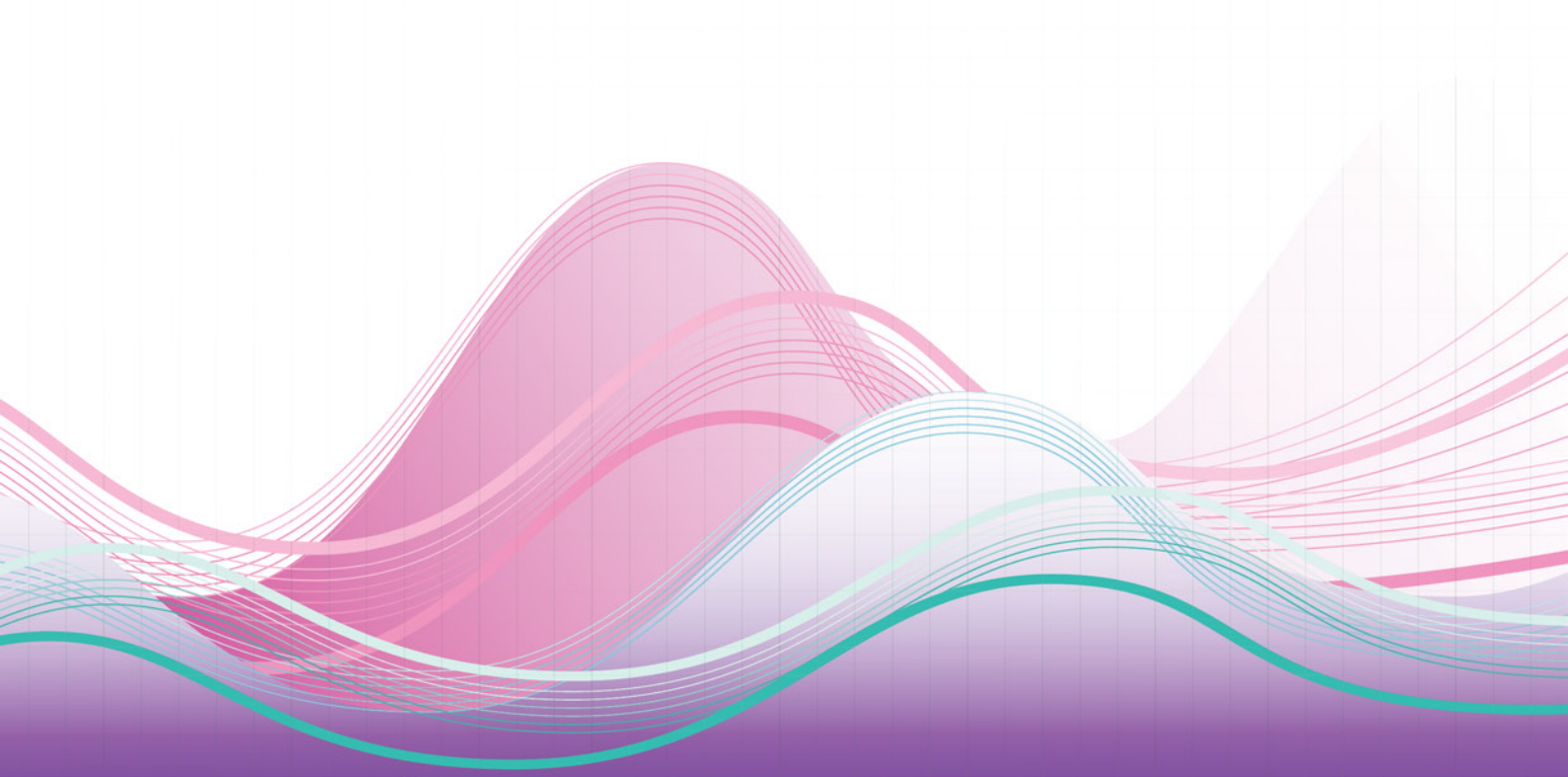


The Insights Series

30-day mortality following hospitalisation,
five clinical conditions, NSW,
July 2009 – June 2012

Acute myocardial infarction, ischaemic stroke,
haemorrhagic stroke, pneumonia and hip fracture surgery

Performance Profile:
Royal North Shore Hospital



Royal North Shore Hospital summary dashboard, July 2009 - June 2012

30-day mortality following hospitalisation for five conditions

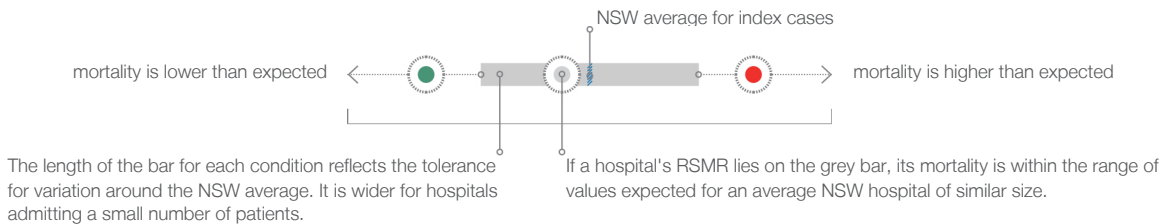
Hospital-specific risk-standardised mortality ratios (RSMRs) report the ratio of actual or 'observed' number of deaths to the 'expected' number of deaths. A hierarchical logistic regression model draws on the NSW patient population's characteristics and outcomes to estimate the expected number of deaths for each hospital, given its case mix. A ratio less than 1.0 indicates lower-than-expected mortality, and a ratio higher than 1.0 indicates higher-than-expected mortality. Small deviations from 1.0 are not considered to be meaningful. Funnel plots with 90% and 95% control limits around the NSW rate are used to identify hospitals with higher and lower mortality.

