Australian Stroke Clinical Registry

OUTLIER/UNWARRANTED VARIATION COMMUNICATION POLICY

Version 5.0
April 2025

1.0 Preamble

The overarching aim of the Australian Stroke Clinical Registry (AuSCR) is to monitor clinical care and outcomes associated with stroke. This policy document provides guidance for hospital-level outlier monitoring, investigation and reporting as part of addressing causes of variation. This policy aligns with the Australian Commission on Safety and Quality in Health Care *Australian Framework for Clinical Quality Registries* which identifies that clinical quality registries should generate risk-adjusted reports which are provided back to participating hospitals to address significant variance and inform improvements in health care quality.[1] In addition, hospital identified reports on performance are provided biannually to some State Government Health Departments that fund the AuSCR.

The AuSCR Office provides to participating hospitals:

- a Stroke Performance Scorecard indicating hospital stroke performance on indicators of acute stroke care compared to the previous year and the national benchmark. Performance against the National Targets[2, 3] are also included.
- following linkage with the National Death Index, a Hospital Performance Report, including detailed analysis of processes of care and verified outcome data that is case mix adjusted. Statistical methods are used for examining clinical variation, where hospitals have submitted more than 50 episodes of care for the reporting period.
- An Annual Report including summary data from all participating hospitals[4]
- Near real-time data dashboards (refreshed at midnight daily)

- *Normal variation* is defined as hospital data that falls within two standard deviations (SD) of the mean for any individual performance indicator (e.g. health outcomes or process of care).
- *Outliers* are defined as hospital data that falls outside three standard deviations from the mean for any individual performance indicator, exhibiting greater than expected differences in patient outcome or processes of care.

  For process of care indicators, hospitals above the three SD limits line may be considered as having 'exceptional performance', while those below the three SD limits line may be considered as having 'poor performance'. Conversely, for health outcomes (mortality), hospitals above the three SD limits line may be considered as having 'poor performance', while those below the three SD limits line may be considered as having 'exceptional performance'.
- *Unwarranted variation* is defined as an outlier indicating poor performance, i.e. below the three SD limit line for processes of care or above the three SD limit line for adverse health outcomes.

This permits hospitals which appear to have poor performance, relative to other hospitals, to investigate the factors that may underlie variation in performance.

Any aspect of unwarranted variation is required to be investigated by the hospital and it is the role of the AuSCR Executive Director to ensure that hospital Lead Clinicians (referred to principal investigators for ethics purposes are made aware of their hospital results.

The performance indicators used to flag outlier hospitals are summarised in Table 1. These indicators are subject to review by the AuSCR Operational and Quality Improvement Committee annually, and may be subject to change. Care must be taken in interpreting these data when they are skewed because the control limits rely on the assumption that 95% of the distribution of data follows a bell-shaped curve. Both exceptional performance and underperformance, occurring over

multiple reporting periods, should be investigated to ensure that the cause is not attributable to data anomalies.

Table 1: Examples of outcome and performance indicators used to flag an outlier hospital

Outlier flags	Proportion
Health outcome	Risk-adjusted mortality rate at 30 days after admission
Processes of care indicators	Patients admitted to a stroke unit
	Patients who received thrombolytic therapy if an ischaemic stroke, with a door-to-needle time within 60 minutes of hospital arrival
	Patients discharged on an antihypertensive agent, if not deceased while in hospital
	Patients who received a care plan at discharge, if discharged home or to a residential aged care facility

Hospitals that appear as low outliers for the proportion of patients with ischaemic stroke treated with thrombolysis will also be reviewed and flagged with hospitals, where appropriate. Given these figures may be impacted by hospital bypass protocols, access to endovascular therapy and arrival of patients within the relevant treatment window, other relevant metrics will be reviewed before determining outlier status, including the proportion of patients treated with thrombolytic therapy or endovascular therapy (combined), and the proportion of patients treated with thrombolytic therapy of patients with ischaemic stroke arriving within 4.5 hours of symptom onset. The Reperfusion and Telemedicine Advisory Group and Operational and Quality Improvement Committee will assist in determining whether these outlier hospitals are notified.

