bureau of
**health
information**

Hospital Quarterly

Technical Supplement

Emergency department measures

July to September 2016

Contents

Summary

This technical supplement describes the methods and technical terms used to calculate NSW public hospital emergency department (ED) activity and performance measures reported in the Bureau of Health Information (BHI) *Hospital Quarterly* report. Recent changes to methods are also described.

ED information in *Hospital Quarterly* is based on analyses of attendance data in the Emergency Department Data Collection (EDDC). Data are extracted from the centralised data warehouse, the Health Information Exchange (HIE), administered by the NSW Ministry of Health.

The activity and performance measures reported in *Hospital Quarterly* are currently based on 132 hospital EDs which have had an electronic records system in place and reliable data in the EDDC for five or more quarters. These 132 EDs comprise the 'NSW totals' reported in *Hospital Quarterly*. They account for approximately 95% of all ED presentations in NSW and 98% of records in the EDDC.

EDs are reported individually for hospitals in principal referral, major or district peer groups (A1, A2, A3, B, C1 and C2). A total of 75 EDs met the reporting criteria in the July to September 2016 quarter.

Peer group changes

In *Hospital Quarterly, July to September 2016*, ED data are no longer individually reported for five hospitals due to their reallocation from peer group C2, to lower peer groups (smaller facilities including community and multi-purpose service peer groups)[1] (Table 1). For the purposes of reporting in *Hospital Quarterly*, data for these hospitals are included in NSW and local health district (LHD) totals, and in 'Other' peer group totals.

Table 1   Changes to hospital peer group allocation and reporting, July to September 2016[1]

Hospitals no longer individually reported	2016 peer group	2016 peer group name	Local health district	2011 peer group
Bellinger River District Hospital	D1a	Community hospitals with surgery	Mid North Coast	C2
Bulli District Hospital	F4	Sub-acute	Illawarra Shoalhaven	C2
Camden Hospital	D1b	Community hospitals without surgery	South Western Sydney	C2
Parkes District Hospital	D1a	Community hospitals with surgery	Western NSW	C2
Tumut Health Service	D1a	Community hospitals with surgery	Murrumbidgee	C2

Effect of peer group changes

The exclusion of five previously C2 hospitals from individual hospital reporting has had no effect on aggregated NSW and LHD reporting, or peer group reporting for hospital peer groups A1, A2, A3, B and C1.

This change has the effect of reducing the number of EDs for which data are reported individually in *Hospital Quarterly* from 80 to 75. It also has the effect of reducing the number of C2 hospitals for which ED data are reported individually from 28 to 23 (Table 2).

In order to make fair comparisons with the same quarter in the previous year, data in *Hospital Quarterly, July to September 2016* are based on recalculations that exclude these hospitals from C2 peer group for 21 quarters. This means that measures reported in the current edition may differ slightly from previous editions of the report. Therefore caution is advised when interpreting any comparisons using previous editions.

The effect of reallocation of five previously C2 hospitals to the 'Other' peer group is shown in Appendix tables 3–5.

Percentage of patients who started treatment within clinically recommended timeframes

Performance measures reporting the percentage of patients who started treatment within clinically recommended timeframes for each triage category and overall were included from *Hospital Quarterly*, January to March 2016.

Time to treatment is measured from presentation time (the earlier of arrival and triage time) to the start of clinical treatment by a doctor or nurse.

Arrival time was used for 99.6% of records.

The clinically recommended maximum waiting times for triage categories from the Australasian College of Emergency Medicine are[2]:

T1: Resuscitation	2 minutes
T2: Emergency	10 minutes
T3: Urgent	30 minutes
T4: Semi-urgent	60 minutes
T5: Non-urgent	120 minutes

Changeover to a new records system

EDs in NSW have progressively replaced historic information systems with more contemporary electronic record systems. Changeover to a new electronic system may impact the completeness and reliability of data input or extraction from local systems to the HIE for periods longer than one quarter.