This measure is not designed to compare hospitals and cannot be used to measure the number of avoidable deaths. RSMRs do not distinguish deaths that are avoidable from those that are a reflection of the natural course of illness. They do not provide, by themselves, a diagnostic of quality and safety of care.

Risk-standardised mortality ratios (RSMRs) for five conditions, dashboard



How to interpret the dashboard



(†) Data for hospitals with an expected mortality of <1 are suppressed.

(◇) Between 90% and 95% upper control limits; (◇◇) Outside 95% upper control limits.

(□) Between 90% and 95% lower control limits; (□□) Outside 95% lower control limits.

Notes: RSMR data are for patients with a hospitalisation noting the relevant condition as principal diagnosis.

Patients include those discharged between July 2009 and June 2012 who were initially admitted to this hospital (regardless of whether they were subsequently transferred) in their last period of care. Deaths are from any cause, in or out of hospital within 30 days of the hospitalisation admission date.

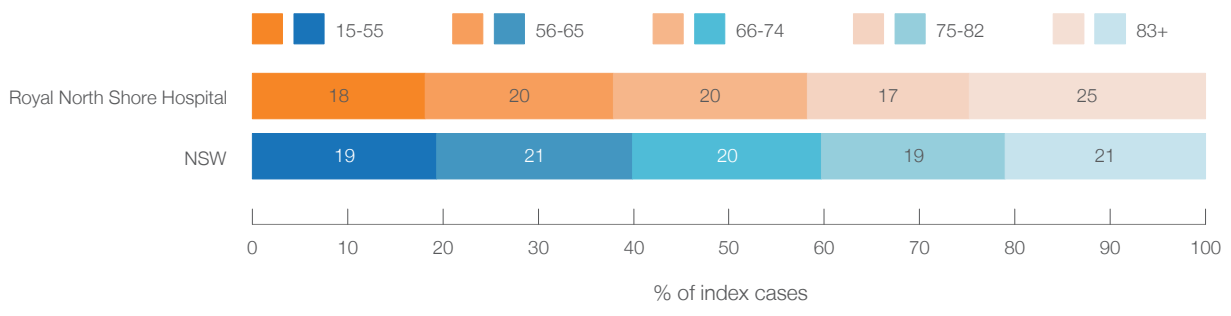
Details of analyses and risk adjustment are available in *Spotlight on Measurement: risk-standardised mortality ratios for five conditions*.

Data source: SAPHaRI, Centre for Epidemiology and Evidence, NSW Ministry of Health.

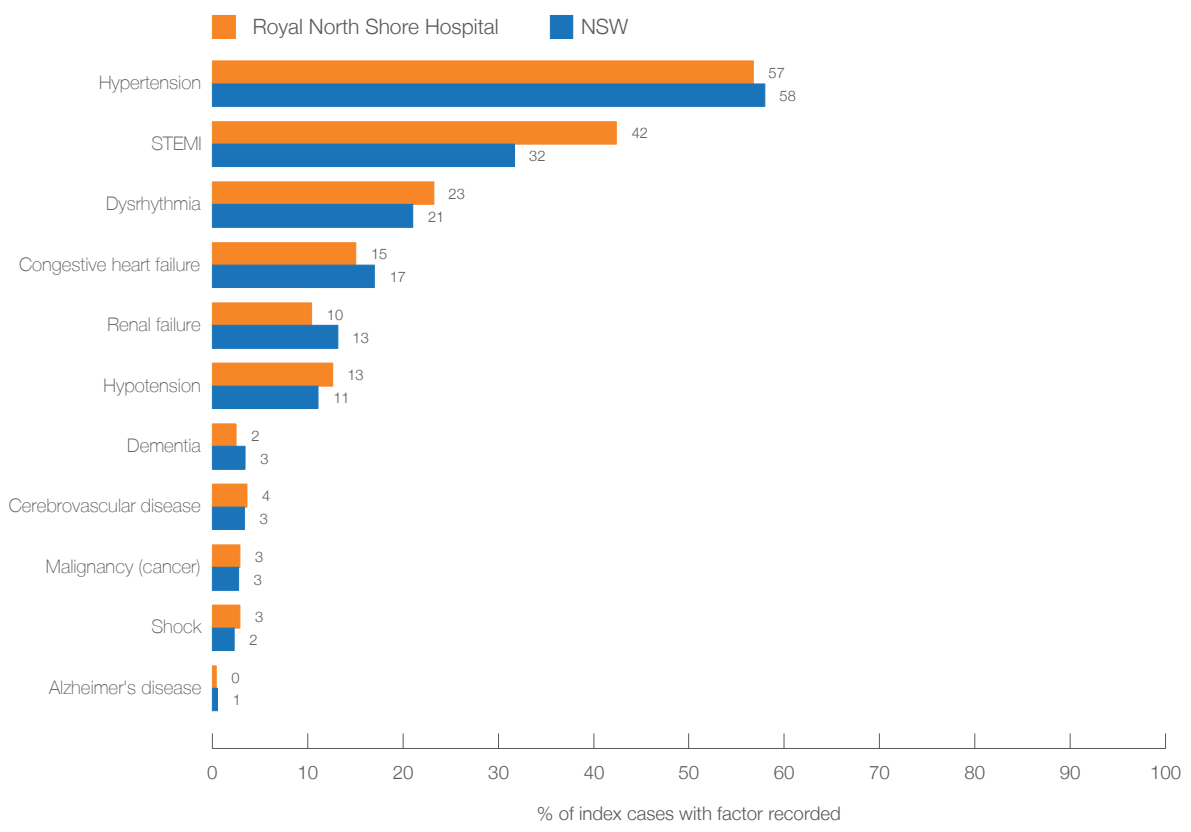
Royal North Shore Hospital profile July 2009 - June 2012
 30-day mortality following hospitalisation for Acute Myocardial Infarction (AMI)