In the event that an outlier hospital is identified, an agreed process (supported by the AuSCR Operational and Quality Improvement Committee) will be followed to ensure that the results are made known to the hospital AuSCR Principal Investigator, and that they are provided with support in understanding their data as part of investigating the potential cause of the variation. Hospitals with both poorer than expected performance and better than expected performance will be asked to undertake an internal review, supported by the AuSCR Governance Committees. The methods of investigation and actions taken will differ (see Sections 3.0 and 4.0).

2.0 Formal reporting of unwarranted variation status

Hospital stroke performance scorecards, highlighting high and low performance on a range of metrics using a traffic light system, will be provided to hospitals soon after the extraction of data for the calendar year. Outliers for process of care indicators (as outlined in Table 1) are calculated at this time and included on these scorecards. Outliers are determined using process control charts where the standard deviation varies depending on the number of episodes, i.e. larger hospitals have a smaller standard deviation.

Where supported by individual states, stroke performance scorecards are provided to hospital Executives to bolster support for quality improvement activities in stroke.

Data in AuSCR Annual Reports will be presented in a de-identified format. Individual hospital data will be identifiable in some figures via a unique identification number and each hospital will be provided with their own number to identify their own performance data. Individual hospital performance reports will also be provided to hospitals as an adjunct to the Annual Report so that performance on additional quality of care metrics can be monitored.

Hospital identified health outcomes and processes of care are also reported directly to some state government funders as part of contractual obligations. These reports will also be used to identify outliers and unwarranted variation status.

The primary health **outcome measure** used to identify unwarranted variation will be risk-adjusted mortality rate (RAMR) at 30 days after admission. These analyses will be conducted following the provision of National Death Index data for the calendar year and provided in the hospital performance reports. Analyses will only be conducted using data from hospitals that have submitted 200 or more episodes per annum, or per reporting period, for ischaemic stroke and 50 or more episodes for haemorrhagic stroke. RAMR will be presented in two different ways. The first method will *exclude* patients transferred from another hospital, and in-hospital strokes. This method is a summary for patients treated at only one hospital and deaths are fully attributed to that hospital. The second RAMR method will *include* patients who were managed by more than one hospital for their episode of stroke care (i.e. include all patients treated at an individual hospital irrespective of whether they presented directly or were transferred). In this analysis, multiple episodes related to the same acute stroke event will be included, and mortality attributed equally to all hospitals involved in the provision of patient care for that stroke event. RAMR will be calculated by dividing the risk-adjusted hospital specific mortality by the risk-adjusted average hospital mortality, and then multiplying by the unadjusted proportion of deaths in the whole sample. Hospital-level risk adjustment models described by Katzan[5] and Cadilhac[6] will be used to calculate the risk adjusted hospital specific mortality rate. All RAMR models will be adjusted for age, sex, country of birth, Indigenous status, socioeconomic position, stroke type, stroke severity and previous history of stroke.

The adherence to **processes of care** by individual hospitals will also be assessed and reported back to hospital Principal Investigators to potentially identify the factors that might have influenced the differences observed in outcomes between participating hospitals. Analysis of adherence to processes of care will only be conducted for those hospitals that have submitted 50 or more episodes documenting the individual process of care per annum, or in the reporting period.

Paediatric data

Data relating to the performance of paediatric hospitals will be reviewed separately, and only assessed when the thresholds for sample sizes have been met. These data will be reviewed in the first instance by the AuSCR Paediatric Advisory Group.

3.0 Methods for investigating unwarranted variation in participating hospitals with poorer than expected performance

Process of care outliers are determined once the annual dataset has been extracted for reporting. The scorecards highlight (in red) processes of care that are more than three standard deviations from the mean.

RAMR outliers are determined once linkage with the National Death Index is complete.

Methods for investigating special cause variation for hospitals exhibiting poor performance are summarised in Table 2 and Figure 1.

