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Using National Audit to Ensure Patients Receive the Best Possible Care and Outcomes

Professor David Harrison

Head Statistician, ICNARC

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25 years and counting...

What is ICNARC?

- ICNARC is an independent, not-for-profit, scientific organisation
- We work to help ensure the best possible care by facilitating improvements in the structure, processes, outcomes and experiences of critical care – for patients and for those who care for them

What is ICNARC?

- We achieve this by…
  - …establishing quality through research
  - …assessing quality through audit
  - …promoting quality through sharing information

"…research is concerned with discovering the right thing to do; audit with ensuring it is done right…"

Richard Smith, formed Editor-in-Chief, BMJ

ICNARC's National Audit Programme

	National clinical audit of adult critical care Launched in 1994
	National clinical audit of in-hospital cardiac arrest Launched in 2009 in collaboration with the Resuscitation Council UK
	National clinical audit of adult critical care (Republic of Ireland) Launched in 2010 in collaboration with the National Office of Clinical Audit
	National clinical audit of cardiothoracic critical care Launched in 2014 in collaboration with the Association for Cardiothoracic Anaesthesia and Critical Care

ICNARC Case Mix Programme

- 290 adult critical care units in England, Wales and Northern Ireland
- 100% coverage of general critical care units providing Level 3 (intensive) care

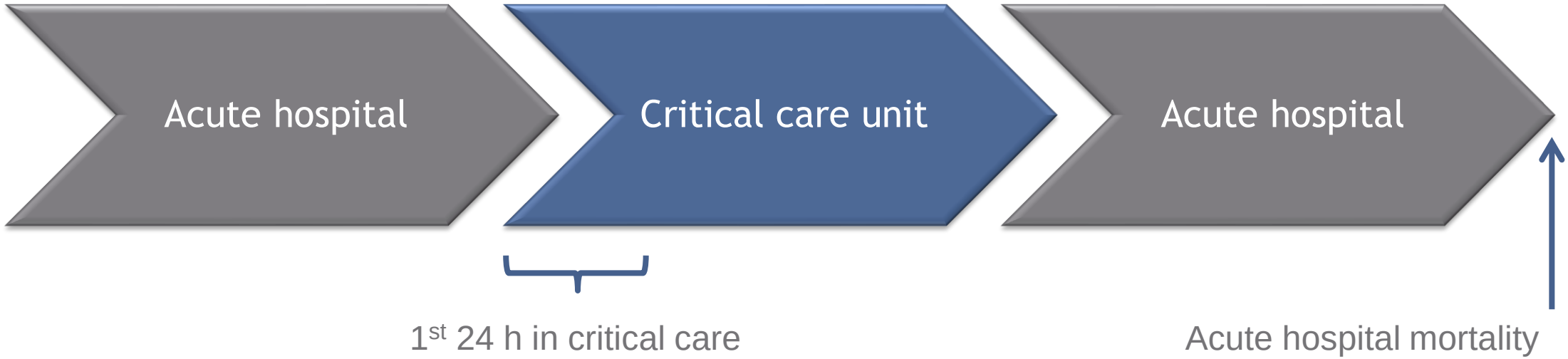
Challenges with auditing critical care

- Heterogeneous patient group
- Limited evidence-based interventions

Advantages of auditing critical care

- Data-rich environment
- Objective patient-centred outcome measure

case mix programme



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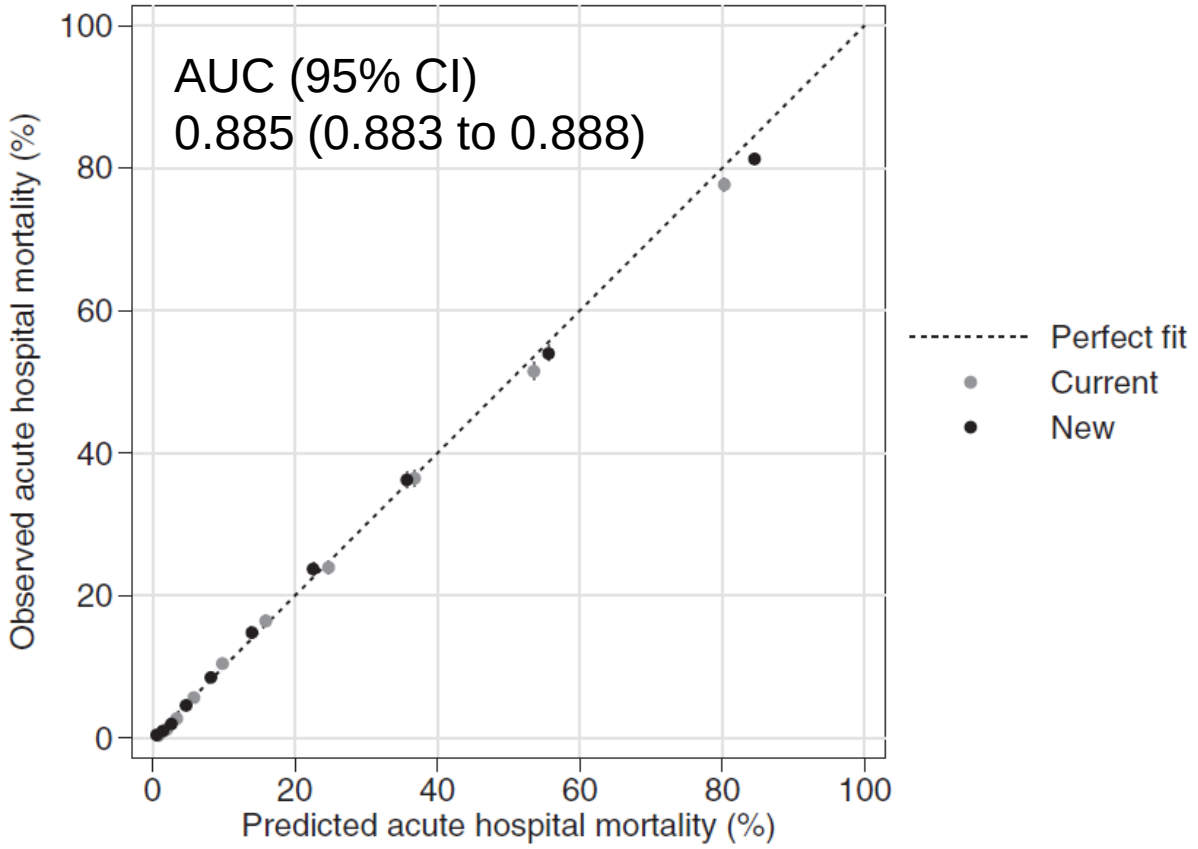
ICNARC risk prediction model

- Age
- Dependency
- Severe conditions in past medical history
- CPR pre-admission
- Prior location/urgency
- Primary reason for admission
- Physiology



Ferrando-Vivas et al. *J Crit Care* 2017; 38:335-9.

