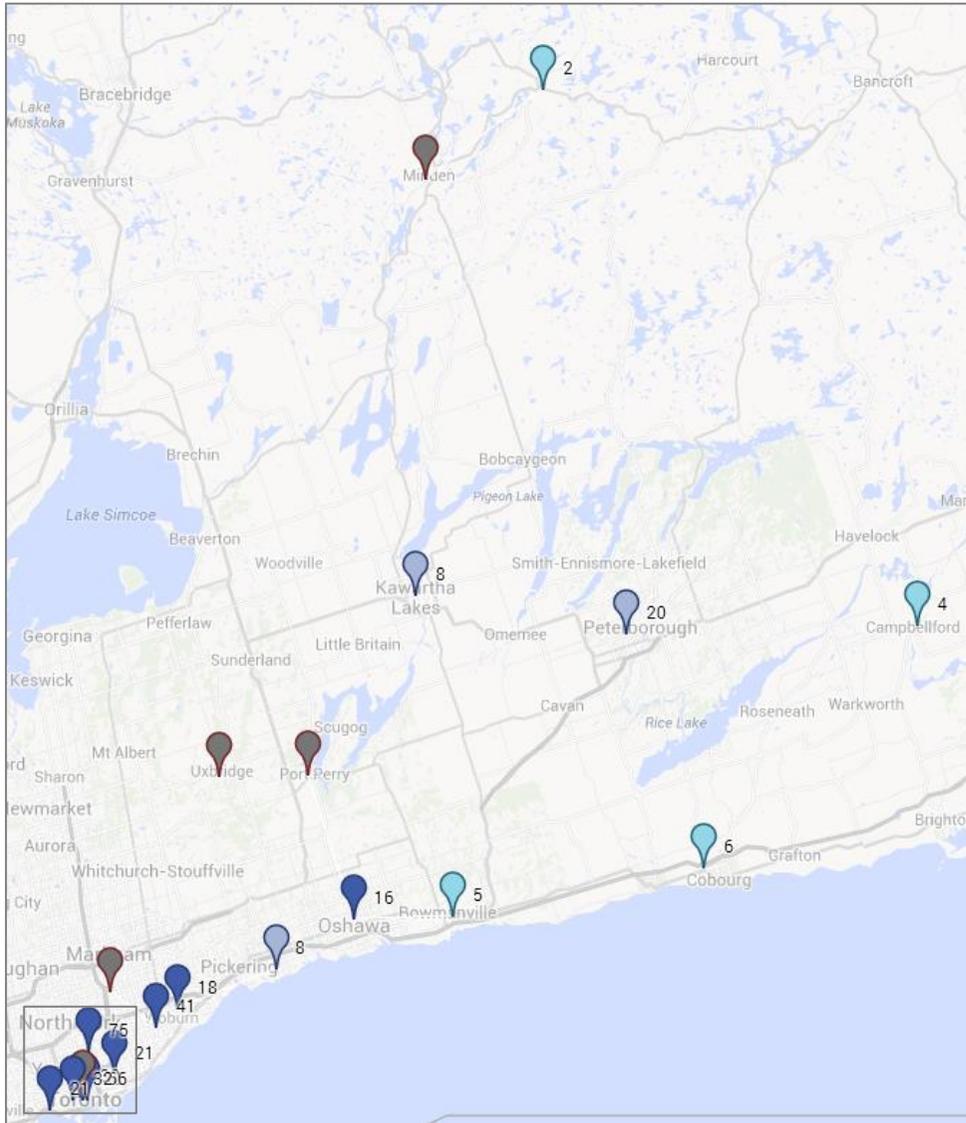
- Critical Care Services Ontario coordinates critical care for the entire province
  - It leads the overall planning, implementation and evaluation of critical care services
  - The Critical Care Information System (CCIS)'s real time data on every patient admitted provides an important medium for monitoring and managing the province's critical care resources more effectively
  - CitiCall Ontario provides 24/7 emergency consultations for patient treatment decision support, and centralised bed and transfer management, as well as quality improvement and reporting initiatives
- New workforce models are being developed
  - Critical Care Response Teams (CCRTs), one of the seven initiatives of the Critical Care Strategy, are comprised of specially trained critical care practitioners and work collaboratively with hospital staff to identify, assess, and respond to the needs of seriously ill patients prior to deterioration
- Staffing and other requirements are based on the level of the ICU
  - An intensivist should coordinate access to and be the most responsible physician for critical care in units capable of providing Level 3 care