At a facility level, during a changeover period, the only information from the EDDC reported by BHI is the total number of ED presentations. For aggregated NSW reporting (for example, for NSW, LHDs or peer groups), data from affected hospitals are included in total counts but are excluded from calculation of all performance measures.

Activity and performance measures

This section contains the definitions used for calculating measures of ED activity and performance reported in *Hospital Quarterly*.

In the following definitions, numbers in brackets indicate the HIE database field code used to identify records by ED visit type or mode of separation (as appropriate). The arrival date and time field is used to select records from the HIE for each quarter. Unless explicitly stated, records with incomplete information in the fields required for a calculation are excluded.

All presentations

'All presentations' is the count of every record in the ED visit database of the HIE. This count includes presentations of all ED visit types including emergency presentations, planned return visits, pre-arranged admissions, some outpatient visits, private referrals, persons pronounced dead on arrival and patients in transit. This count excludes records entered in error (mode of separation = 99), telehealth and eHealth presentations (ED visit type = 12), and presentations by patients who are already admitted to the same hospital (ED visit type = 13).

Records are assigned to quarters of the year using the arrival date and time field.

Emergency presentations

'Emergency presentations' are records in the ED visit database of the HIE of presentations with an ED visit type of emergency (1), an unplanned return visit for a continuing condition (3) or disaster (11). Emergency presentations in *Hospital Quarterly* are reported by triage category.

Records with missing or invalid information for triage category are excluded from reported counts of emergency presentations.

Emergency presentations by quarter

The time series graphs in *Hospital Quarterly* present the number of emergency presentations to an ED during each quarter for the past 21 quarters.

All presentations by mode of separation

Presentations are reported based on the mode of separation field: treated and discharged, treated and admitted to hospital, left without, or before, completing treatment, transferred to another hospital and other modes of separation. Records with a missing mode of separation are included in the 'other' cohort.

The mode of separation cohorts are:

- Treated and discharged – presentations with mode of separation: departed with treatment complete (4)

- Treated and admitted to hospital – presentations with modes of separation: admitted to a ward/inpatient unit (1), admitted and discharged as an inpatient within ED (2), admitted and died in ED (3), admitted to a critical care ward (10), admitted via an operating theatre (11) or admitted – left at own risk (13)

- Left without, or before completing, treatment – presentations with modes of separation: departed, did not wait (6) and departed – left at their own risk (7). Patients who 'did not wait' were triaged, but left the ED before treatment was commenced. Patients who 'left at their own risk' were triaged and treatment was begun by a clinician or nurse, but the patient left prior to completing their treatment.

- Transferred to another hospital – presentations with mode of separation: transferred to another hospital (5) or admitted and then transferred to another hospital (12)

- Other – presentations with modes of separation: dead on arrival (8) or departed for another clinical service location (9). Presentations with missing mode of separation are also included in this cohort.

Presentation time

Presentation time is the earlier of the following fields in the emergency visit database of the HIE:

- Arrival time – the date and time the patient presented at the ED
- Triage time – the date and time when the patient was assessed by a triage nurse.

If triage time is more than 12 hours before arrival time, then the triage time field is considered an error and presentation time is set equal to arrival time.

Treatment time

Treatment time is the earlier of the following fields in the ED visit database of the HIE:

- First seen by clinician time – the date and time when the patient is first seen by a medical officer and has a physical examination or treatment performed that is relevant to their presenting problem(s)
- First seen by nurse time – the date and time when the patient is first seen by a nurse and has an assessment or treatment performed that is relevant to their presenting problem(s).

If either 'first seen by clinician time' or 'first seen by nurse time' is more than 12 hours before presentation time or more than 31 days after presentation time, then that field is considered an error and is excluded from calculations. If both 'first seen by clinician time' and 'first seen by nurse time' are more than 12 hours before presentation time or more than 31 days after presentation time, then treatment time for that record is considered an error and excluded from calculations. If treatment time is earlier than presentation time, but 12 hours or less before

presentation time, then time from presentation until treatment is set to zero.