Reporting

- Quarterly reports to participating critical care units
- Reports to Critical Care Networks
- Online annual public report

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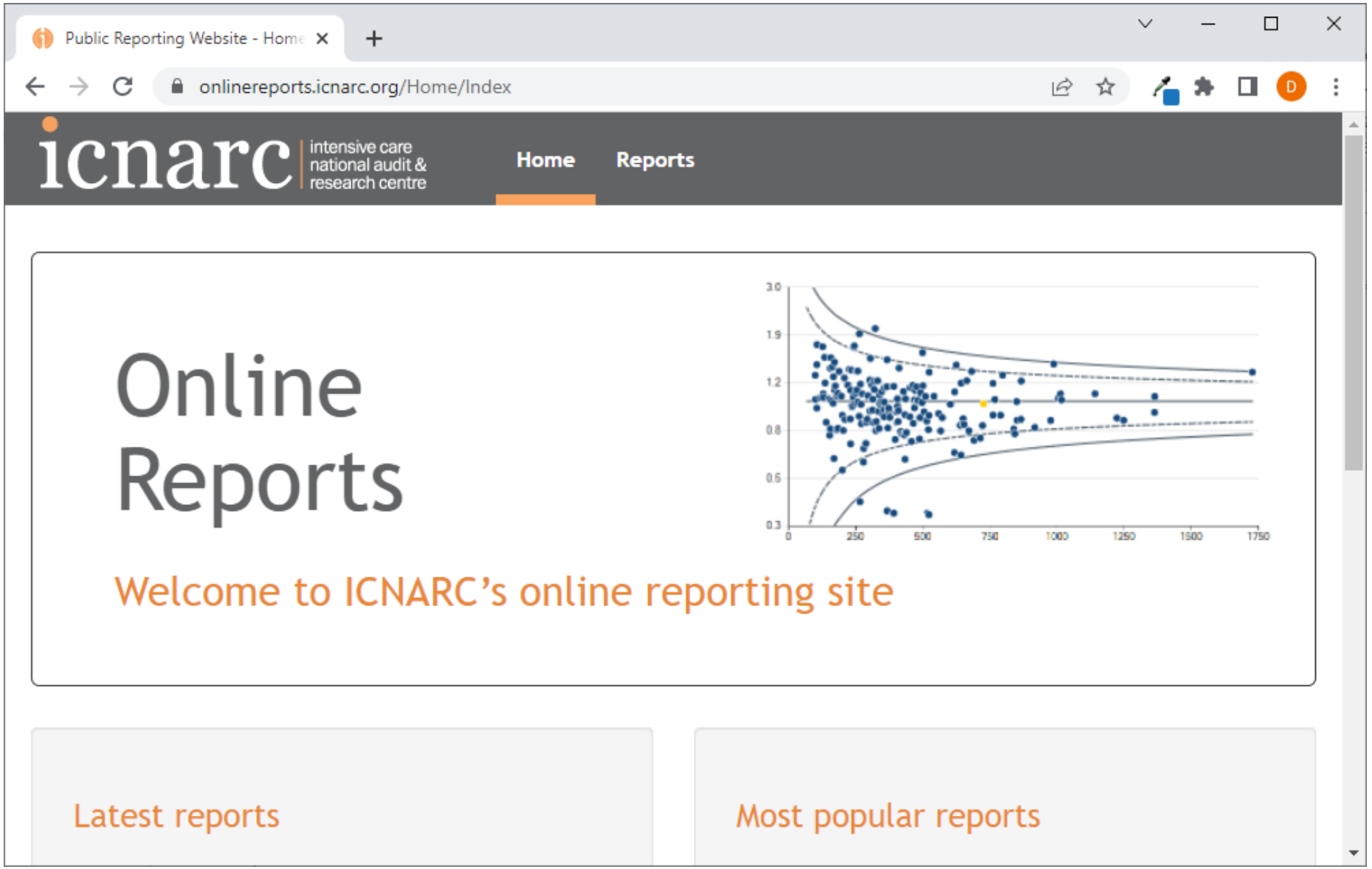

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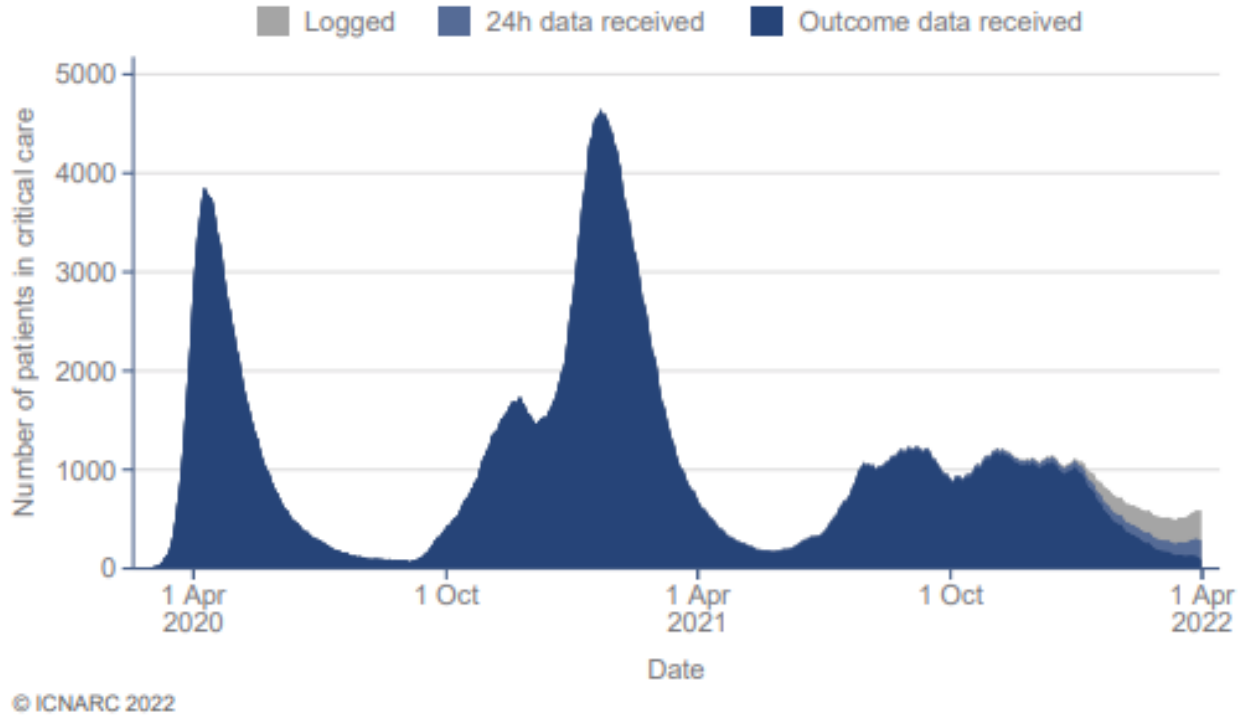
COVID-19