## Comparison to NHS

- Compared to the NHS, more acute providers operate without an in-house critical care service in Ontario
- Lower tier critical care providers are supported by a state-wide 24/7 telephone line to critical care specialists and a centralised bed management and retrieval support service
- Although we have not found evidence that quality of critical care is low in the region, local efforts are ongoing to address known problems - particularly around lack of capacity for higher level services and repatriation protocols – which suggest this may not be a good service to review in more depth



# Advanced critical care is heavily concentrated in the central Toronto area with predominantly lower levels of provision in district hospitals



- Central Toronto hospitals have a concentration of level III facilities and receive a large proportion of transfers for other LHINs in Ontario
- Critical care facilities in Central Toronto LHIN frequently operate at  $\geq 95\%$  occupancy and repatriation of patients is a major challenge (in part ameliorated by recent Ontario Critical Care Strategy and state-wide CitiCall service)

	Level III ICU, intensivist led		Paediatric & neonatal ICU
	Level III ICU, not intensivist led		No ICU
	Level II ICU		ICU beds



# Critical care in Sweden

## Service line definition

### In Sweden there are three levels of ICUs:

1. Region or university hospitals, which provide the most qualified monitoring and treatment
2. County hospitals, set up to provide support in most organ systems, particularly circulatory and respiratory failure, but lack the most advanced methods
3. Rural hospitals, providing acute failure of some organ systems, but lacks the ability to offer care at the level 1/2

