Technical Supplement

Healthcare in Focus 2012

How well does NSW perform?

Looking out and looking in

Annual Performance Report: December 2012

Bureau of Health Information

Introduction

This is a supplement to the Bureau of Health Information's third annual performance report, *Healthcare in Focus 2012: How well does NSW perform*? The supplement describes methods and technical terms used to compute descriptive statistics and performance indicators reported. It is intended for audiences interested in the creation of health information.

Sources of data

To produce the report, the Bureau relied on the following sources of data:

- NSW Ministry of Health linked admitted patient, emergency presentation and fact of death (2009–11) data and unlinked admitted patient data collection (2000–2011)
- The Organisation for Economic Co-operation and Development (OECD) health data library
- Australian Bureau of Statistics (ABS) mortality data for 2007, 2008, 2009 and 2010
- Survey data from the *2011 NSW Health Patient Survey*
- Survey results from Australian Bureau of Statistics (ABS) *Patient Experience Survey 2010–11*
- Survey results from the *Commonwealth Fund International Health Policy Survey 2011*
- Australian Institute of Health and Welfare (AIHW) expenditure data
- Stroke audit data from the National Stroke Foundation
- Health and healthcare performance data already published by governments. The sources of these data are indicated where appropriate.

The Bureau used SAS / BASE and SAS / STAT software, version 9.2 of the SAS System for Windows and SAS / EG software version 5.1 for the statistical analysis of data published in the report.[1]

NSW Ministry of Health linked admitted, emergency and fact of death (2009–11) and admitted patient data collection (2009–2011)[2]

The NSW Ministry of Health maintains a library of datasets containing records of hospital admissions, emergency department presentations and fact of death, which include a unique person identifier. The person identifier is a statistical linkage key, generated by the Centre of Health Record Linkage (CHeReL) using probabilistic record linkage methods. Further information can be found at www.cherel.org.au

The Bureau used these datasets to generate a suite of NSW healthcare system performance indicators. The cohort excludes admissions to Albury Base Hospital (administrated by Victoria Health since July 2009) and newborns *'without qualification days'* (i.e. well newborns). Well newborns are defined in linked data using ICD10 codes as 'Z38.0', 'Z38.3' and 'Z38.6' in any of the diagnosis fields. The indicators calculated by the Bureau using these data are:

Number of hospitalisations by principal diagnosis

Each overnight episode in admitted patient data collection 2010–11, was assigned to a category using ICD10–AM chapter of the primary diagnosis. Hospitals were classified as public and private using their assigned facility type. A patient can have multiple episodes in a single hospital stay.

Counts of patients admitted to hospitals

Linked data allowed the Bureau to identify admission patterns of individual patients by enumerating episodes of care that each patient was admitted for. The distribution of patients with 0, 1, 2 or 3+ episodes of care were ascertained. For patients with three or more episodes of care, the categories of principal diagnosis (as defined above) for the episodes were calculated.

Since the admitted patient data collection is the census of the hospitalisations, a count of NSW residents that were not admitted was calculated using ABS NSW estimated resident population for December 2010.

Calculating bed days

Total bed days is a measure of total hospital use over a defined period of time and refers to the number of bed days occupied by all overnight patients admitted for an acute episode of care during a defined period. Bed days for an episode that begins and ends within the period are calculated by the difference between the episode start date and the episode end date. Bed days for an episode that begins before 1 July 2010 are calculated as the difference between 1 July 2010 of the period and the episode end date. Episode leave days are not subtracted from the bed days in the calculation of total bed days. Acute episodes were identified using service category field.

Counts of patients visiting emergency departments

Linked data allowed the Bureau to identify patterns of emergency department visits of individual patients which enabled counting the number of times that patients visited emergency departments across NSW hospitals. Only records from emergency departments submitting data from the Ministry electronically are available in linked data sets. These records accounted for 84% of all ED visits in NSW in 2010–11.

Visits to emergency departments

Counts of emergency department visits in NSW in 2010–11 that were recorded in the emergency department data collection, were reported according to arrival mode, urgency category and mode of separation.

Using linked emergency department visits between July 2005 and June 2011, we reported the proportion of unplanned return visits within 48 hours to emergency departments. We identified unplanned re-presentation within 48 hours by calculating the difference between arrival time and previous departure time.