- Usual public reporting cycle paused due to COVID-19
- Focus instead on public reporting of national data to support the national response to COVID-19



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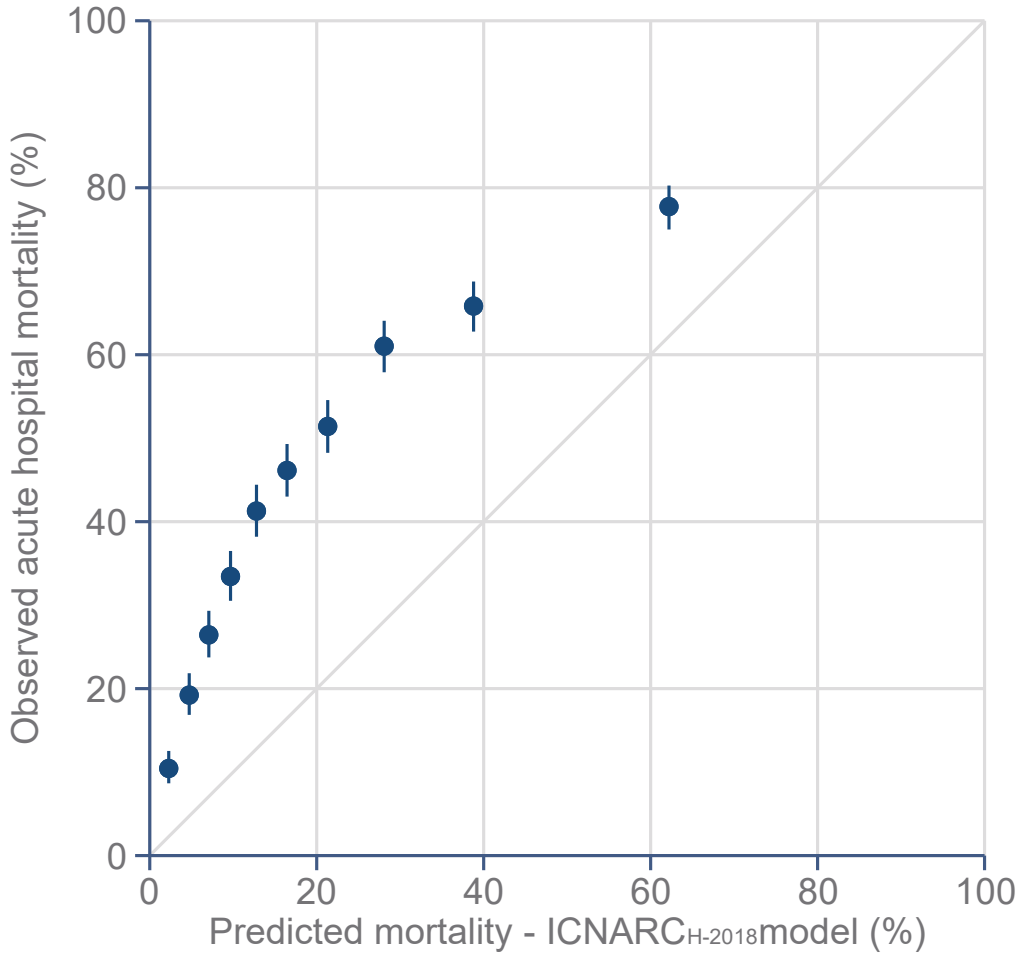
COVID-19 – risk modelling

- Usual risk model had poor fit for COVID-19
- COVID-19 treated as generic ‘respiratory infection’
- Mortality greatly under-predicted



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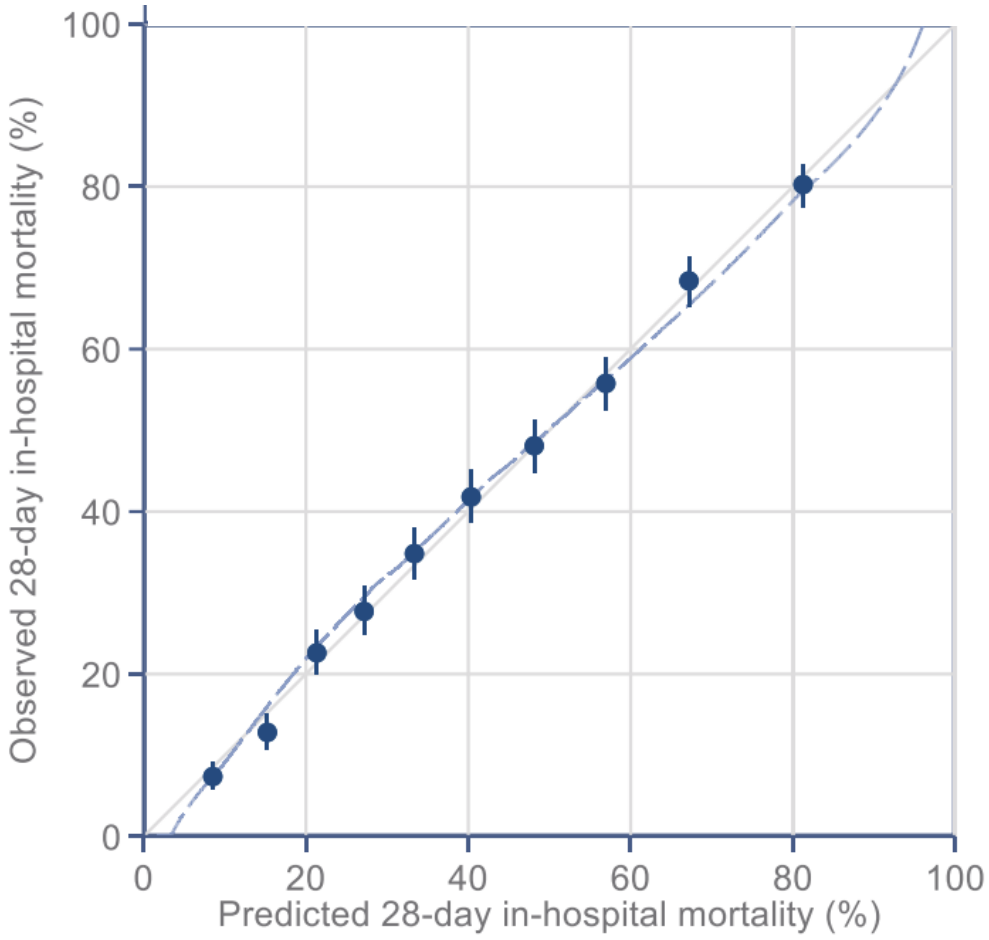
COVID-19 – risk modelling

- Developed bespoke model
- 28-day mortality rather than in-hospital mortality to support rapid reporting
- Fitted to data from March-April 2020



Ferrando-Vivas et al. *Preprints* 2021; 2021020059.