	This hospital	NSW
Total Acute Myocardial Infarction (AMI) hospitalisations	1,279	37,794
Acute Myocardial Infarction (AMI) patients		
Presenting patients (index cases)¹	969	29,223
Patients not transferred to another hospital	780	18,303
Patients transferred out to another hospital	189	10,920

Age profile, index cases²



Significant patient factors and comorbidities, index cases³

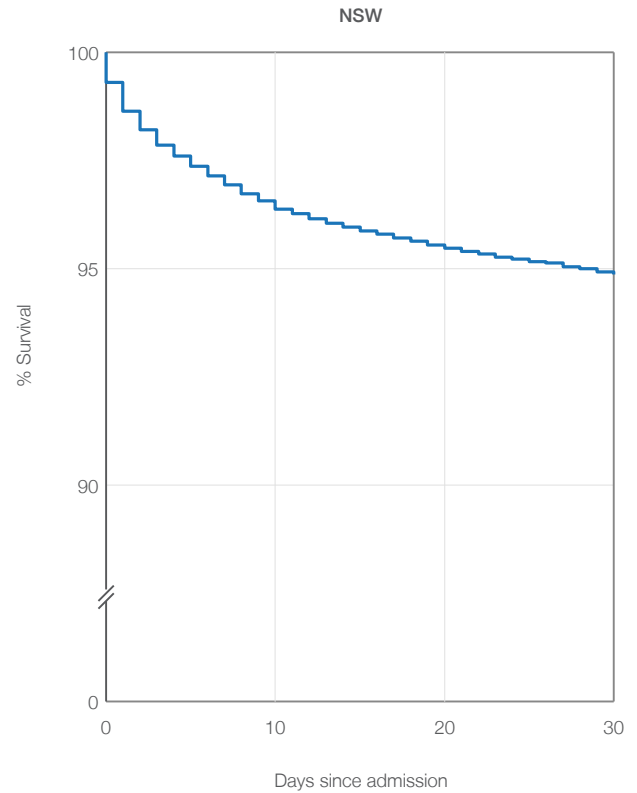
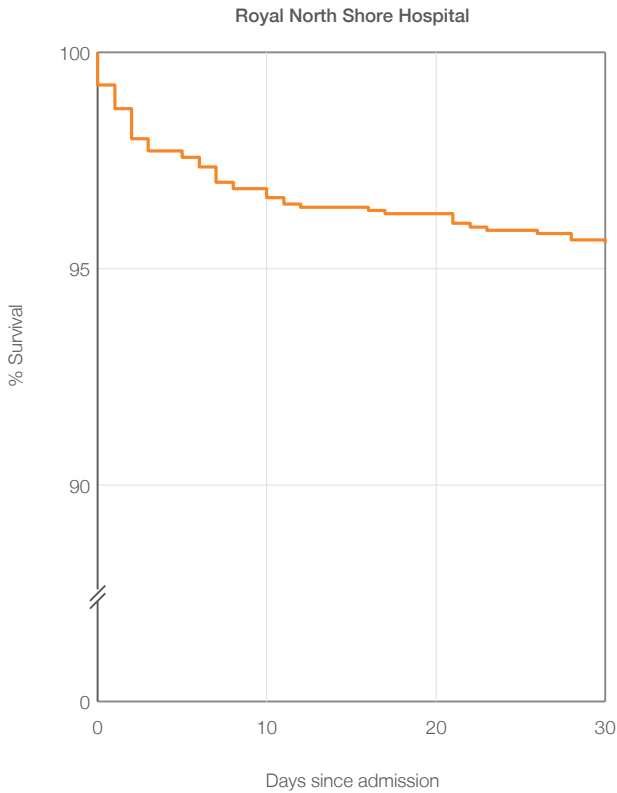


Royal North Shore Hospital profile July 2009 - June 2012

30-day mortality following hospitalisation for Acute Myocardial Infarction (AMI)