30-day post-admission mortality rates

The calculation of 30-day mortality rates is based on a methodology used in OECD Health Data 2012. Specific information regarding this methodology can be found at Health Care Quality Indicators section of OECD Health Stats.[3]

There are four different types of mortality rates defined in OECD Health Data:

- Patient based 30-day (in-hospital and out of hospital)
- Patient based 30-day in-hospital (any hospital)
- Patient based 30-day in-hospital (same hospital)
- Admission based 30-day in-hospital (same hospital) mortality rates.

Having access to admission data linked to date of death, the Bureau was able to calculate the in-hospital and out-of-hospital mortality rates for persons admitted with a primary diagnosis of acute myocardial infarction (AMI), ischaemic stroke and haemorrhagic stroke. Days until death was calculated from the last admission of the patient before death. Appendix, Table 1 shows the ICD–10 AM codes used for identifying episodes for each specific disease.

Hospital level 30-day mortality rates are directly standardised for age, sex and most recent Charlson comorbidity index[4] to the population of patients admitted for the condition in NSW. Age groups used for standardisation were 15–44, 45–54, 55–64, 65–74, 75–84 and 85+ years of age. Comorbidity was scored on all secondary diagnoses of the last admission

prior to death or the end of study period and categorised into three groups (0, 1 and 2+ using the Charlson index score).

Statistical estimates of directly standardised rates become unstable when the numerator or denominator is small. Standardised 30-day mortality rates are not reported if there were less than 50 admissions to the hospital for the condition or there were less than 10 deaths within 30 days of admission attributable to the hospital. A caution is attached to rates calculated using a death count of between 10 and 19.

Surgical procedure

We used admitted patient data collection 2010–11, and identified surgical episodes using Diagnostic Related Group (DRG) field to look at most frequent surgical procedure performed by public and private hospitals. There is concordant DRG to surgical, medical and other, in the AR-DRG Definitions Manuals.[5] As some hospitals used an older version of DRG, using the most recent concordance file did not assign a surgical flag to all records. To resolve this issue, the Bureau used multiple versions of DRG concordance files to identify surgical episodes regardless of the version of DRG used by the hospital. Procedures were coded using the Australian Classifications of Health Intervention (ACHI) and grouped as defined in Health Statistics NSW.[6]

Organisation for Economic Co-operation and Development (OECD) data library

The Bureau used OECD methodology to calculate a selection of indicators for NSW in order to compare NSW performance with selected OECD countries. The definitions of performance indicators used by the OECD are available at the healthcare quality indicators section of OECD Health Stats.[3] Broadly, these indicators include those outlined below.

Potential years of life lost (PYLL):

Potential years of life lost (PYLL) is a summary measure of premature mortality, calculated by summing deaths at each age, multiplying that by the number of remaining years of life up to a selected age limit, which for OECD analyses is 70 years.

Data for NSW were obtained for comparison with OECD data in two ways. As mortality data for years 2008 to 2011 were not released at the time of analysis for this report, the Bureau commissioned the ABS to calculate mortality rates and PYLL, standardised by age and sex to the 2010 OECD resident population, for NSW and Australia for 2007–2010 using the same methods as the OECD.

To be consistent in methodology used for the trends, the Bureau used population and mortality data from NSW Health data collections accessed from the Health Outcomes Information Statistical Toolkit (HOIST) to calculate PYLL 1999–2007 for NSW and Australia. Rates were age-standardised using the OECD standard population 2010 (Appendix, Table 3) to enable fairer comparisons between NSW and other countries.

PYLL were calculated for selected conditions listed in Appendix, Table 1 with corresponding ICD–10 mortality codes.

Rates of hospitalisation for selected conditions

The Bureau calculated the rate of hospitalisation for selected conditions using OECD definitions to compare NSW performance against selected OECD countries in the past 10 years. The cohort includes residents of NSW using NSW hospitals for overnight episodes. The morbidity codes used to calculate NSW indicators presented in this report are listed in Appendix, Table 1.