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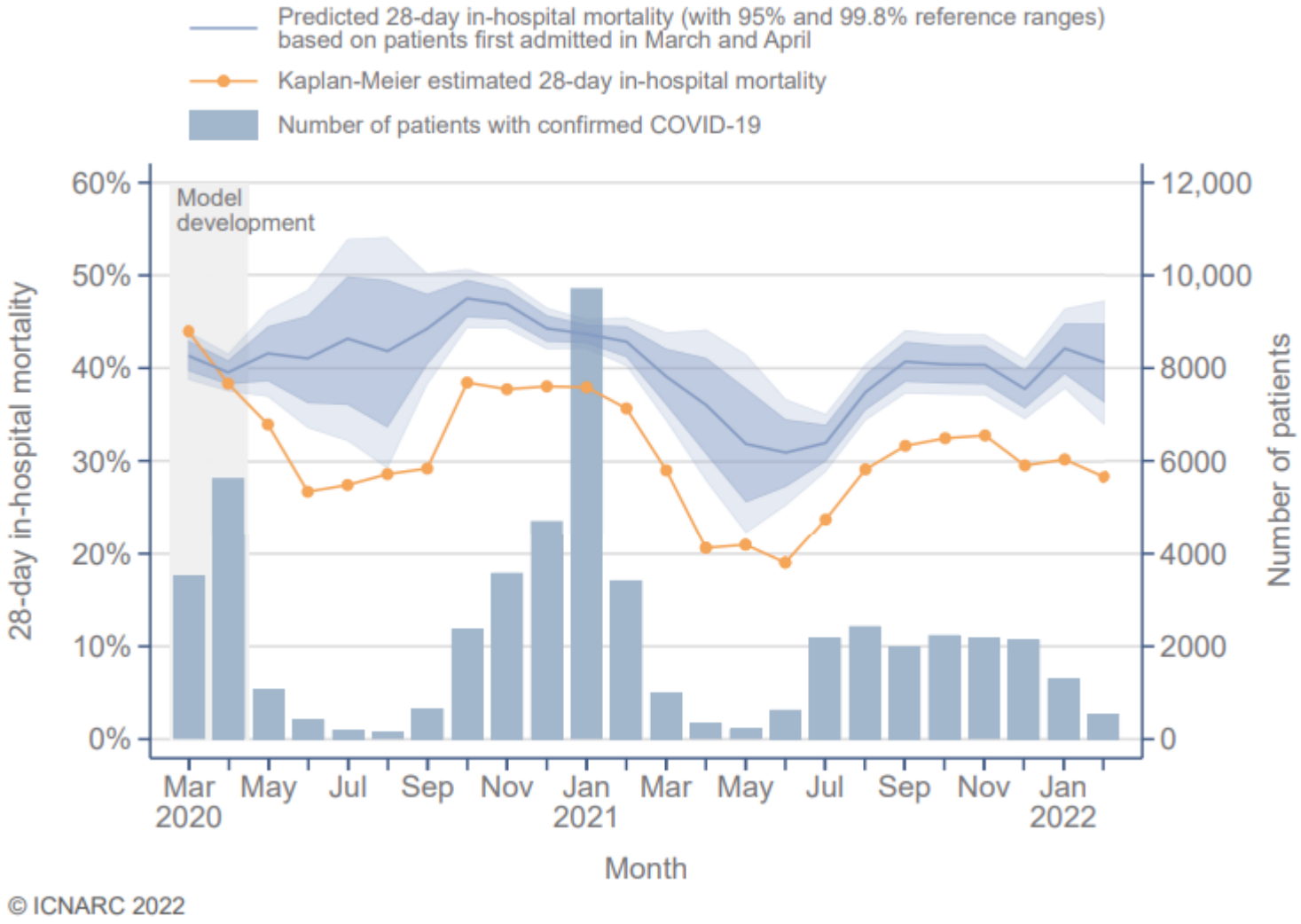
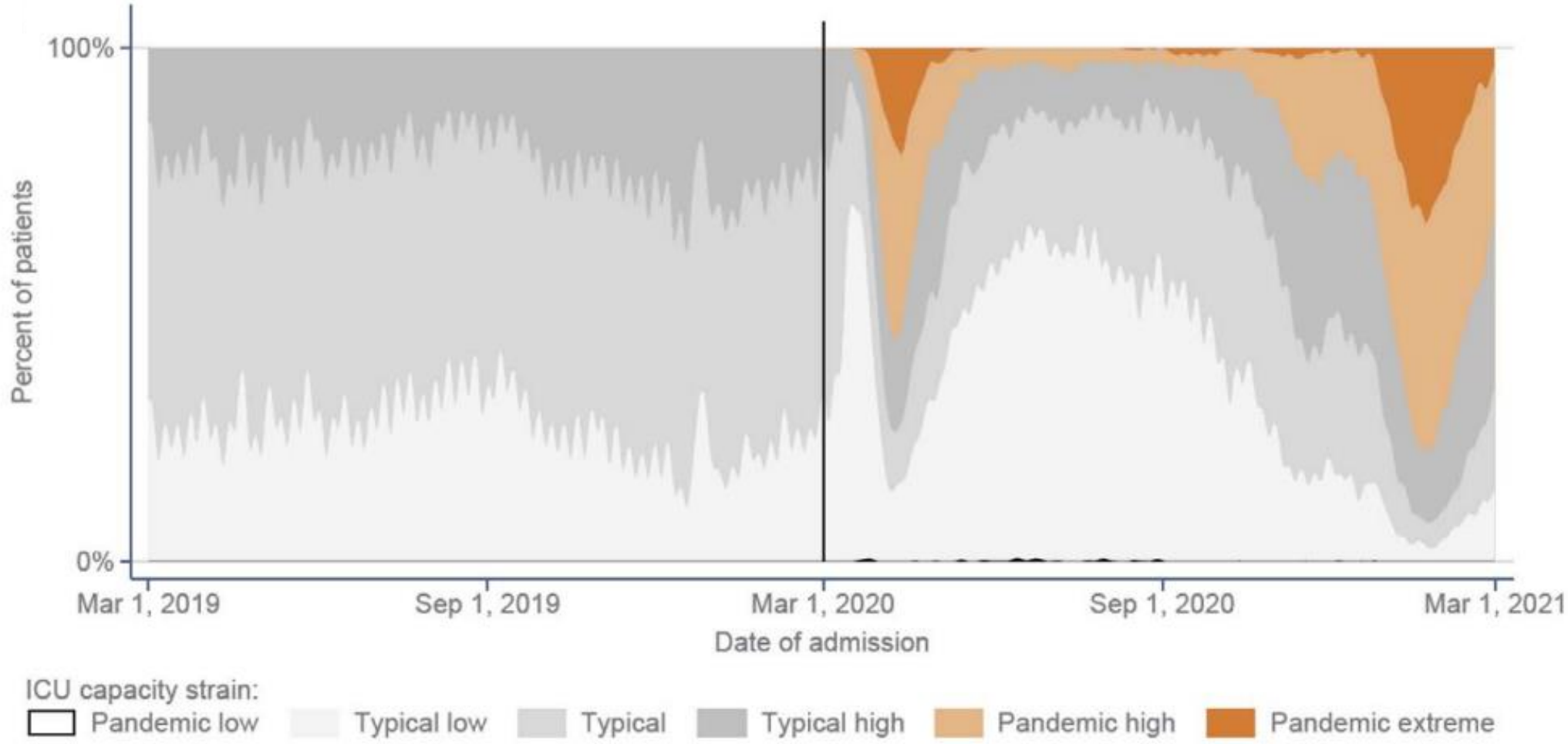
COVID-19 – risk modelling