Table 2: Summary of methods for investigating hospitals with poorer than expected performance

STAGE	METHOD
1	AuSCR Annual analysis, on hospitals that have submitted >50 episodes for the period, identifies hospital outlier status on an individual performance indicator based on admissions from the previous calendar year (i.e. 12-month data collection period).
2	AuSCR staff reviews the data identify any factors which may have contributed to an erroneous identification as an outlier. Review of the data will include an assessment of missing data, selection bias (based on case ascertainment for the 12-month reporting period), hospital factors (e.g. lack of stroke unit), potentially erroneous or unusual patterns of data and sample size. For RAMR this will include investigation of the data relating to risk adjustment variables. Comparisons of previous year's reports or data dashboards may also be undertaken.
Outcome of Stage 2: Hospital NOT confirmed as an outlier (NO case for action)	
3A	AuSCR Operational and Quality Improvement Committee informed of hospital outlier status and results of data review. Committees to inform Executive Director whether any further actions are required.
4A	Where a hospital outlier status is attributed to a specific cause (e.g. erroneous data uploaded to the AuSCR), then the AuSCR Executive Director may request that the hospital Principal Investigator provide corrected data.
5A	Where corrected data cannot be provided within the AuSCR Annual Reporting timeframe, then the Executive Director may remove an outlier hospital from the AuSCR Annual Report with respect to the specific performance indicator on which they are an outlier. The Executive Director would then advise the AuSCR Operational and Quality Improvement Committees of this action, in addition to the hospital Principal Investigator. The Executive Director may also seek guidance from the Operational and Quality Improvement Committees about removal of erroneous data from the AuSCR archived dataset, if a hospital indicates that they have no capacity to provide corrected data.
Outcome of Stage 2: Hospital confirmed as an outlier (i.e. case for action)	
3B	AuSCR Operational and Quality Improvement Committee is informed of confirmed hospital outlier status

STAGE	METHOD
	following the data review by the Executive Director. The Committees will support the Executive Director to follow up poor performance on the individual performance indicator with the hospital Principal Investigator as required.
4B	The Executive Director writes to the hospital Principal Investigator and provides a copy of the scorecard (for process of care indicators) or hospital performance report (for RAMR) illustrating outlier status of the individual performance indicator.
5B	The Executive Director offers to meet with the hospital Principal Investigator to discuss outlier status.
6B	The Executive Director may offer assistance with further investigations of relevant data held locally via completion of a random medical record audit. Assistance with engagement of local Quality Officers, or with quality Improvement support may be offered, as relevant, and within the means of the AuSCR. The Executive Director will agree on a time frame with the hospital Principal Investigator in which hospital performance against the individual indicator will be reassessed.
7B	The Executive Director informs the AuSCR Operational and Quality Improvement Committees of the outcomes of discussions with the hospital Principal Investigator and proposed future actions. The Executive Director will also report outlier status, and outcomes from subsequent discussions with the hospital Principal Investigator to the relevant State Health Department funder *where this is specified under the contractual obligations*. In the case where the hospital has been an outlier on the same individual process of care across more than one reporting period (i.e. across two AuSCR Annual Reports) then the continued outlier status would be reported by the Executive Director to the AuSCR Operational and Quality Improvement Committees who would decide on the appropriate escalation process required.
Where the Executive Director Receives No Response to Stage 4B	
5C	Where the Executive Director has received no response from the hospital Principal Investigator within four weeks to the initial written notification, a second written notification will be sent to the hospital Principal Investigator.
Where the Executive Director Receives No Response to Stage 5C	
5D	Where the Executive Director has received no response from the hospital Principal Investigator within four weeks to the second written notification, a phone call will be made.
Where the Executive Director Receives No Response to Stage 5D	
5E	Where the Executive Director receives no response to a phone call, OR where the response received does not enable further investigation of the data, or plans for future reassessment of the data, then the matter will be escalated back to the AuSCR Operational and Quality Improvement Committees for further action.