Unadjusted 30-day in and out of hospital mortality rates for selected conditions

The Bureau calculated the unadjusted 30-day in and out of hospital mortality rate in NSW according to OECD definition for selected morbidities. The numerator is the number of deaths (age 15+) in any hospital and out of hospital that occurred within 30 days of hospital admission with a primary diagnosis of a selected condition. The denominator is the number of patients admitted to hospital (age 15+) with a primary diagnosis of selected morbidity in 2010–11. We calculated these rates for Acute Myocardial Infarction (AMI), ischaemic stroke and haemorrhagic stroke.

Safety and mental health indicators

The safety indicators calculated for NSW using 2009–10 admitted patient data collection are summarised in Appendix, Table 2. Surgical and medical discharges were identified using updated DRG codes for these indicators. The cohort includes NSW residents, 15 years of age and older, using NSW hospitals. All rates were age-sex standardised to the OECD 2005 standard population (Appendix, Table 4). The age group used was 15 to 85 years, shown in five year groups, then 85+. For more information about methods used for calculating these indicators see Drösler, 2009.[7]

NSW Health Patient Survey

NSW Health conducted a comprehensive statewide patient experience survey from 2007–2011. The survey was held to gain information from patients across NSW about their experiences with healthcare services from a variety of patient groups. The survey used patient survey questionnaires developed by NRC+ Picker in the United States and was conducted in conjunction with IPSOS Social Research Institute.

For this report, the Bureau used de-identified unit record data from the 2011 survey in the following patient groups:

- Overnight Inpatients (14,832 patients)
- Day-only Inpatients (11,325 patients)
- Non-Admitted Emergency Patients (13,567 patients)
- Mental Health Inpatients (469 patients)
- Mental Health Outpatients (2704 patients).

For each question used in the report, the percentage of patients responding to any category in each hospital was calculated after taking into account the weights allocated to each patient by IPSOS. The SAS / STAT software procedure SURVEYMEANS was used to make these calculations. Hospitals with less than 30 patients or more than 7% standard errors around estimated rates are suppressed.

As the sample number for mental health inpatients was small, calculating rates by facilities was not possible. We have only reported the NSW rate for patients responding *Yes* to the question: *Did they tell you what danger signals about your condition to watch for after you went home?*

Appendix

Table 1: International Classification of Disease (ICD–10 AM) mortality and morbidity codes used across the report

	Mortality code	Morbidity code
AMI	I21	I21 and I22
Haemorrhagic stroke	I60–I62	N/A
Ischaemic stroke	I63–I64	I63–I64
Stroke	I60–I69	I60–I69
Complications of surgical and medical care	N/A	T80–T88
Diabetes - short term complications	N/A	E10.0, E10.1, E11.0, E11.1, E13.0, E13.1, E14.0, E14.1
Malignant neoplasm	C00–C97	N/A
Colorectal cancer	C18–C21	C18–C21
Lung cancer	C33–C34	C33–C34
Skin cancer	C43–C44	C43–C44
Breast cancer	C50	C50
Prostate cancer	C61	N/A
Circulatory disease	I00–I99	I00–I99
Respiratory disease	J00–J99	J00–J99
Mental health	N/A	F00–F99
Musculoskeletal disease	N/A	M00–M99

Table 2: Detailed information about health indicators calculated by the Bureau using OECD definitions