Ready for departure time

Ready for departure time is the date and time when the assessment and initial treatment of the person is completed such that if home arrangements of the person (including transport) were available, the person could leave the ED. It is recorded in the ready for departure time field in the emergency visit database in the HIE. If the time recorded for ready for departure is before presentation time or more than 31 days after presentation time, then that departure time field is considered an error and treated as missing. If the time recorded for ready for departure time is missing or is later than the time recorded for actual departure time, then actual departure time is used in calculations. If both ready for departure time and actual departure time are missing, the record is excluded from calculations that use ready for departure time.

Actual departure time

Actual departure time is the date and time at which the patient physically leaves the ED as recorded in the actual departure time field in the emergency visit database in the HIE. If the time recorded for actual departure is before presentation time or more than 31 days after presentation time, then the actual departure time field is treated as missing and the record is excluded from calculations that use actual departure time.

Time from presentation to starting treatment

Time from presentation to starting treatment is calculated as the difference between presentation time and treatment time. It is reported by triage category for emergency presentations. Records with an ED visit type of Emergency (1), Unplanned return visit for a continuing condition (3) and Disaster (11) are included. Records with a mode of separation of Did not wait for treatment (6), Dead on Arrival (8) or Departed for other

Clinical Service Location (9) are excluded, since patients in these categories do not receive clinical treatment in the ED.

If treatment time is more than 12 hours before presentation time or more than 31 days after presentation time, then that time from presentation until treatment is considered an error and set to missing. If treatment time is before presentation time by 12 hours or less, then time from presentation until treatment is set to zero.

Records with a missing treatment time are excluded from calculations that use treatment time.

BHI does not report time from presentation to starting treatment for patients in triage category 1, since BHI considers that waiting time measures are not informative for these patients. Recording of presentation, triage and treatment time for patients who should be assessed or treated within two minutes (triage 1) is unlikely to be recorded precisely enough to report against a two-minute benchmark, particularly when clinicians are focused on providing immediate and essential care.[2]

Time spent in the ED

Time spent in the ED is calculated as the difference between presentation time and departure time. Departure time is defined as:

- Actual departure time – for all patients other than those who were treated and discharged

- Ready for departure time – for patients who were treated and discharged.

If the time recorded for actual departure is before presentation time, or more than 31 days after presentation time, then that departure time field is considered an error and treated as missing.

If the time recorded for ready for departure time is missing, is before presentation time or more than 31 days after presentation time, or is later than the time recorded for actual departure time, then actual departure time is used in calculations.

Records with missing time to departure are excluded from calculations that use time to departure.

Median

The median is a statistical measure of the midpoint of the waiting times distribution. This measure is used in *Hospital Quarterly* to describe time from presentation until treatment and time spent in the ED. The median is the time by which half of patients started treatment or left the ED. The other half of patients took equal to or longer than this time. BHI uses the data for each patient and the empirical distribution function with averaging to compute the median in SAS©5. Results are rounded to the nearest whole minute for reporting.

95th percentile

The 95th percentile is a statistical measure of the waiting time distribution. It is used in *Hospital Quarterly* to describe time from presentation until treatment, and time spent in the ED. The 95th percentile is the time by which 95% of patients started treatment or left the ED. The final 5% of patients took equal to or longer than this time. BHI uses the data for each patient and the empirical distribution function with averaging to compute the 95th percentile in SAS©5. Results are rounded to the nearest whole minute for reporting.

Percentage of patients who started treatment within clinically recommended timeframes

This percentage is calculated as the number of presentations where the time from presentation to treatment was less than, or equal to, the clinically recommended time as a percentage of the total number of presentations.