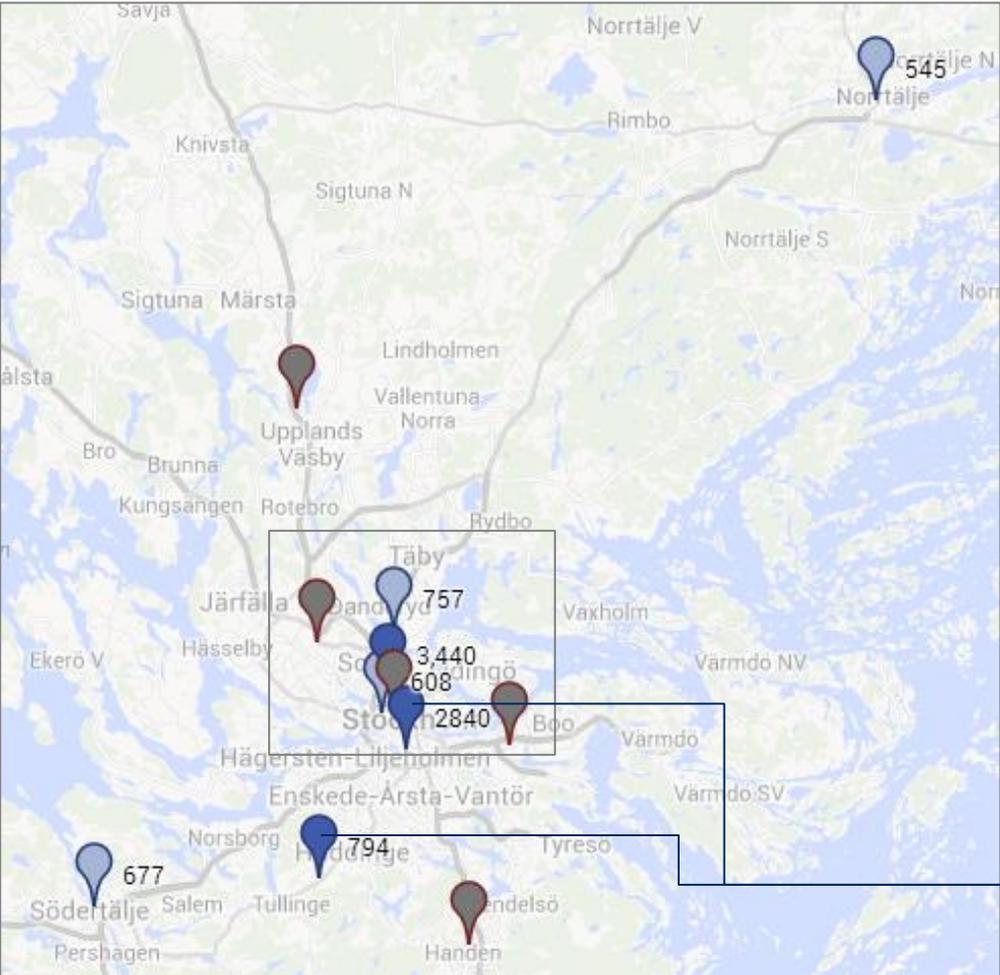
## Service delivery model

- ICU care is not centralised and number of admissions varies significantly
  - There are 84 ICUs in Sweden<sup>1</sup>
  - The average number of admissions per ICU per year is 600, but varies from 150 to 5,641 per hospital<sup>1</sup>
- Region or university hospitals also often have specialized ICUs focused on supporting specific clinics
  - For example, Karolinska has a general, paediatric, neurosurgical and thoracic ICU, as well as a specialised ICU for Extra Corporeal Membrane Oxygenation
- ICU standards are set according to the level of care they provide
  - There are minimum staffing, size and volume requirements based on the level of the ICU
  - The managing physician needs to be an anaesthetist or intensivist

## Comparison to NHS

- Critical care in Sweden is similar to the NHS, with most acute hospitals offering some form of ICU
- Like in England, Swedish larger hospitals often offer some kind of specialised ICU care

# All acute hospitals have an ICU, and the larger hospitals have specialised ICUs



**Karolinska Solna**

- General ICU: 1,063
- Paediatric ICU: 739
- Extra Corporeal Membrane Oxygenation ICU: 68
- Neurosurgical ICU: 410
- Thoracic ICU: 1,160

**Sodersjukhuset**

- General ICU: 794
- Cardiac ICU: 2,004

**Astrid Lindgren**

- Neonatal ICU Solna: 600
- Neonatal ICU Huddinge: *Admissions unknown*

● Specialised ICUs  
 ● General ICU  