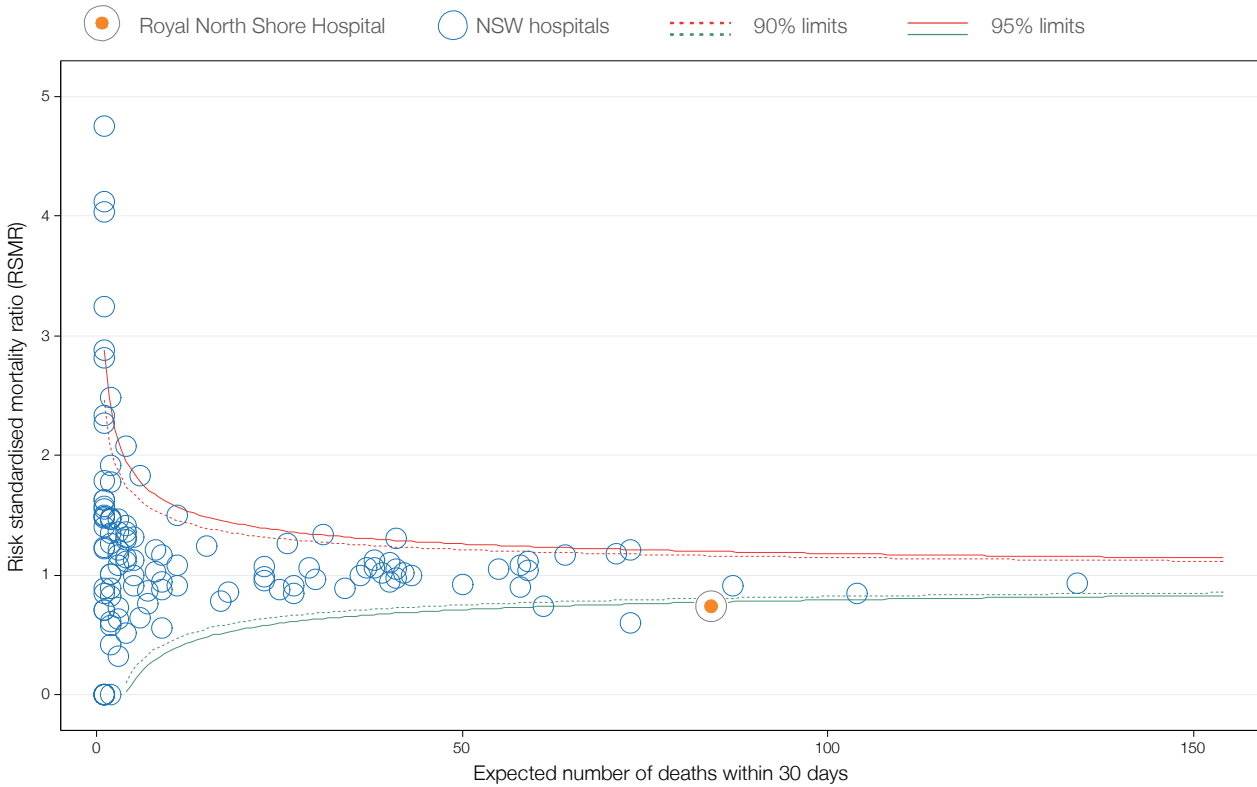
Mortality (all causes) among 969 Acute Myocardial Infarction (AMI) index cases ⁴	This hospital percentage	NSW percentage
Percentages: index cases who died within 30 days of hospitalisation	6%	
Of all deaths:		
percentage in this hospital	71%	(64%)
percentage in another hospital following transfer	2%	(6%)
percentage after discharge	27%	(31%)
percentage on day of admission	18%	(14%)
percentage within 7 days	69%	(61%)

Survival of index cases following hospitalisation for Acute Myocardial Infarction (AMI)⁵
Adjusted for average age and Charlson comorbidity score



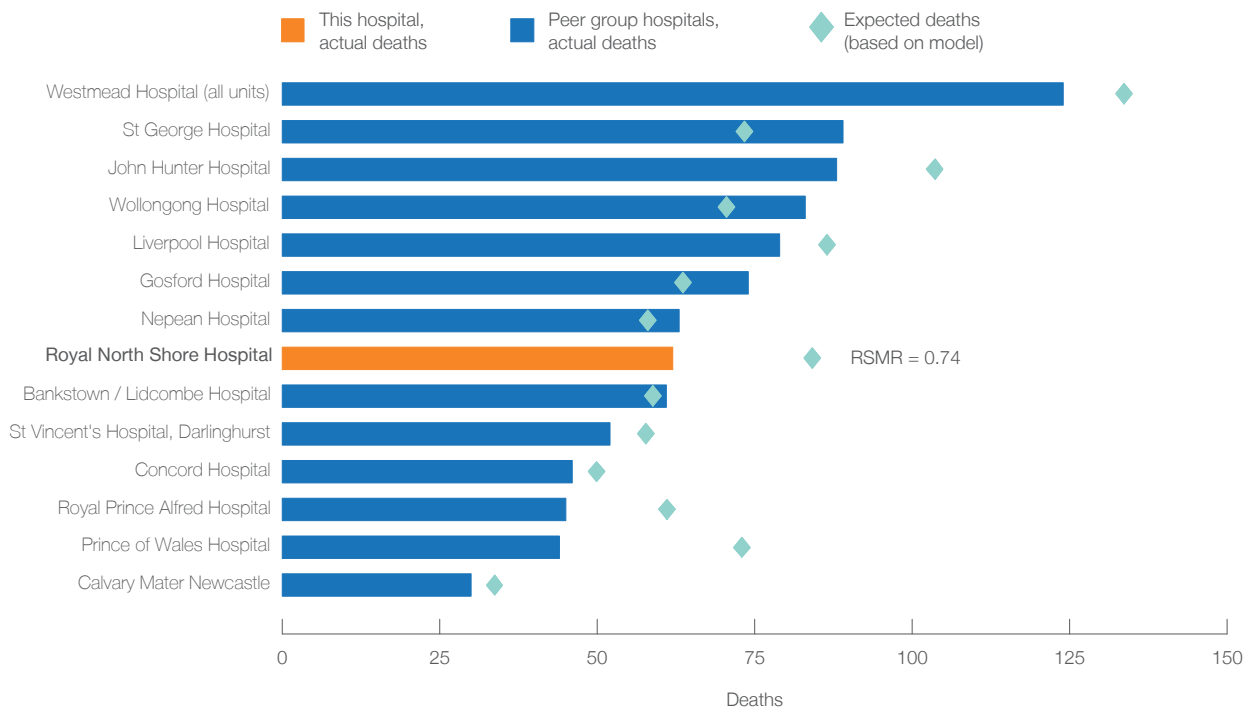
Royal North Shore Hospital profile July 2009 - June 2012

Hospital-level Acute Myocardial Infarction (AMI) risk-standardised mortality ratio by number of expected deaths, NSW public hospitals



Hospital-specific RSMRs report the ratio of actual or 'observed' number of deaths to the 'expected' number of deaths. A hierarchical logistic regression model draws on the NSW patient population's characteristics and outcomes to estimate the expected number of deaths for each hospital, given the characteristics of its patients.