A patient started treatment within the clinically recommended timeframe if the time from

presentation to the start of clinical treatment is less than, or equal to, the maximum waiting times recommended in the Australasian College of Emergency Medicine policy on the Australasian Triage.[2]

AUSTRALASIAN TRIAGE SCALE CATEGORY	TREATMENT ACUITY (maximum waiting time for medical assessment and treatment)	PERFORMANCE INDICATOR THRESHOLD
Triage 1: Resuscitation	Immediate	100%
Triage 2: Emergency	10 minutes	80%
Triage 3: Urgent	30 minutes	75%
Triage 4: Semi-urgent	60 minutes	70%
Triage 5: Non-urgent	120 minutes	70%

The percentage is reported for emergency patients with a triage category of 2 to 5. It is reported by triage category, and for these triage categories combined.

Calculation of the time elapsed is described in more detail in the sections Presentation time, Treatment time, and Time from presentation to starting treatment.

Percentage of patients who started treatment, by time

The distribution curve in *Hospital Quarterly* shows the cumulative percentage of emergency presentations by minutes from presentation until treatment by triage category. The cumulative percentage is computed by summing the proportions of patients whose treatment started in one minute intervals of time elapsed since presentation within each triage category.

Emergency patients who received treatment are patients with visit type = 1, 3 or 11 and mode of separation = 1, 2, 3, 4, 5, 7, 10, 11, 12 and 13. This cohort only includes patients who had a valid triage category and treatment time. Calculation of the time elapsed is described in the section Time from presentation to starting treatment.

If the cumulative distribution does not reach 100%, it indicates that some patients in that triage category waited longer than the maximum time shown on the horizontal axis for their treatment to start.

Percentage of patients who spent four hours or less in the ED

The percentage of patients who spent four hours or less in the ED is calculated as the number of patients with time from presentation to leaving the ED of four hours or less as a percentage of the total number of patients.

Records with missing time to departure are excluded from calculations of percentage leaving the ED within four hours.

Percentage of patients by time spent in the ED

The distribution curve in *Hospital Quarterly* shows the cumulative percentage of patients and time spent in the ED by the number of hours from presentation until leaving the ED. The cumulative percentage is computed by summing the percentage of patients and time spent in the ED in one minute intervals of time elapsed from presentation to departure. Records that do not have a valid time from presentation to departure are excluded from calculation. Calculation of the time elapsed is described in the section Time from presentation to leaving the ED.

If the cumulative distribution does not reach 100%, it indicates that some patients waited longer than the maximum time shown on the horizontal axis to leave the ED.

Percentage of patients by time spent in the ED and mode of separation

The distribution curve in *Hospital Quarterly* shows the cumulative percentage of patients by the number of hours spent in the ED by mode of separation. The cumulative percentage is computed by summing the percentage of patients and time spent in the ED in one minute intervals of time elapsed from presentation to departure for each mode of separation. Records that do not have a valid departure time are excluded from calculation. Calculation of the time elapsed is described in the section Time spent in the ED.

If the cumulative distribution does not reach 100%, it indicates that some patients in that mode of separation waited longer than the maximum time shown on the horizontal axis of the graph, to leave the ED.

Arrivals by ambulance and transfer of care time

Data for calculating number of ambulance arrivals and transfer of care time are downloaded from the Transfer of Care Reporting System (TCRS) portal. The TCRS incorporates data drawn from the NSW Ambulance information system and from the EDDC.

Overall results for NSW, peer group and LHD use records for patients arriving at hospitals with an ED which is included in *Hospital Quarterly* and has records in the TCRS. The TCRS does not include all hospitals with EDs which are reported in *Hospital Quarterly*. Records in the TCRS for any hospitals where the EDs are not reported in *Hospital Quarterly* are excluded from all calculations of ambulance arrivals and transfer of care time.

Ambulance arrivals is the count of all cases recorded in the TCRS as arriving at a hospital with an ED which is included in *Hospital Quarterly*. Ambulance arrivals include all emergency and priority medical patients transported by ambulance.