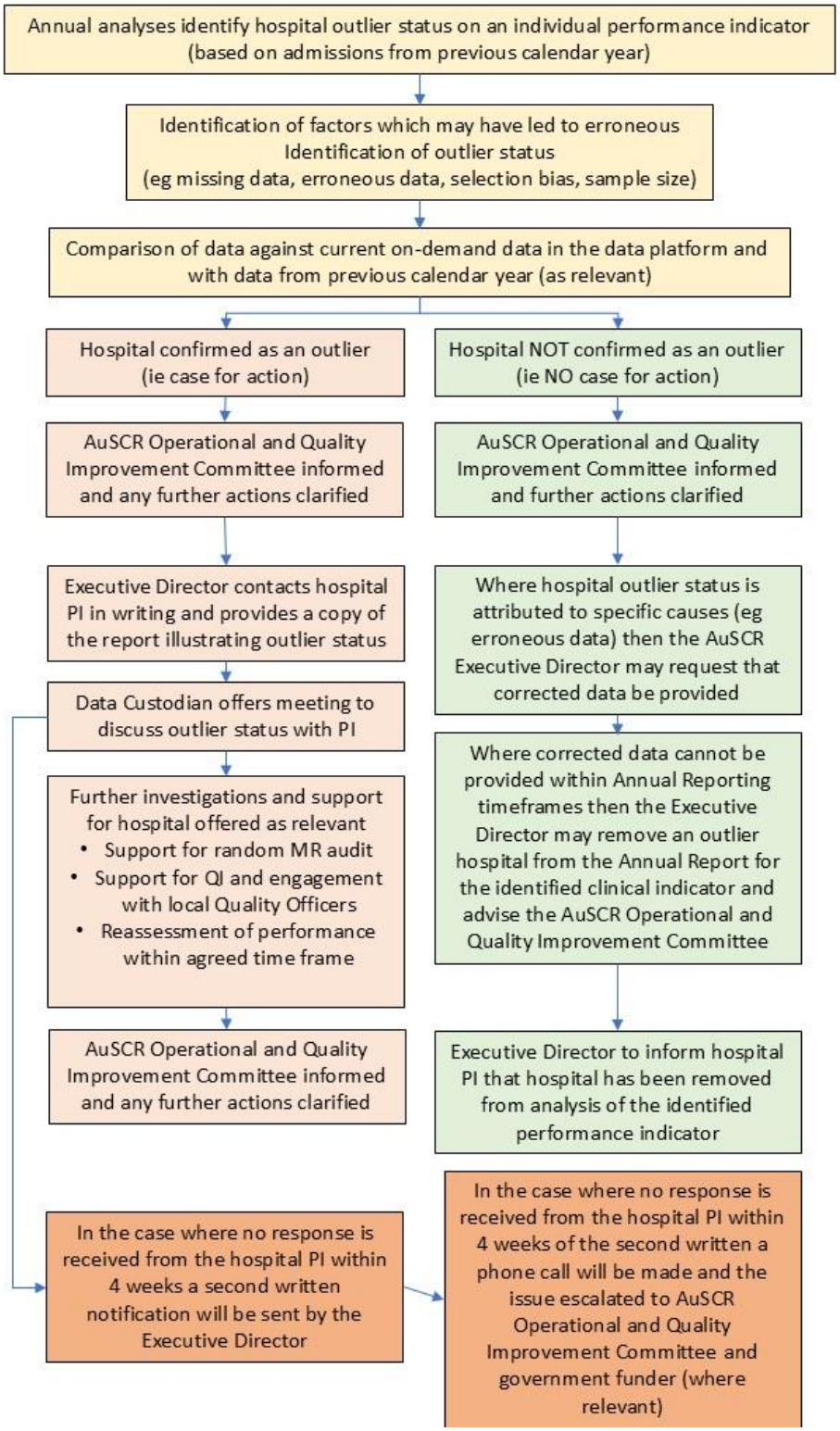
Note: actions referred to as being undertaken by the Executive Director may also involve support as appropriate from AuSCR Coordinators and Data Managers.

No further action is required unless this hospital is identified as an outlier in a second consecutive 12-month period, *or* where an AuSCR contract with a state health department outlines additional processes. In the event that a hospital is an outlier for a second consecutive period, the Executive Director, and the AuSCR Operational and Quality Improvement Committee will decide on an appropriate escalation process for this hospital.