Actual and expected deaths, compared to local peers



Royal North Shore Hospital profile July 2009 - June 2012

30-day mortality following hospitalisation for Acute Myocardial Infarction (AMI)

Illustrating the effect of standardisation, July 2009 - June 2012

In order to make fair comparisons, a number of risk adjustments are made to mortality data. These take into account patient level factors that influence the likelihood of dying. The table below illustrates the cumulative effect of the statistical adjustments. For each ratio, hospitals are compared to the average NSW result, given their case mix.

■ Lower mortality
 ■ No difference
 ■ Higher mortality

Unadjusted ratio	Age and sex standardised ratio	Risk-standardised mortality ratio
0.85	0.79	0.74

Time series risk-standardised mortality ratio, July 2000 - June 2012 ⁶

■ Lower mortality
 ■ No difference
 ■ Higher mortality

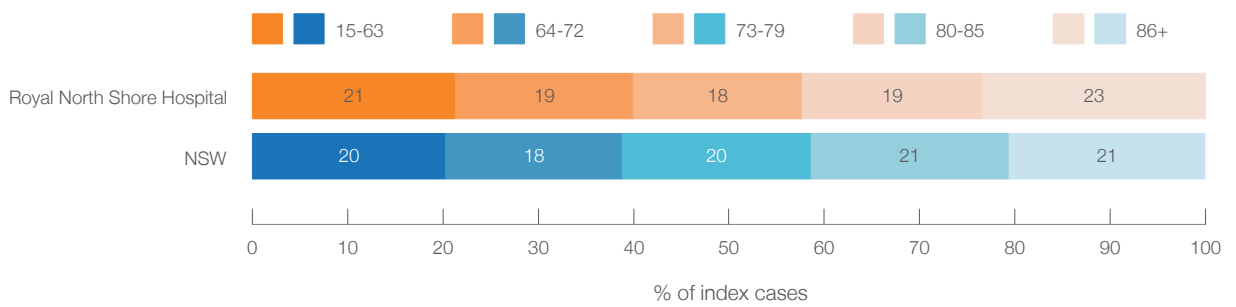
Year (financial years)	2000-02	2003-05	2006-08	2009-11
Risk-standardised mortality ratio	0.84	0.76	0.64	0.74

- (1) Index cases refer to patients discharged between July 2009 and June 2012 who were initially admitted to this hospital (regardless of whether they were subsequently transferred) in their last period of care.
 - (2) Age at admission date.
 - (3) Only those conditions that were shown to have a significant impact on mortality ($P < 0.05$) are shown. Many are a result of end-organ damage resulting from comorbidities, such as diabetes. A broader set of comorbidities was screened for potential impacts on mortality. Comorbidities as recorded on patient record, with one year look back. STEMI refers to ST-elevation myocardial infarction.
 - (4) Deaths are from any cause, in or out of hospital within 30 days of the index hospitalisation admission date.
 - (5) Kaplan-Meier survival curve for 30-day following admission for haemorrhagic stroke, adjusted for average age and average Charlson comorbidity score. Survival curves depict the proportion of patients who were alive, day 0 – day 30.
 - (6) To make RSMRs comparable over time, a reference population is required. Time series RSMRs for each hospital are based on the reference years (July 2009 - June 2012). Control limits are based on the NSW average within each period.
 - (†) Data for hospitals with an expected mortality of < 1 are suppressed.
 - (◇) Between 90% and 95% upper control limits; (◇◇) Outside 95% upper control limits.
 - (□) Between 90% and 95% lower control limits; (□□) Outside 95% lower control limits.
- Details of analyses and risk adjustment are available in *Spotlight on Measurement: risk-standardised mortality ratios*
 Data source: SAPHaRI, Centre for Epidemiology and Evidence, NSW Ministry of Health.

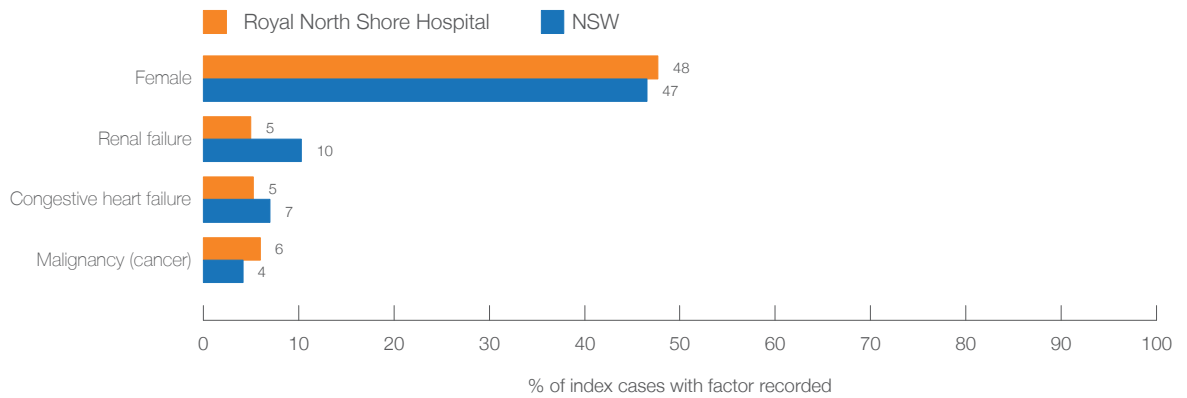
Royal North Shore Hospital profile July 2009 - June 2012
 30-day mortality following hospitalisation for ischaemic stroke