 # Number of ICU admissions per year (excl. neonatal ICU)



# Critical care services in Germany

## Service line definition

- Intensive care units are specifically staffed and equipped stations in which the medical care of critically ill patients is ensured. The critically ill patient is characterized by life-threatening disorders of one or more organ systems<sup>1</sup>

## Service delivery model

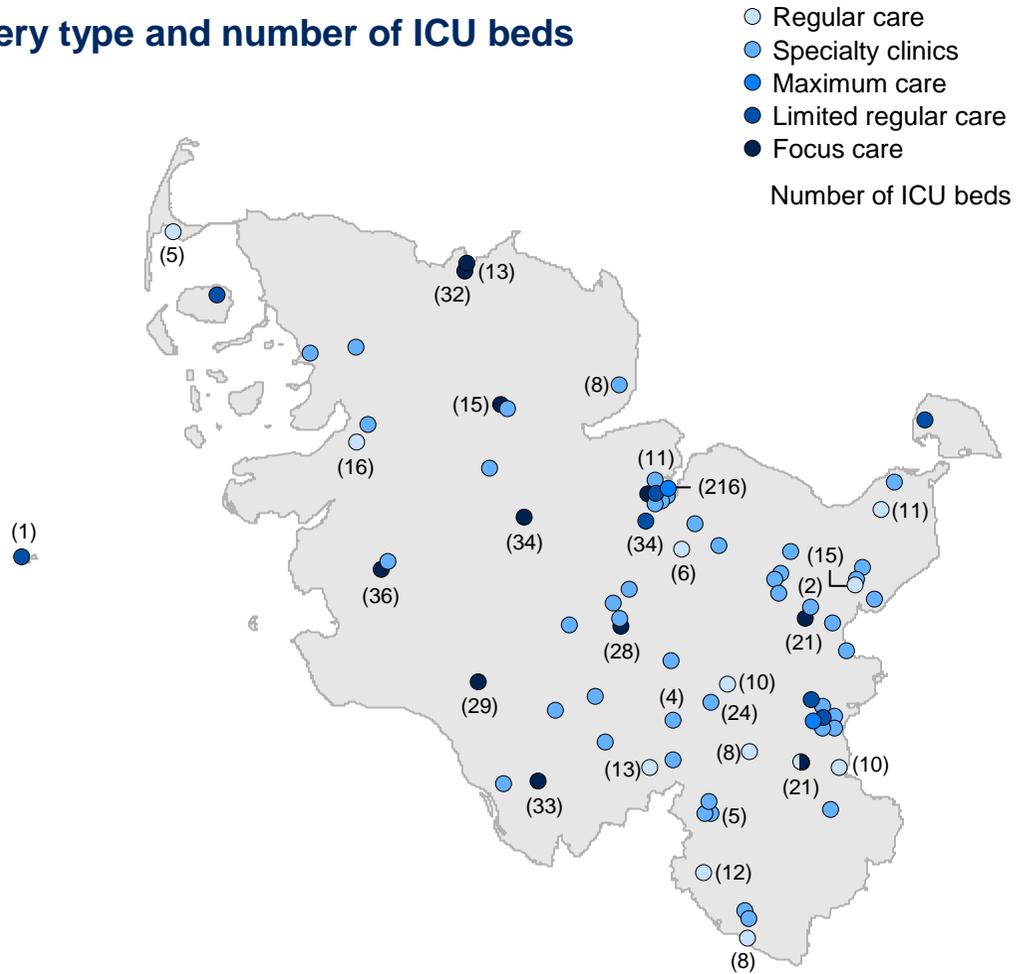
- While there is no ICU level differentiation, the requirements for an ICU are determined by the hospital type
  - Germany does not define three levels of ICU acuity like in the other countries
  - The Land hospital plan requires ICU beds for hospitals delivering regular care or higher
  - 24-hours-physician presence required for focus care hospitals
- In Germany, there are 31.8 ICU beds per 100,000 population, versus 7.5 and 9.3 in the UK and the Netherlands respectively<sup>2</sup>
- Quality standards for critical care are new but see a good uptake
  - In 2010, the first version of German quality indicators in intensive care were published by the German Interdisciplinary Society of Intensive Care Medicine (DIVI), which were reviewed in 2013<sup>1</sup>
  - An increasing number of peer reviews are showing a high degree of implementation of the standards
- ICU cost reimbursement is highly variable and generally disadvantages smaller hospitals<sup>2</sup>
  - Reimbursement is based on a highly specific DRG system, taking into account complexity of the condition, health status (e.g. ventilation required), complex treatment (e.g. 24/7 consultant presence required) and complicating procedures (e.g. chemotherapy)
  - Since smaller hospitals have less complex cases, they generally receive lower reimbursements