- Model fit changed rapidly
- Mortality improved
- Models used to report to units regularly recalibrated



COVID-19 – impact on critical care



Wilcox et al. *Crit Care Med* 2022; doi:10.1097/CCM.0000000000005464

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COVID-19 – impact on critical care

Adjusted OR for Hospital Mortality	ICU Capacity Strain Within Reference Range			ICU Capacity Strain Outside Reference Range		
	Typical Low	Typical	Typical High	Pandemic High	Pandemic Extreme	$p > \chi^2$
Both waves						
All patients	0.93 (0.89–0.97)	Reference	1.07 (1.02–1.12)	1.12 (1.06–1.18)	1.11 (1.03–1.20)	$p = 8 \times 10^{-12}$
COVID-19	0.92 (0.83–1.01)	Reference	1.02 (0.93–1.11)	1.12 (1.03–1.22)	1.10 (0.99–1.23)	$p = 0.0002$
Non-COVID-19	0.95 (0.90–1.00)	Reference	1.10 (1.04–1.17)	1.16 (1.08–1.25)	1.30 (1.14–1.48)	$p = 3 \times 10^{-11}$

Wilcox et al. *Crit Care Med* 2022; doi:10.1097/CCM.0000000000005464

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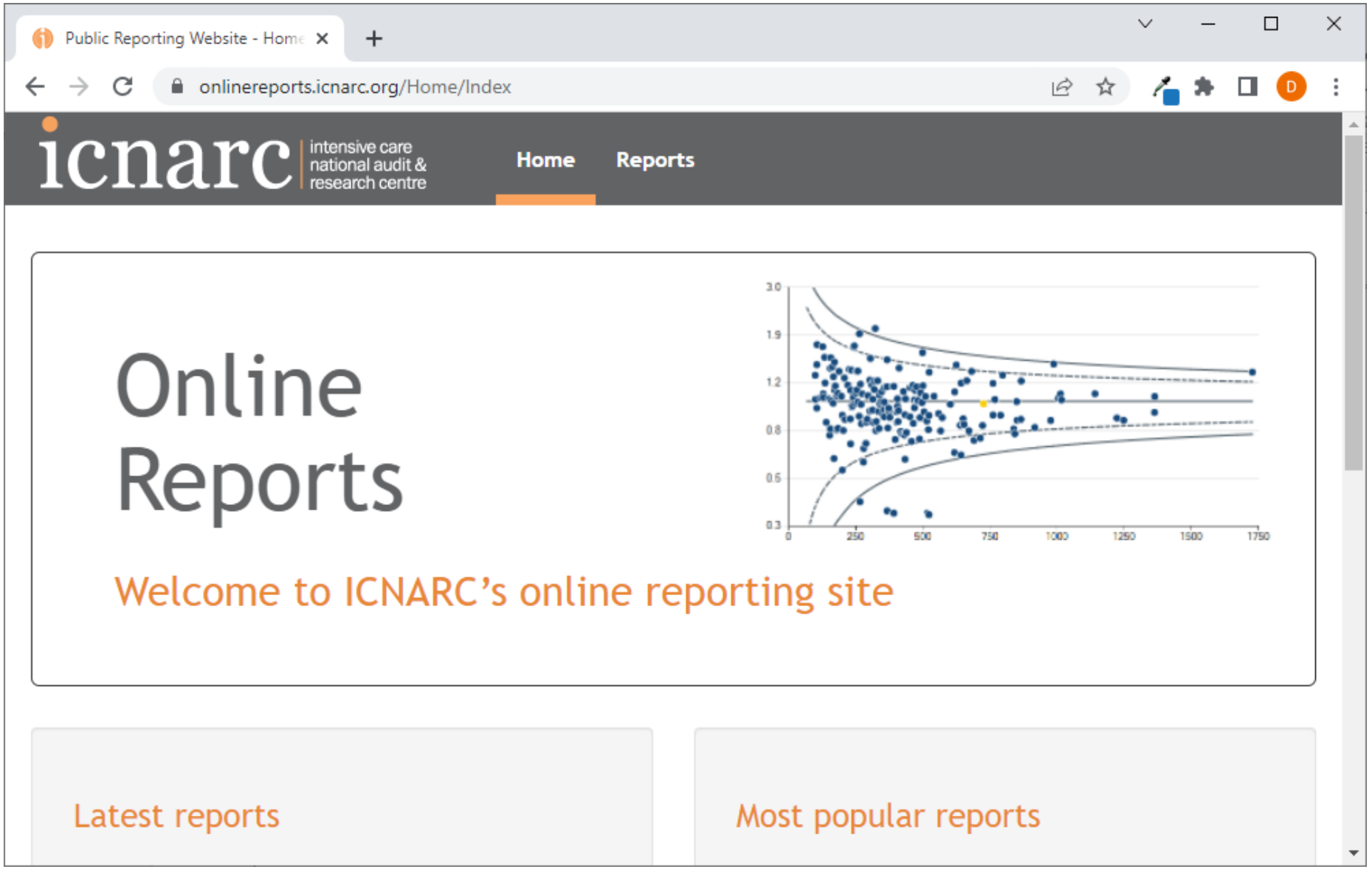