	This hospital	NSW
Total ischaemic stroke hospitalisations	775	15,299
Ischaemic stroke patients		
Presenting patients (index cases)¹	723	14,205
Patients not transferred to another hospital	670	11,757
Patients transferred out to another hospital	53	2,448

Age profile, index cases²



Significant patient factors and comorbidities, index cases³



Royal North Shore Hospital profile July 2009 - June 2012
 30-day mortality following hospitalisation for ischaemic stroke

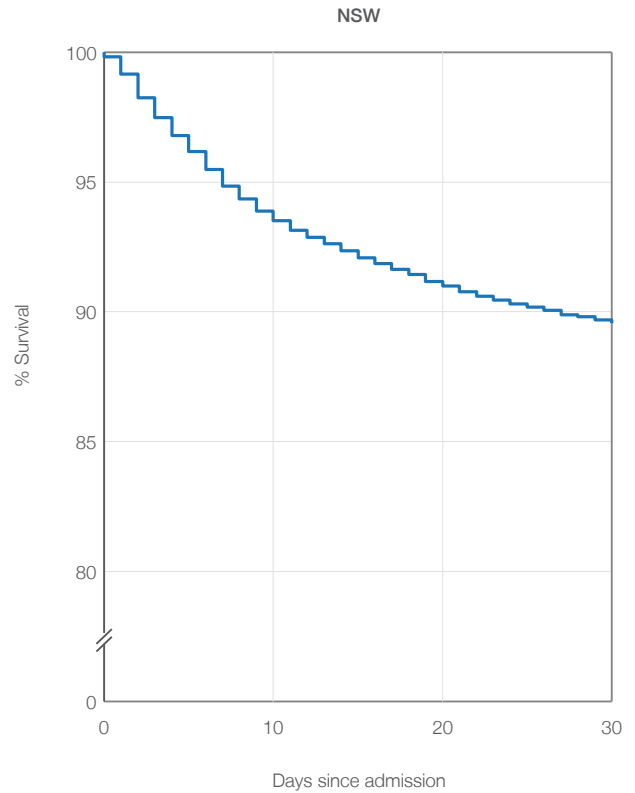
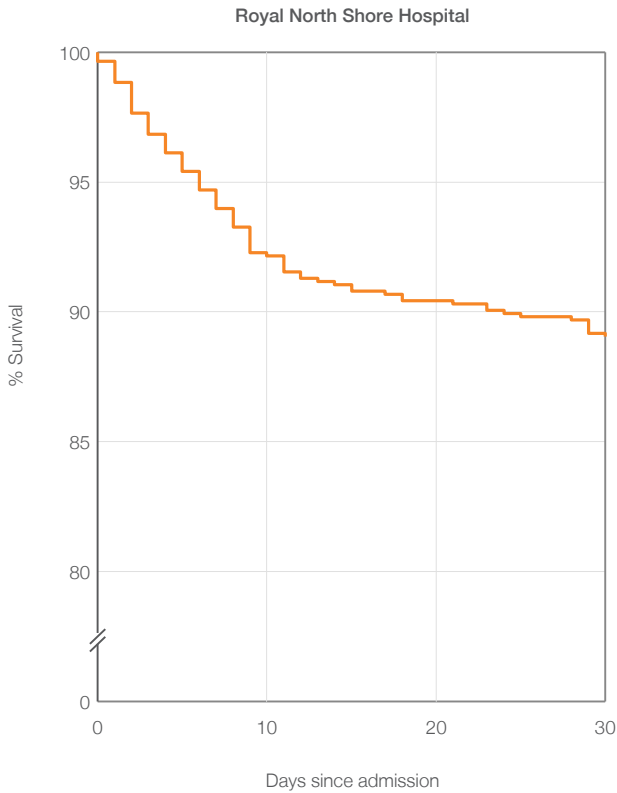
Mortality (all causes) among 723 ischaemic stroke index cases⁴

Percentages: index cases who died within 30 days of hospitalisation

Of all deaths:

