

Hospital Quarterly

Technical Supplement

Emergency department measures

October to December 2016

BUREAU OF HEALTH INFORMATION

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Please also note that there is the potential for minor revisions of data in this report.

Please check the online version at **bhi.nsw.gov.au** for any amendments.

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Contents

- 1 Summary1
- 2 Activity and performance measures2
- 3 References9

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 October to December 2016 quarter.

Change from 95th to 90th percentile times

In *Hospital Quarterly*, October to December 2016, the 90th percentile has replaced the 95th percentile for related ED measures. This is in line with the use of the 90th percentile to report Commonwealth ED and elective surgery waiting times and elective surgery waiting times in this report.

This means that measures reported in the current issue of *Hospital Quarterly* will differ slightly from previous issues of the report. Therefore caution is advised when interpreting any comparisons using previous issues.

The effects of this change on time from presentation to starting treatment, transfer of care time and time spent in the ED are shown in Appendix 1. At a hospital level, the range of difference between hospitals (difference between results for the 95th percentile and 90th percentile times are:

Time from presentation to starting treatment for patients in triage 2 improves between 1 and 37 minutes, For patients in triage 3: between 5 and 45 minutes, for patients in triage 4: between 8 and 50 minutes and in triage 5: between 5 and 70 minutes. Transfer of care improves between 2 and 75 minutes. Time spent in the ED improves by between 43 and 362 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, time spent in the ED and transfer of care. The median is the time by which half of patients started treatment, the time they spent in the ED or had their care transferred. 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.

90th percentile

The 90th percentile is a statistical measure of the waiting time distribution. It is used in *Hospital Quarterly* to describe time from presentation until treatment, time spent in the ED and transfer of care. The 90th percentile is the time by which 90% of patients started treatment, left the ED or had their care transferred. The final 10% 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 90th 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)
- 90th 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 1 Effect of using 90th percentile, rather than 95th percentile on time from presentation to starting treatment in the ED (minutes), by LHD, October to December 2016

	Triage 2			Triage 3			Triage 4			Triage 5		
	P95	P90	Difference (mins)	P95	P90	Difference (mins)	P95	P90	Difference (mins)	P95	P90	Difference (mins)
NSW	39	26	-13	97	67	-30	132	97	-35	136	103	-33
CCLHD	33	22	-11	98	73	-25	118	89	-29	105	85	-20
FWLHD	17	13	-4	62	41	-21	92	62	-30	96	72	-24
HNELHD	35	22	-13	97	68	-29	141	106	-35	149	115	-34
ISHLHD	35	24	-11	112	80	-32	135	99	-36	119	89	-30
MNCLHD	32	24	-8	79	58	-21	133	99	-34	144	110	-34
MLHD	32	19	-13	66	45	-21	90	64	-26	83	57	-26
NBMLHD	41	29	-12	127	84	-43	140	98	-42	144	109	-35
NNSWLHD	26	19	-7	73	51	-22	120	90	-30	128	99	-29
NSLHD	21	15	-6	63	45	-18	107	77	-30	127	104	-23
SESLHD	34	27	-7	91	66	-25	108	80	-28	126	94	-32
SWSLHD	36	25	-11	90	61	-29	129	92	-37	129	93	-36
SNSWLHD	33	24	-9	89	61	-28	145	108	-37	150	115	-35
SVLHD	24	15	-9	92	65	-27	136	93	-43	144	96	-48
SCHN	30	19	-11	70	55	-15	172	135	-37	138	127	-11
SYDLHD	26	20	-6	91	64	-27	117	88	-29	133	100	-33
WNSWLHD	20	14	-6	77	55	-22	127	91	-36	138	106	-32
WSLHD	96	61	-35	173	132	-41	176	136	-40	156	123	-33

Table 2 Effect of using 90th percentile, rather than 95th percentile on time from presentation to starting treatment in the ED (minutes), by hospital peer group, October to December 2016

	Triage 2			Triage 3			Triage 4			Triage 5		
	P95	P90	Difference (mins)	P95	P90	Difference (mins)	P95	P90	Difference (mins)	P95	P90	Difference (mins)
A1 peer group	53	32	-21	112	77	-35	131	97	-34	144	113	-31
A2 peer group	30	19	-11	70	55	-15	172	135	-37	138	127	-11
A3 peer group	30	20	-10	68	47	-21	119	82	-37	140	104	-36
B peer group	32	22	-10	96	67	-29	133	100	-33	141	109	-32
C1 peer group	27	19	-8	85	59	-26	131	94	-37	131	100	-31
C2 peer group	35	25	-10	78	56	-22	125	91	-34	137	100	-37

Table 3 Effect of using 90th percentile, rather than 95th percentile on transfer of care time and time spent in the ED (hours and minutes), by LHD, October to December 2016

	Transfer of care			Time spent in the ED		
	P95	P90	Difference (mins)	P95	P90	Difference (hrs/mins)
NSW	36	26	-10	9h 32m	6h 54m	-2h 38m
CCLHD	49	29	-20	8h 16m	6h 34m	-1h 42m
FWLHD	31	23	-8	5h 14m	4h 2m	-1h 12m
HNELHD	28	21	-7	7h 32m	5h 48m	-1h 44m
ISLHD	45	30	-15	12h 46m	8h 37m	-4h 9m
MLHD	39	28	-11	6h 34m	4h 46m	-1h 48m
MNCLHD	37	27	-10	8h 24m	6h 16m	-2h 8m
NBMLHD	32	25	-7	11h 22m	7h 53m	-3h 29m
NNSWLHD	42	29	-13	7h 47m	5h 38m	-2h 9m
NSLHD	33	26	-7	8h 5m	6h 16m	-1h 49m
SCHN	19	15	-4	8h 39m	6h 22m	-2h 17m
SESLHD	32	24	-8	9h 30m	7h 12m	-2h 18m
SNSWLHD	36	26	-10	6h 28m	5h 5m	-1h 23m
SVLHD	55	36	-19	13h 56m	9h 41m	-4h 15m
SWSLHD	43	30	-13	11h 51m	8h 19m	-3h 32m
SYDLHD	28	23	-5	9h 33m	7h 3m	-2h 30m
WNSWLHD	37	28	-9	11h 5m	7h 5m	-4h 0m
WSLHD	36	28	-8	15h 57m	10h 42m	-5h 15m

Table 4 Effect of using 90th percentile, rather than 95th percentile on transfer of care time and time spent in the ED (hours and minutes), by hospital peer group, October to December 2016

	Transfer of care			Time spent in the ED		
	P95	P90	Difference (mins)	P95	P90	Difference (hrs/mins)
NSW	36	26	-10	9h 32m	6h 54m	-2h 38m
A1 peer group	37	27	-10	11h 53m	8h 27m	-3h 26m
A2 peer group	19	15	-4	8h 39m	6h 22m	-2h 17m
A3 peer group	33	23	-10	6h 50m	5h 17m	-1h 33m
B peer group	36	26	-10	9h 45m	7h 1m	-2h 44m
C1 peer group	34	25	-9	8h 5m	6h 3m	-2h 2m
C2 peer group	35	25	-10	6h 18m	4h 39m	-1h 39m

References

1. 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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