Transfer of care time is the time from arrival of patients at the ED by ambulance and transfer of responsibility for their care from ambulance to ED staff in an ED treatment zone. Transfer of care time can only be calculated for matched records. These are records where the ambulance incident number and date can be identified in both the NSW Ambulance data and the ED data. Records which cannot be matched are excluded from all calculations that use transfer of care time.

If the time recorded for transfer of care is earlier than ambulance arrival time, then transfer of care time is calculated starting from ED triage time. If the time of transfer of care is earlier than both arrival and triage time, then transfer of care time is set to missing and the record is excluded from all calculations requiring transfer of care time.

Transfer of care performance is reported as:

- Median time for transfer of care (minutes)
- 95th percentile time for transfer of care (minutes)
- Percentage of ambulance arrivals with transfer of care time within 30 minutes. The denominator for the percentage is the number of matched records with a valid transfer of care time.

Transfer of care performance is not reported for hospitals with less than 50 matched records in the quarter. Records from these hospitals are excluded from calculation of performance measures.

Caution is advised when interpreting performance results for hospitals where transfer of care could not be calculated for more than 30% of total records because records were not matched or transfer of care time was missing.

For more information, see *Spotlight on Measurement: Measuring transfer of care from the ambulance to the emergency department* available at bhi.nsw.gov.au

Appendix

Table 2   Peer group C2 hospitals and changes, July to September 2016

C2 cohort	Hospital	Local health district	Peer group
Up to April to June 2016	Ballina	Northern NSW	C2
	Batemans Bay	Southern NSW	C2
	Bellingen	Mid North Coast	C2
	Bulli	Illawarra Shoalhaven	C2
	Camden	South Western Sydney	C2
	Casino	Northern NSW	C2
	Cessnock	Hunter New England	C2
	Deniliquin	Murrumbidgee	C2
	Forbes	Western NSW	C2
	Gunnedah	Hunter New England	C2
	Inverell	Hunter New England	C2
	Kempsey	Mid North Coast	C2
	Kurri Kurri	Hunter New England	C2
	Lithgow	Nepean Blue Mountains	C2
	Macksville	Mid North Coast	C2
	Maclean	Northern NSW	C2
	Milton	Illawarra Shoalhaven	C2
	Moree	Hunter New England	C2
	Moruya	Southern NSW	C2
	Mudgee	Western NSW	C2
	Muswellbrook	Hunter New England	C2
	Narrabri	Hunter New England	C2
	Parkes	Western NSW	C2
	Queanbeyan	Southern NSW	C2
	Singleton	Hunter New England	C2
	Tumut	Murrumbidgee	C2
	Young	Murrumbidgee	C2
July to September 2016	Ballina	Northern NSW	C2
	Batemans Bay	Southern NSW	C2
	Bellingen	Other Mid North Coast	D1a
	Bulli	Illawarra Shoalhaven	F4
	Camden	Other South Western Sydney	D1b
	Casino	Northern NSW	C2
	Cessnock	Hunter New England	C2
	Deniliquin	Murrumbidgee	C2
	Forbes	Western NSW	C2
	Gunnedah	Hunter New England	C2
	Inverell	Hunter New England	C2
	Kempsey	Mid North Coast	C2
	Kurri Kurri	Hunter New England	C2
	Lithgow	Nepean Blue Mountains	C2
	Macksville	Mid North Coast	C2
	Maclean	Northern NSW	C2
	Milton	Illawarra Shoalhaven	C2
	Moree	Hunter New England	C2
	Moruya	Southern NSW	C2
	Mudgee	Western NSW	C2
	Muswellbrook	Hunter New England	C2
	Narrabri	Hunter New England	C2
	Parkes	Other Western NSW	D1a
	Queanbeyan	Southern NSW	C2
	Singleton	Hunter New England	C2
	Tumut	Other Murrumbidgee	D1a
	Young	Murrumbidgee	C2