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Introduction | Results | Appendix

Search hospitals

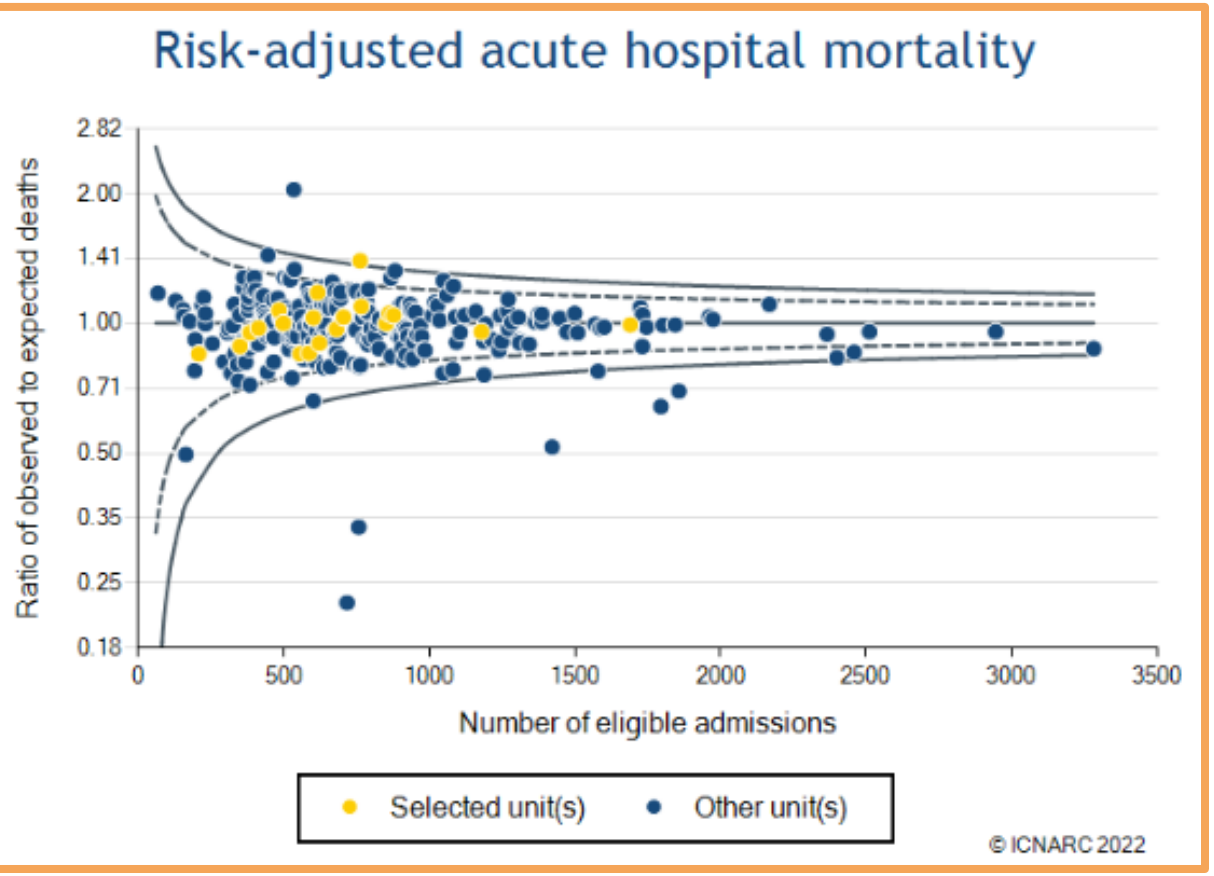
Search hospitals...

A to Z Lookup

South East Coast Operational Delivery Network / All Trusts / All Hospitals / All Units

Charts

- Active participation
- Data completeness
- Quality indicator dashboard
- High-risk admissions from the ward
- High-risk sepsis admissions from the ward
- Unit-acquired infections in blood
- Out-of-hours discharges to the ward (not delayed)
- Time to discharge