4.0 Methods for investigating outliers in performance among participating hospitals with better than expected performance

STAGE	METHOD
1	AuSCR Annual analysis identifies hospital outlier status on hospitals that have submitted >50 episodes for the period, for an individual performance indicator based on admissions from the previous year.
2	The Executive Director requests review of the data for the hospital and individual performance indicator to identify any factors which may have contributed to the identification as an outlier (e.g. selection bias as measured by case ascertainment results for the period in question or inclusion of patients treated only in a stroke unit).
In cases where selection bias is evident from Stage 2	
3A	The Executive Director will contact the hospital Principal Investigator and discuss methods to improve case ascertainment and limit selection bias. The Executive Director inform the AuSCR Operational and Quality Improvement Committee of the findings. Where recommended, a random medical record audit may be requested by the Executive Director.
In cases where NO selection bias is evident from Stage 2	
3B	The Executive Director inform the AuSCR Operational and Quality Improvement Committees of the findings. Hospitals that show exceptional performance will be congratulated via a letter from the Chairs of the AuSCR Operational and Quality Improvement Committee and will be asked if they would like to share any learnings with other AuSCR sites about how these results were achieved.

Note: actions referred to as being undertaken by the Executive Director may also involve support as appropriate from AuSCR Program Manager, Coordinators and Data Managers.



Where the outlier status of a hospital on a particular clinical indicator extends across two AuSCR Annual Reporting periods the Executive Director would report this result to the Operational and Quality Improvement Committee who would decide on an appropriate escalation process

AuSDaT, Australian Stroke Data Tool; MR, medical record; PI, principal investigator; QI, quality improvement

Figure 1: Flowchart summary of process for investigating hospitals with poorer than expected performance on an individual indicator.

References

1. Australian Commission on Safety and Quality in Health Care. Australian Framework for National Clinical Quality Registries 2024. Sydney: ACSQHC, 2024.
2. Australian Stroke Coalition. National Stroke Targets 30/60/90 [online]. Available at: https://australianstrokecoalition.org.au/portfolio/targets. Accessed 28/03/2024.
3. Kleinig TJ, Murphy L, Taskforce NST. 30/60/90 National stroke targets and stroke unit access for all Australians: it's about time. Medical Journal of Australia 2024.
4. Australian Stroke Clinical Registry. Annual Reports [online]. Available at: https://auscr.com.au/about/annual-reports/.
5. Katzan IL, Spertus J, Bettger JP, et al. Risk Adjustment of Ischemic Stroke Outcomes for Comparing Hospital Performance. Stroke 2014;45:918-944.
6. Cadilhac DA, Kilkenny MF, Levi CR, et al. Risk-adjusted hospital mortality rates for stroke: evidence from the Australian Stroke Clinical Registry (AuSCR). Medical Journal of Australia 2017;206:345-350.

Appendix 1: Example Stroke Performance Scorecard

STROKE PERFORMANCE SCORECARD

AuSCR Australian Stroke Clinical Registry

Hospital 47		2022 N=187	2023 N=214
	Case ascertainment	87%	95%
Quality indicator	**2023 Benchmark***	**% Adherence**	**% Adherence**
Endovascular stroke therapy (ischaemic strokes presenting directly only)	23%		
Thrombolytic delivery (ischaemic strokes only)	18%	16	12
Door-to-needle within 60 minutes	66%	45	20
Stroke unit care	97%	31	59
Antithrombotic therapy within 48 hours of stroke onset	94%	86	87
Mobilised same day or day after arrival	82%	73	73
Swallow screen or assessment prior to oral intake	93%	52	53
Swallow screen or assessment within 4 hours	66%	49	43
Antihypertensive medications prescribed (if discharged to the community)	96%	70	83
Antithrombotic medications prescribed (if discharged to the community)	100%	93	100
Lipid-lowering medications prescribed (if discharged to the community)	99%	92	90
Care plan provided (if discharged to the community)	99%	40	67

Key to colour-coded scoring system §			
Low outlier in the relevant time period#	*Below the national average in the relevant time period*	*Above the national average in the relevant time period*	*At, or above, the benchmark in the relevant time period*

** Achievable benchmarks relate to the 2023 year and are derived using a modified ABC™ method for stroke episodes only.*

§ Coloured circles are not shown if your hospital did not collect data on the quality indicator or >30% of data were missing.

 # Red is also only assigned if >50 episodes contributed to the denominator and ≤30% of data were missing.

AuSCR Australian Stroke Clinical Registry