Table 3   Effect of reallocation of four hospitals from C2 peer group to 'Other' peer group on median, 95th percentile time to starting treatment in the ED and percentage of patients whose treatment started within clinically recommended timeframes, Hospital Quarterly, July to September 2016

	Measure after change	Measure before change	Difference
Triage 2			
Median (minutes) time	8m	7m	1m
95th percentile time	35m	34m	1m
Percentage on time (%)	66.9	68.2	-1.3 percentage points
Triage 3			
Median (minutes) time	19m	18m	2m
95th percentile time	84m	81m	3m
Percentage on time (%)	72.2	74.0	-1.8 percentage points
Triage 4			
Median (minutes) time	26m	24m	2m
95th percentile time	128m	123m	5m
Percentage on time (%)	78.9	80.9	-2.0 percentage points
Triage 5			
Median (minutes) time	25m	22m	3m
95th percentile time	146m	140m	6m
Percentage on time (%)	91.8	92.9	-1.1 percentage points

Table 4   Effect of reallocation of four hospitals from C2 peer group to 'Other' peer group on number of ED presentations, median and 95th transfer of care times and percentage of patients whose care was transferred within 30 minutes, Hospital Quarterly, July to September 2016

Peer group		Measure after change	Measure before change	Change
C2	Number of presentations	68,325	77,836	-9,551
	Median (minutes) transfer of care time	11 m	11 m	Unchanged
	95th percentile transfer of care time	39m	39m	Unchanged
	Percentage whose care was transferred within 30 minutes	90.3%	90.1%	0.2 percentage points

Table 5   Effect of reallocation of four hospitals from C2 peer group to 'Other' peer group on time spent in the ED and percentage of patients who spent four hours of less in the ED, Hospital Quarterly, July to September 2016

Peer group		Measure after change	Measure before change	Change
C2	Median (hours and minutes) time spent in the ED	1h 43m	1h 38m	5 m
	95th percentile time spent in the ED	6h 46m	6h 34m	12 m
	Percentage who spent four hours or less in the ED	84.7%	85.7%	-1 percentage point

References

1. Health System Information & Performance Reporting, NSW Ministry of Health, NSW Hospital peer groups 2016, 06 April 2016 [online] [cited 04 November 2016]. Available from http://www0.health.nsw.gov.au/policies/ib/2016/IB2016_013.html

2. Australasian College of Emergency Medicine. Policy on the Australian Triage Scale (Revised July 2013) [online]. Available from https://www.acem.org.au/getattachment/693998d7-94be-4ca7-a0e7-3d74cc9b733f/Policy-on-the-Australasian-Triage-Scale.aspx

About the Bureau of Health Information

The Bureau of Health Information (BHI) is a board-governed organisation that provides independent information about the performance of the NSW public healthcare system.

BHI was established in 2009 to provide system-wide support through transparent reporting.

BHI supports the accountability of the healthcare system by providing regular and detailed information to the community, government and healthcare professionals. This in turn supports quality improvement by highlighting how well the healthcare system is functioning and where there are opportunities to improve.

BHI manages the NSW Patient Survey Program, gathering information from patients about their experiences in public hospitals and other healthcare facilities.

BHI publishes a range of reports and tools that provide relevant, accurate and impartial information about how the health system is measuring up in terms of:

- Accessibility – healthcare when and where needed

- Appropriateness – the right healthcare, the right way

- Effectiveness – making a difference for patients

- Efficiency – value for money

- Equity – health for all, healthcare that's fair

- Sustainability – caring for the future.

BHI's work relies on the efforts of a wide range of healthcare, data and policy experts. All of our assessment efforts leverage the work of hospital coders, analysts, technicians and healthcare providers who gather, codify and report data. Our public reporting of performance information is enabled and enhanced by the infrastructure, expertise and stewardship provided by colleagues from NSW Health and its pillar organisations.

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