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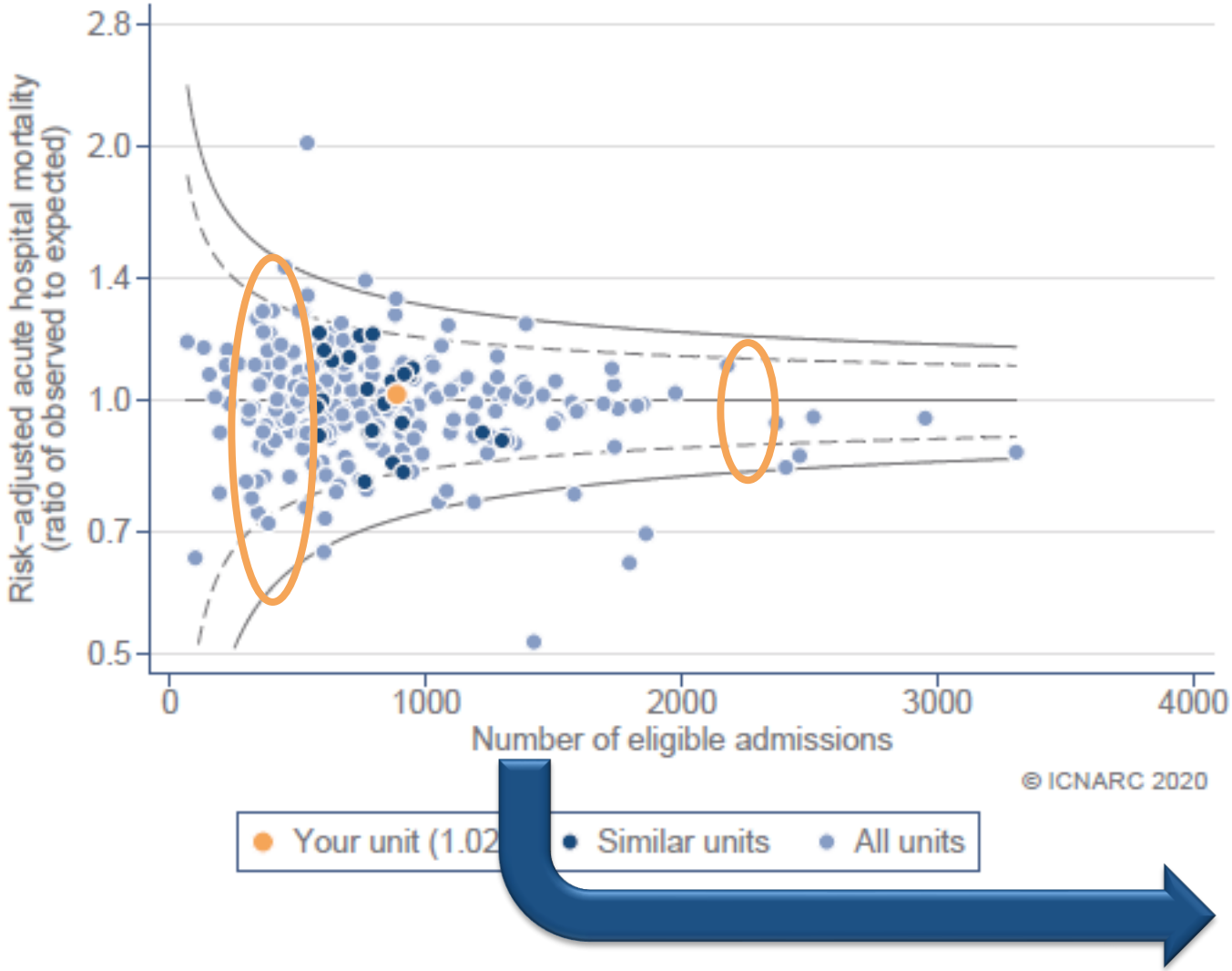
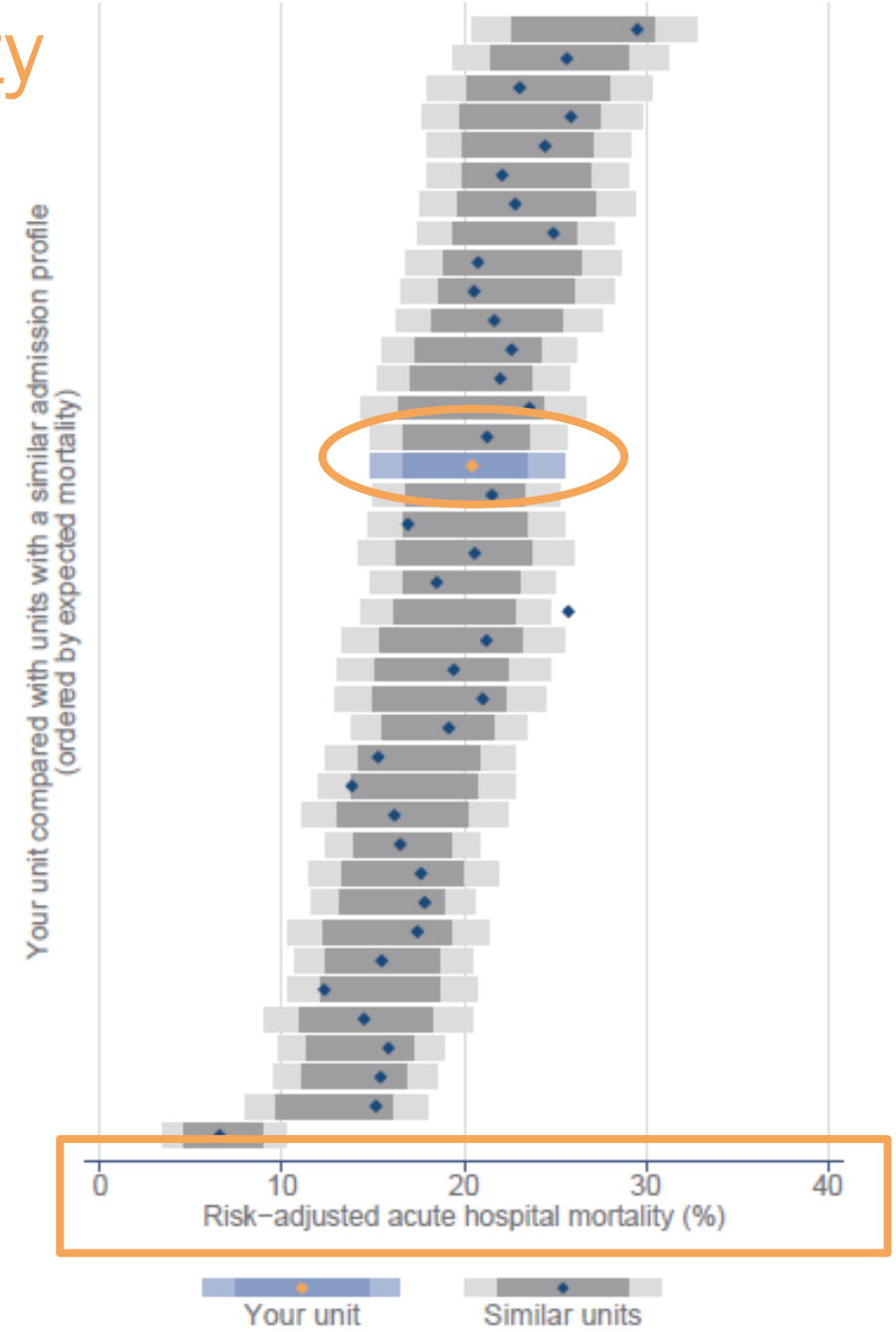
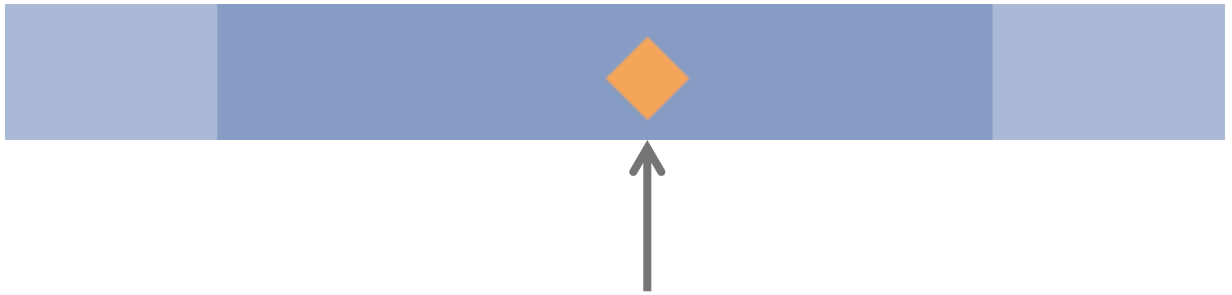
Presenting risk-adjusted mortality