Indicator	ICD–10 code	Note
Foreign body left in during procedure per 100,000 medical and surgical discharges	Non-primary diagnosis of T81.5,T81.6,Y61	Excluding psychiatric hospitals. Excluding episodes with length of stay less than 24 hours. Those who were under 15 with pregnancy / childbirth and puerperium episodes are also included.
Post-operative pulmonary embolism or deep vein thrombosis, per 100,000 surgical discharges	Non-primary diagnosis of I26.0, I26.9, I80.1, I80.2, I80.3, I80.8, I80.9, I82.8, I82.9	Excluding pregnancy / childbirth and puerperium episodes. Excluding episodes with length of stay less than 48 hours. Any episode with procedure code of *'interruption of Vena Cava'* are also excluded.
Accidental puncture or laceration, per 100,000 discharges (medical and surgical)	Non-primary diagnosis of T81.2, Y60	Excluding psychiatric hospitals. Excluding episodes with length of stay less than 24 hours. Excluding pregnancy / childbirth and puerperium episodes.
Post-operative sepsis rate, per 100,000 elective surgical discharges	Non-primary diagnosis of in: A40.0, A40.1, A40.2, A40.3, A40.8, A40.9, A41.0, A41.1, A41.2, A41.3, A41.4, A41.5, A41.8, A41.9, R57.8, T81.1	Elective surgical discharge defined using emergency status field. Excluding psychiatric hospitals. Excluding pregnancy / childbirth and puerperium episodes and immunocompromised patients. Excluding episodes with length of stay less than 96 hours.
Unplanned mental health eadmissions within 30 days for patients with schizophrenia	Schizophrenia: First, second or third diagnosis in: F20, F21, F23.1, F23.2, F25.0, F25.1, F25.2, F25.8, F25.9	Mental health readmission defined as primary diagnosis in: F10–F69 or F90–F99
Unplanned mental health readmissions within 30 days for patients with bipolar disorder	First, second or third diagnosis in: F31	Mental health readmission defined as primary diagnosis in: F10–F69 or F90–F99

Table 3: **Total OECD Population 2010:** the following standard population was used to calculate age-standardised rates for mortality and for potential years of life lost (PYLL)

Age group (years)	Population
0	1.28
1–4	5.04
5–9	6.16
10–14	6.2
15–19	6.62
20–24	6.77
25–29	7.01
30–34	6.94
35–39	7.17
40–44	7.1
45–49	7.11
50–54	6.6
55–59	5.98
60–64	5.4
65–69	4.21
70–74	3.58
75–79	2.88
80–84	2.13
85+	1.82
Total	100

Table 4: **OECD 2005 standard population:** the following standard population was used to calculate age- and sex- standardised rates

	Standard population OECD 2005		
Age group (years)	Male	Female	Total
15–19	40,625,795	38,773,417	79,399,212
20–24	41,743,145	40,258,194	82,001,339
25–29	41,941,848	40,948,668	82,890,516
30–34	43,389,484	42,704,755	86,094,239
35–39	43,371,817	42,895,601	86,267,418
40–44	43,161,119	43,109,483	86,270,602
45–49	40,248,518	40,649,038	80,897,556
50–54	36,427,644	37,364,408	73,792,052
55–59	33,380,411	34,689,310	68,069,721
60–64	26,289,839	28,254,493	54,544,332
65–69	22,346,079	25,279,333	47,625,412
70–74	18,074,327	22,236,819	40,311,146
75–79	13,607,727	19,097,765	32,705,492
80–84	8,425,270	14,684,935	23,110,205
85+	5,282,533	12,504,426	17,786,959
Total	458,315,556	483,450,645	941,766,201

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1. SAS Institute. The SAS System for Windows, version 9.2 Cary (NC). SAS Institute 2005. (Note: SAS and all other SAS Institute Inc. product or service names are registered trademarks or trademarks of SAS Institute Inc. in the USA and other countries. ® indicates USA registration).

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The suite of products includes:

- *Healthcare in Focus 2012: How well does NSW perform?* The main report describes performance of the healthcare system in NSW, using some 100 indicators. It compares NSW with Australia as a whole and 10 other countries
- *Technical Supplement* (presenting research methods and statistical analyses)
- Downloadable *slide library* of key figures.

About the Bureau

The Bureau of Health Information provides the community, healthcare professionals and the NSW Parliament with timely, accurate and comparable information on the performance of the NSW public health system in ways that enhance the system's accountability and inform efforts to increase its beneficial impact on the health and wellbeing of the people of NSW.

The Bureau is an independent, board-governed statutory health corporation. The conclusions in this report are those of the Bureau and no official endorsement by the NSW Minister for Health, the NSW Ministry of Health or any other NSW statutory health corporation is intended or should be inferred.

To contact the Bureau of Health Information

Telephone: +61 2 8644 2100
Fax: +61 2 8644 2119
Email: enquiries@bhi.nsw.gov.au
Postal address:
PO Box 1770, Chatswood
New South Wales 2057, Australia
Web: www.bhi.nsw.gov.au

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Please note that there is the potential for minor revisions of data in this report. Please check the online version at www.bhi.nsw.gov.au for any amendments.