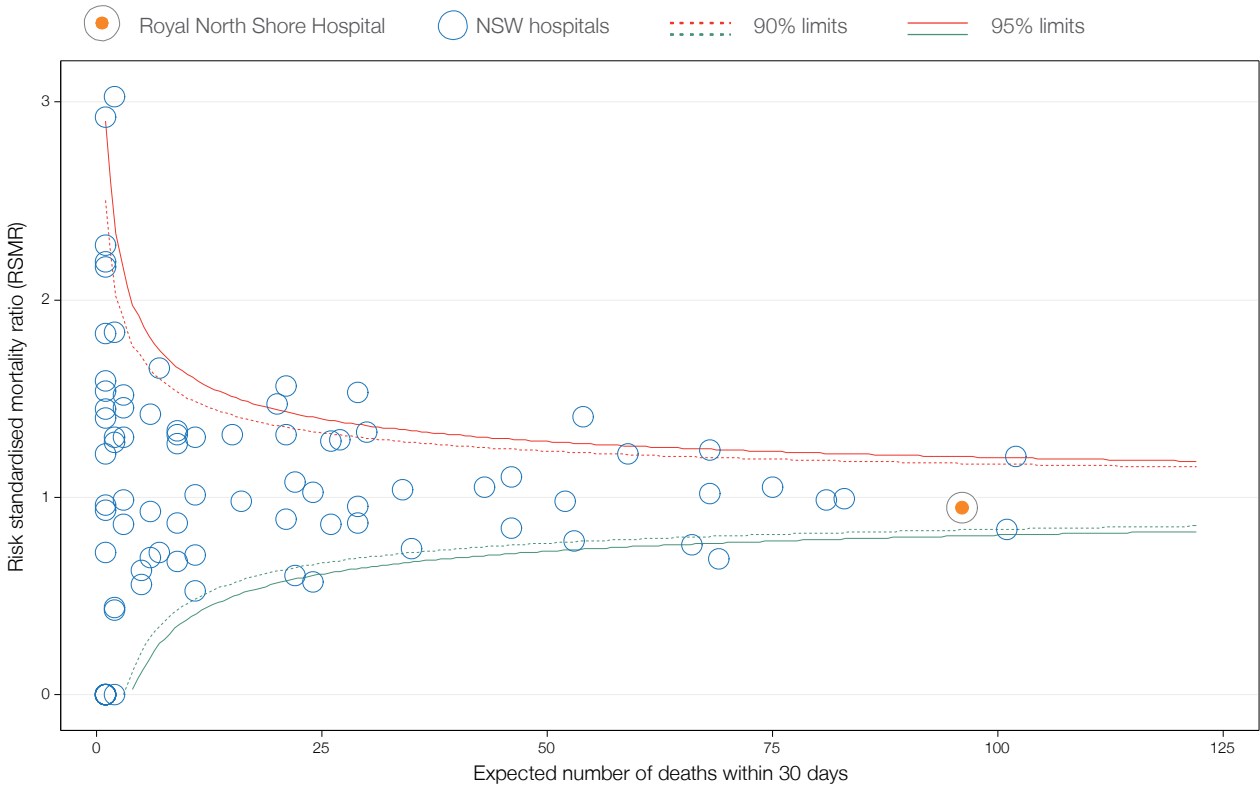
	This hospital percentage	NSW percentage
percentage in this hospital	71%	(67%)
percentage in another hospital following transfer	0%	(2%)
percentage after discharge	29%	(31%)
percentage on day of admission	3%	(2%)
percentage within 7 days	56%	(51%)

Survival of index cases following hospitalisation for ischaemic stroke⁵
 Adjusted for average age and Charlson comorbidity score



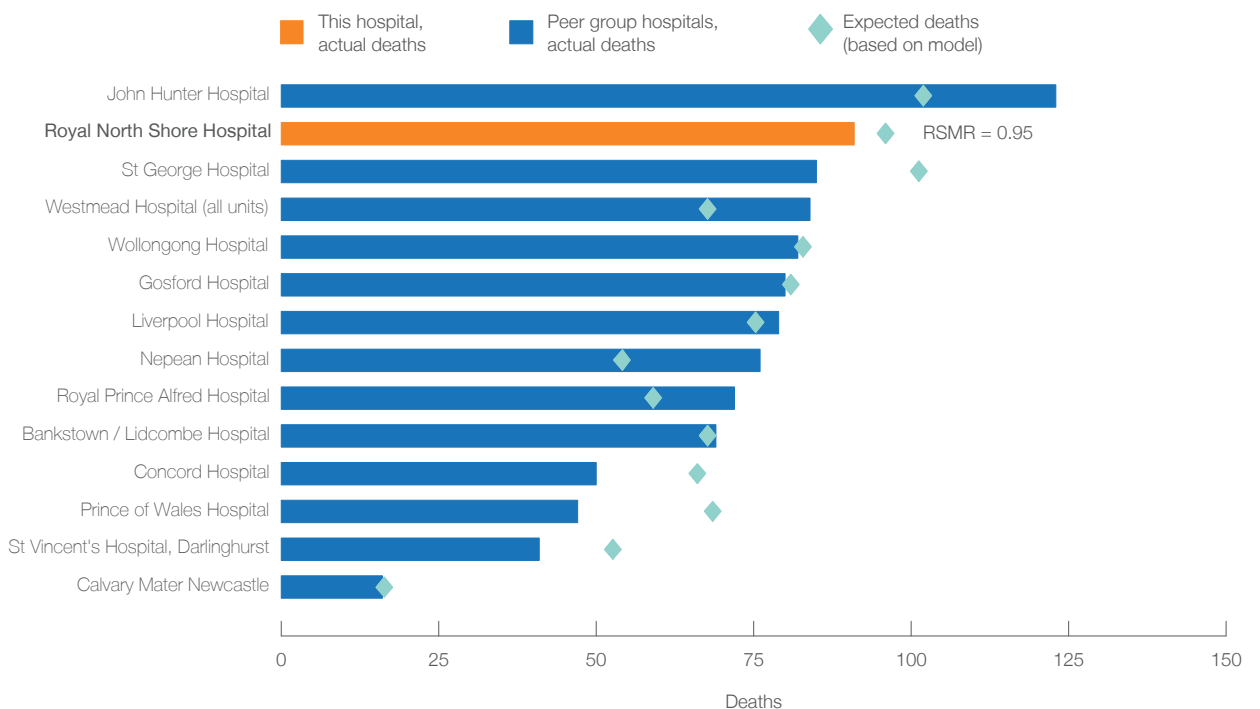
Royal North Shore Hospital profile July 2009 - June 2012

Hospital-level ischaemic stroke risk-standardised mortality ratio by number of expected deaths, NSW public hospitals



Hospital-specific RSMRs report the ratio of actual or 'observed' number of deaths to the 'expected' number of deaths. A hierarchical logistic regression model draws on the NSW patient population's characteristics and outcomes to estimate the expected number of deaths for each hospital, given the characteristics of its patients.