## Comparison to NHS

- Critical care services in Germany are similar to England, with most hospitals providing ICU beds
- In Germany however, this is the result of standards that require hospitals of a certain level of care to have an ICU
- Requirements for ICU staffing and other guidelines are set at a general level (i.e. disregarding acuity) in both England and Germany

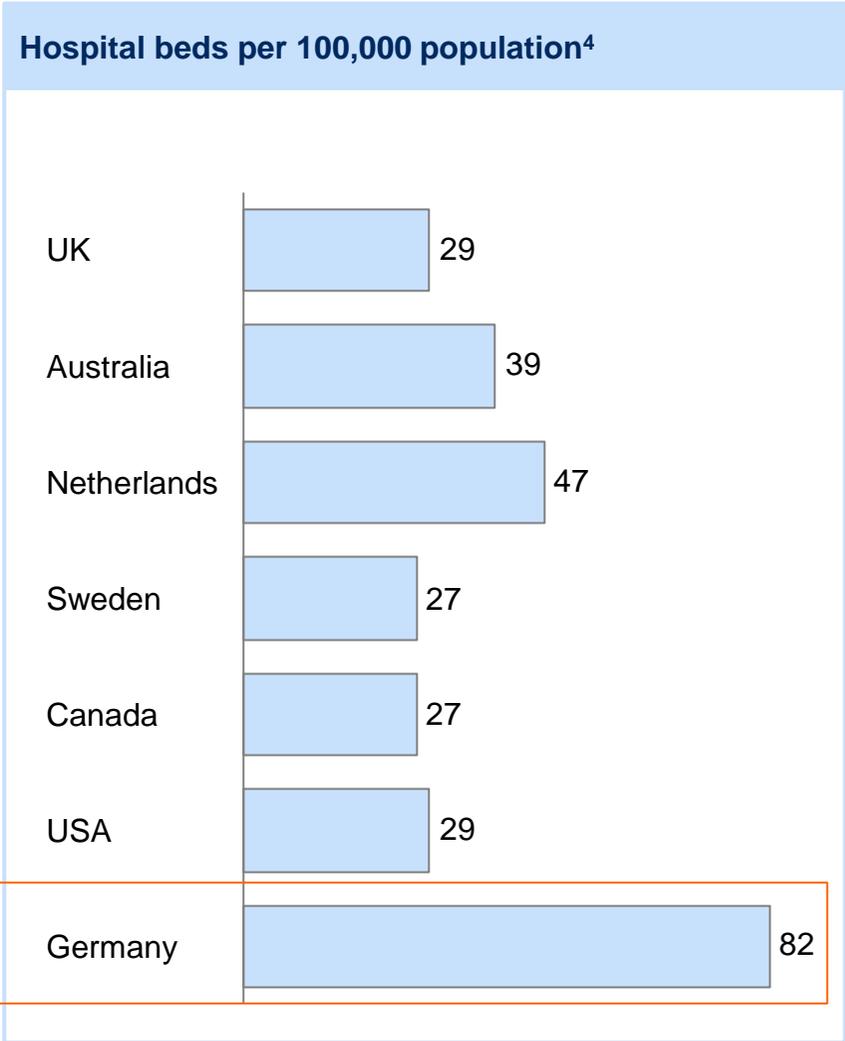
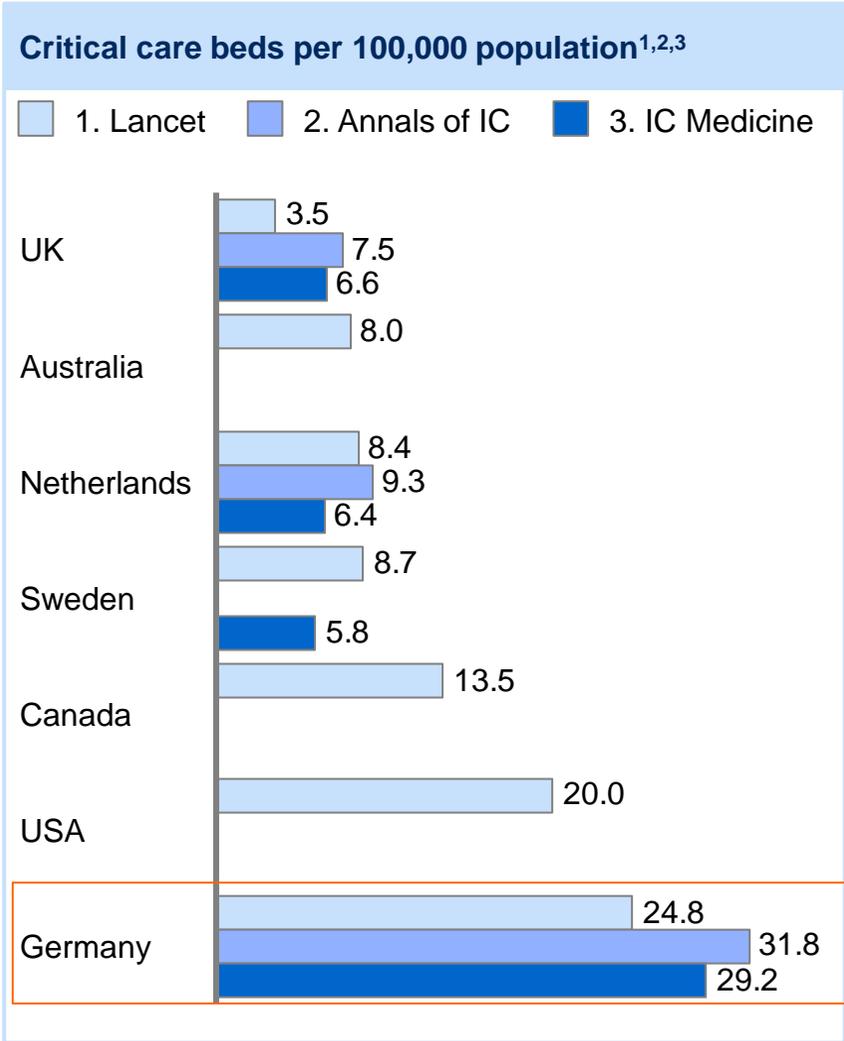
# ICU beds are required for regular care hospitals and higher levels of delivery types

## Hospitals by delivery type and number of ICU beds





# Different sources show the same high number of critical care beds for Germany, but this same trend is seen in general hospital beds



SOURCE: 1. Critical care and the global burden of critical illness in adults, Lancet 2010; 2. Bittner et al.: How is intensive care reimbursed? A review of eight European countries. Annals of Intensive Care 2013, 3:37; 3. Rhodes et al.: The variability of critical care bed numbers in Europe, Intensive Care Medicine 2012; 4. WHO World Health Statistics 2014