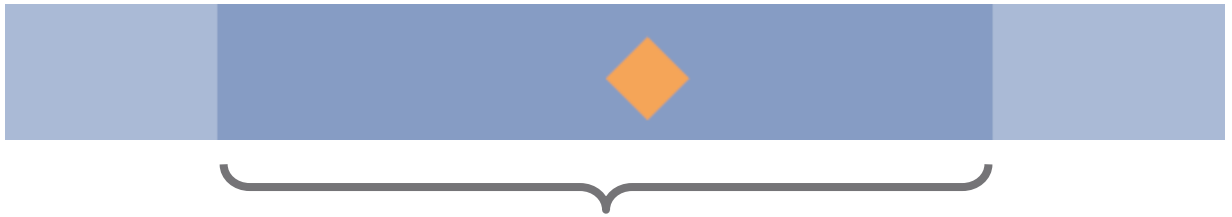


Presenting risk-adjusted mortality



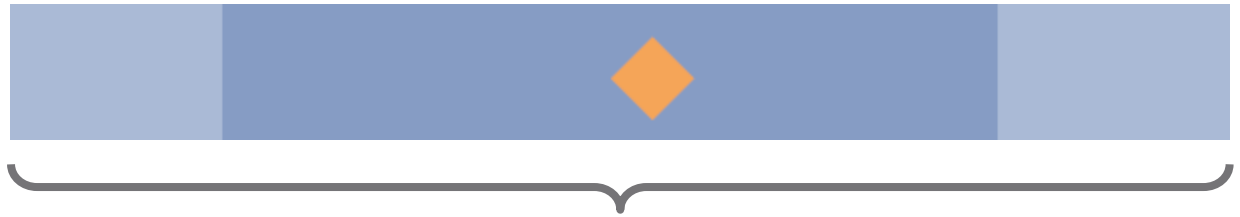
Observed mortality for this critical care unit

Presenting risk-adjusted mortality



95% predicted range
If the true mortality is as predicted,
the observed value will fall in this range
19 times out of 20

Presenting risk-adjusted mortality



99.8% predicted range
If the true mortality is as predicted,
the observed value will fall in this range
998 times out of 1000

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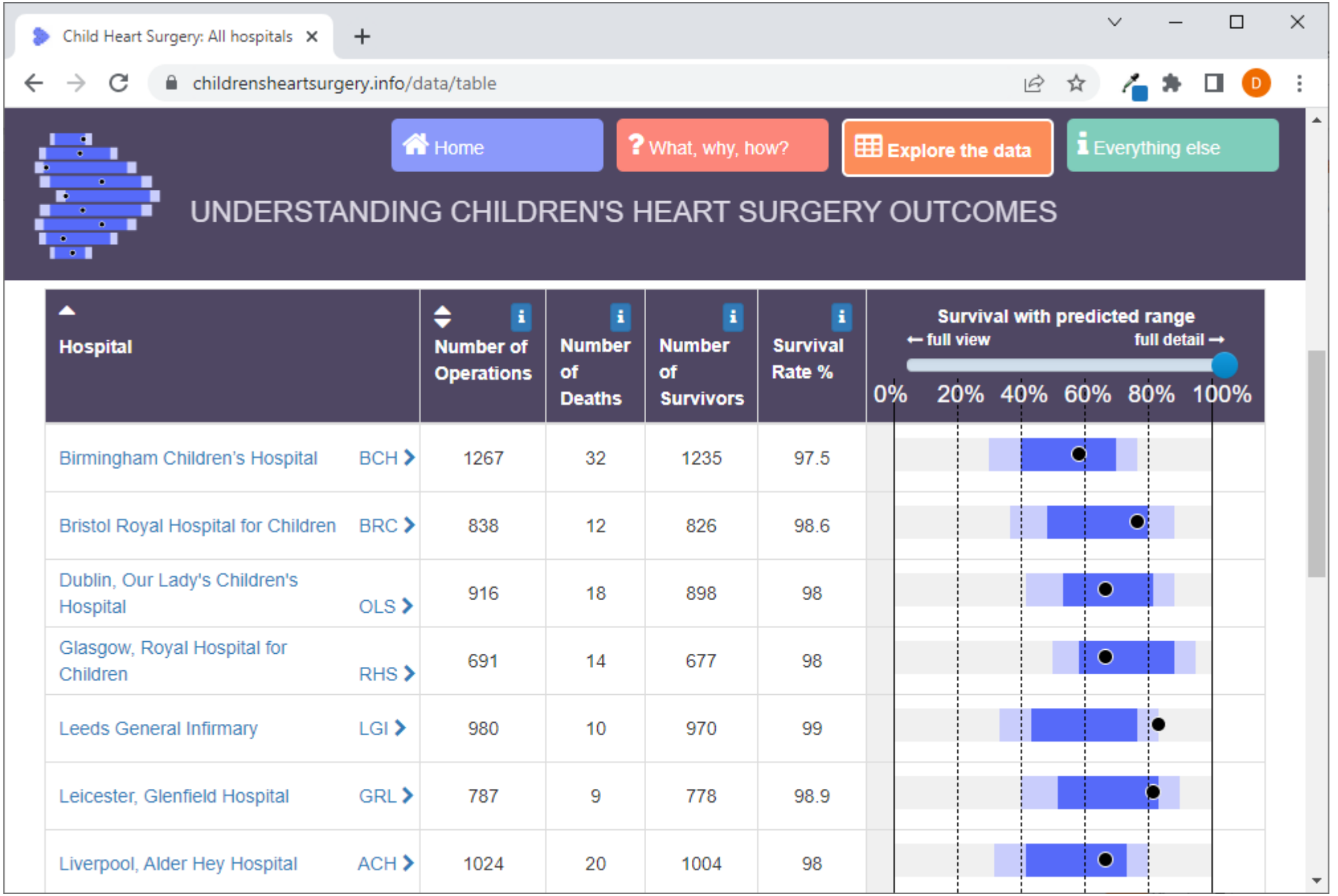

Limitations of risk-adjusted mortality

- Warning flag – something may not be right
- Not directly actionable
- Requires local investigation

Outlier management

- ICNARC policy based on HQIP guidance https://www.hqip.org.uk/outlier-management-for-national-clinical-audits/
- In addition to outlier management of ‘alarm’ (>3SD) status, the same procedure is followed for providers with ‘alert’ (>2SD) status in two consecutive reports

Outlier management

- Critical care units identified as potential outliers are provided with a detailed report into:
  - Data completeness
  - Distributions of key variables
  - Breakdown of results by major patient groups
- If issues with the data are identified, corrected data resubmitted and re-analysed
- If concerns over care processes, encouraged to seek peer review via professional societies

Using National Audit to Ensure Patients Receive the Best Possible Care and Outcomes

- A partnership between national audit team and local clinicians
- Clear, well-presented, understandable data
- Received with an open mind and a desire to improve