# Critical care in Arkansas - Introduction

## Service line definition

- A Critical Care Unit is a section of the hospital where intensive care nursing, necessary monitoring and treatment equipment and supplies are provided to those patients who, in the opinion of the attending physician, require such specialized services
- Critical care beds in US hospitals are categorised by specialty and acuity. The main categories are adult medical/surgical, cardiac, paediatric, neonatal and burns. Acuity levels and requirements are set out in national clinical guidelines, for example those published by the Society for Critical Care Medicine, but these are not nationally mandated or monitored

## Service delivery model

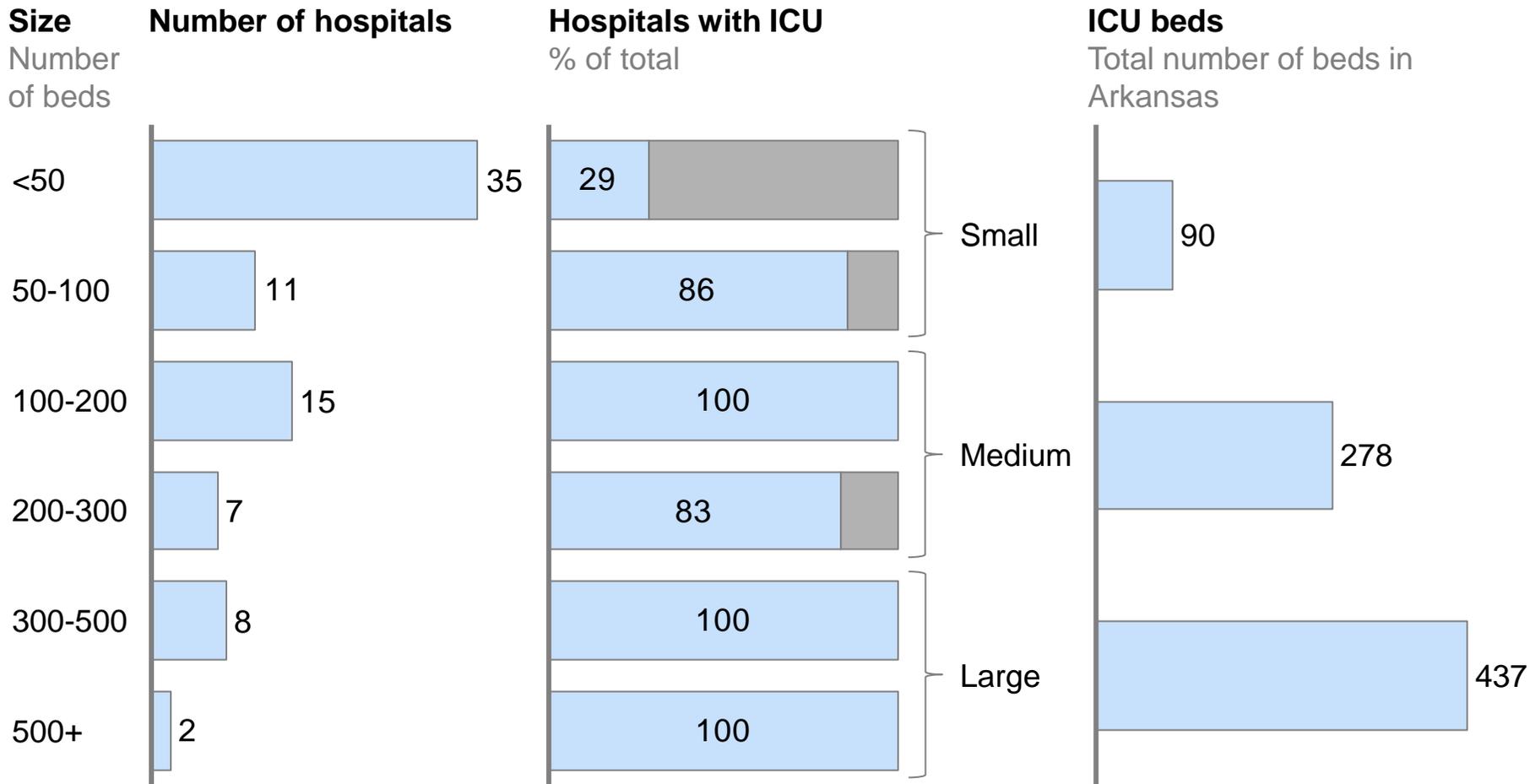
- Acute hospitals are required to provide facilities for higher-dependency care appropriate to the services that they provide. The level and scale of service provision is not centrally determined and accreditation requirements only set out the minimum level of nurse coverage that is required.
- Around half of all acute (medical/surgical) hospitals have dedicated Intensive Care beds
  - In general, dedicated ICU beds are not available at the smaller Critical Access hospitals
  - Patients requiring this level of care would be transferred to another hospital with the appropriate level of service provision
- Ten acute hospitals provide neonatal intensive care beds. Only the state tertiary children's hospital – Arkansas Children's Hospital – provides paediatric intensive care beds, serving the state population of 2.9 million.
- Recently, there has been a state-level effort to calibrate and coordinate neonatal intensive care services across the state, in order to standardize and, to some extent rationalize, the level of services available. This process is ongoing.
- Some hospital systems (private for-profit or not-for-profit chains) operate an e-ICU system whereby multiple sites are monitored and managed from a central location.

## Comparison to NHS

- As there are many more smaller acute providers in Arkansas, as compared to the NHS, there are a larger proportion of sites that operate without on-site dedicated Intensive Care Units
- eICU is far more developed than in the NHS driven both by a number of factors including (but not limited to) a greater willingness to invest in technology, more hospital chains operating under a unified management, and more smaller sites and dispersed population centres



# While many small hospitals have ICU beds, the majority of beds are in larger hospitals





# eICU systems are supporting small, remote hospitals delivering critical care in Arkansas

## Baptist Health's eICU

### Baptist Health

- Baptist health is a health system which operates seven hospitals in Arkansas
- They have introduced eICU technology, which allows for critical care patient monitoring throughout the system at a central remote location
- The physicians and nurses staffed in the eICU control center act as additional support to monitor critically ill patients
- The eIUC system currently includes two critical care units at BHMC-Little Rock and one at BHMC-North Little Rock, but will eventually cover the entire system

### The technology

- The main system monitors vital signs, medications, blood test results, X-rays and other diagnostic information from bedside monitors and medical records
- In addition, special software enables the central team to monitor every critical care patient at once
- All the ICU rooms in the hospitals are equipped with cameras as well as microphones, to allow the central team to observe patients and interact with the local staff

### Quality outcomes

- eICU are increasing quality by increasing intensivist coverage, where currently only 13% of patients in critical care is seen by an intesivist



# Critical care services in Victoria, Australia

## Service line definition

- In Victoria ICUs are split in 3 levels:
  - 1. Provide immediate resuscitation and short term cardio-respiratory support (1 public hospital)<sup>1</sup>
  - 2. Provide a high standard of general intensive care, including complex multi-system life support (13 public hospitals)<sup>1</sup>
  - 3. Tertiary referral unit, providing comprehensive care including complex multi-system life support (9 public hospitals)<sup>1</sup>
- In addition, there are 13 Coronary Care Units (CCU) and 3 High Dependency Units (HDU)<sup>1</sup>

## Service delivery model

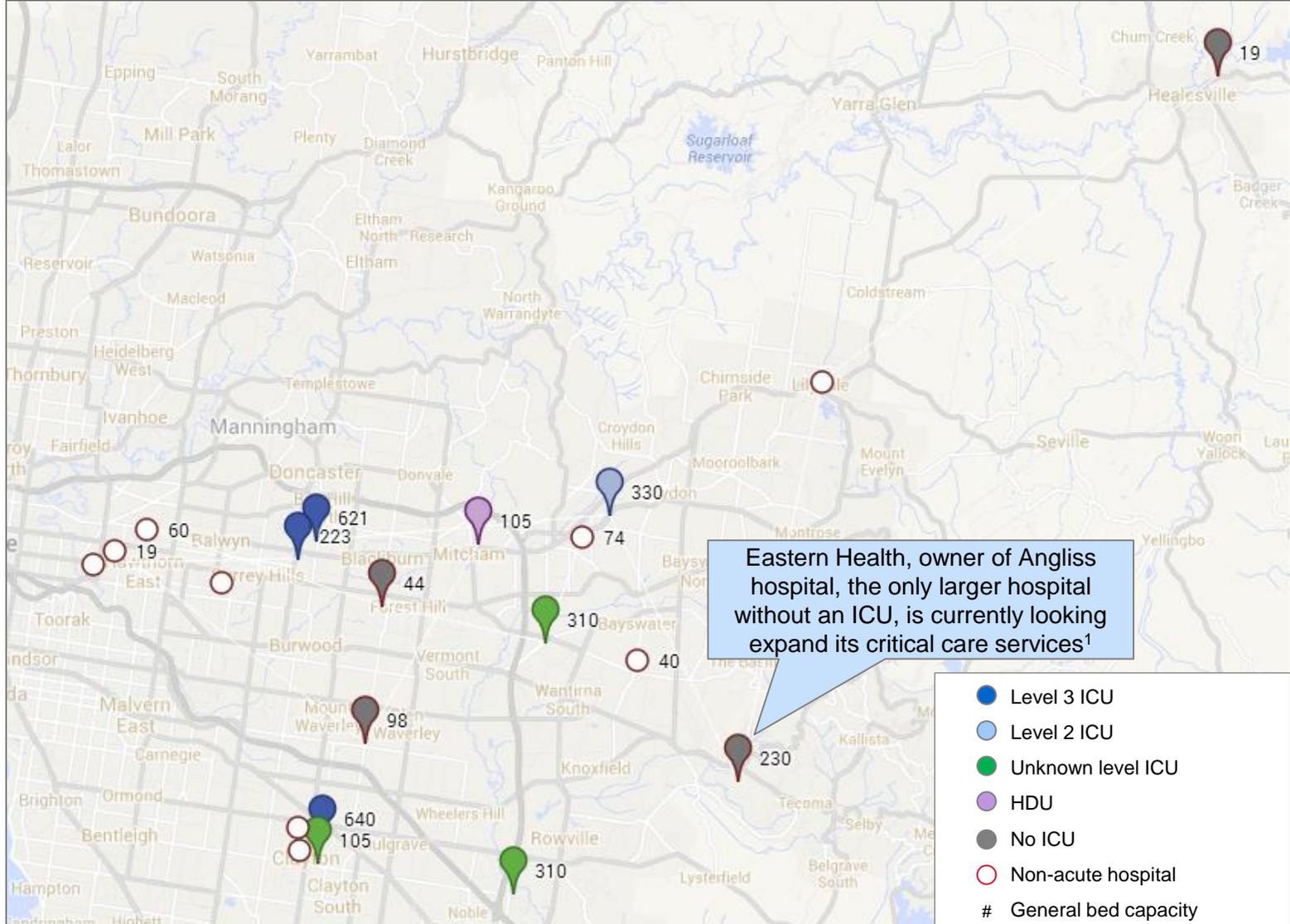
- Adult Retrieval Victoria (ARV) coordinates critical care in the state<sup>2</sup>
  - It is a single contact point for major trauma advice, adult critical care advice, critical care bed access, and retrieval of critical care adult patients state-wide
  - They liaise closely with public and private hospital critical care units (ICU/HDU/CCU/ED) to facilitate access to critical care beds, and monitor the availability of critical care beds in the state to optimise the use of resources
- Critical care workforce shortages are being experienced across all jurisdictions and remain a major constraint to increasing ICU capacity<sup>3</sup>
- A service planning framework for the organisation and the distribution of intensive care services state-wide has been recommended but not yet implemented<sup>3</sup>
- ICU configuration is similar to the NHS, with new models being tested
  - ICUs (level 2 and 3) require a Fellow of the College of Intensive Care Medicine as a director<sup>4</sup>
  - There are minimum staffing, size and volume requirements based on the level of the ICU<sup>4</sup>
  - Alternate models of care such as ICU Liaison Nurse (LN) and Medical Emergency Teams (MET) have been piloted, reviewed and are being extended<sup>3</sup>

## Comparison to NHS

- As in England, most acute hospitals in Victoria provide critical care
- While different levels of patient acuity exist with regards to intensive care units in England, Victoria has a more clearly defined system of tiered care
- Standards are also set based on each tier
- A central coordination system and liaison services enable to operation of different tiers of care by creating a clear transfer and escalation network



# Almost all large acute hospitals in the Eastern Met region have some level of ICU



SOURCE: Critical Care Services in Victoria, Victoria Department of Health; hospital websites ; 1. Eastern Health 2022 - The Strategic Clinical Service Plan 2012–2022