Actual and expected deaths, compared to local peers



Royal North Shore Hospital profile July 2009 - June 2012
 30-day mortality following hospitalisation for ischaemic stroke




Illustrating the effect of standardisation, July 2009 - June 2012

In order to make fair comparisons, a number of risk adjustments are made to mortality data. These take into account patient level factors that influence the likelihood of dying. The table below illustrates the cumulative effect of the statistical adjustments. For each ratio, hospitals are compared to the average NSW result, given their case mix.

 Lower mortality  No difference  Higher mortality

Unadjusted ratio	Age and sex standardised ratio	Risk-standardised mortality ratio
0.94	0.92	0.95

Time series risk-standardised mortality ratio, July 2000 - June 2012 ⁶

 Lower mortality  No difference  Higher mortality

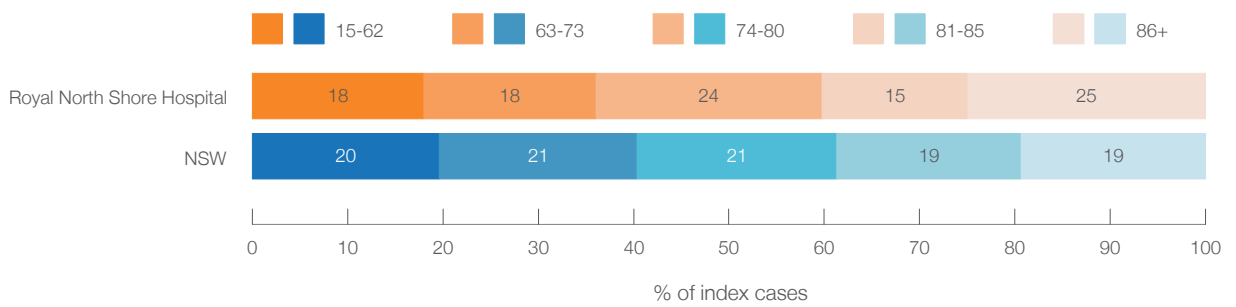
Year (financial years)	2000-02	2003-05	2006-08	2009-11
Risk-standardised mortality ratio	0.78	0.94	0.82	0.95

(1) Index cases refer to patients discharged between July 2009 and June 2012 who were initially admitted to this hospital (regardless of whether they were subsequently transferred) in their last period of care.
 (2) Age at admission date.
 (3) Only those conditions that were shown to have a significant impact on mortality (P<0.05) are shown. Many are a result of end-organ damage resulting from comorbidities, such as diabetes. A broader set of comorbidities was screened for potential impacts on mortality. Comorbidities as recorded on patient record, with one year look back. STEMI refers to ST-elevation myocardial infarction.
 (4) Deaths are from any cause, in or out of hospital within 30 days of the index hospitalisation admission date.
 (5) Kaplan-Meier survival curve for 30-day following admission for haemorrhagic stroke, adjusted for average age and average Charlson comorbidity score. Survival curves depict the proportion of patients who were alive, day 0 – day 30.
 (6) To make RSMRs comparable over time, a reference population is required. Time series RSMRs for each hospital are based on the reference years (July 2009 - June 2012). Control limits are based on the NSW average within each period.
 (†) Data for hospitals with an expected mortality of <1 are suppressed.
 (◇) Between 90% and 95% upper control limits; (◇◇) Outside 95% upper control limits.
 (□) Between 90% and 95% lower control limits; (□□) Outside 95% lower control limits.
 Details of analyses and risk adjustment are available in *Spotlight on Measurement: risk-standardised mortality ratios*
 Data source: SAPHaRI, Centre for Epidemiology and Evidence, NSW Ministry of Health.

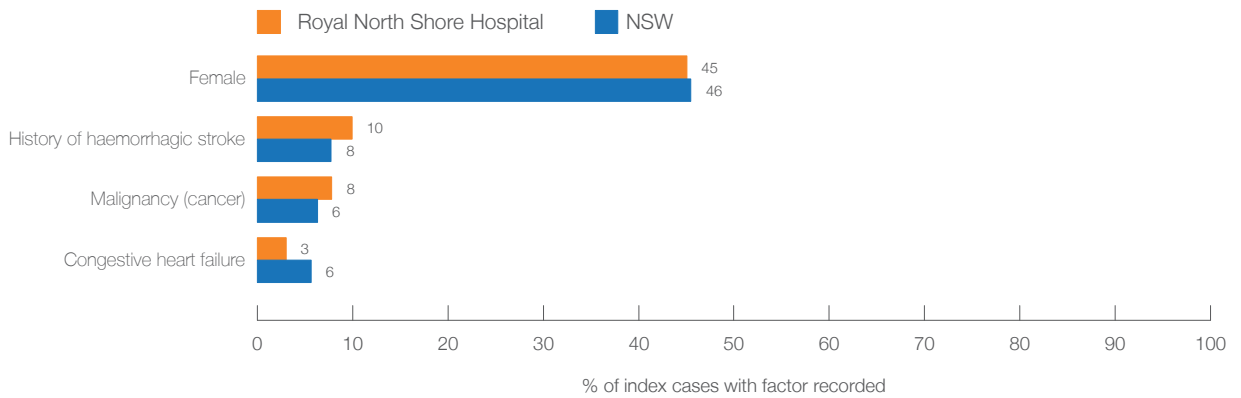
Royal North Shore Hospital profile July 2009 - June 2012
 30-day mortality following hospitalisation for haemorrhagic stroke

	This hospital	NSW
Total haemorrhagic stroke hospitalisations	441	6,573
Haemorrhagic stroke patients		
Presenting patients (index cases)¹	333	5,681
Patients not transferred to another hospital	255	4,148
Patients transferred out to another hospital	78	1,533

Age profile, index cases²



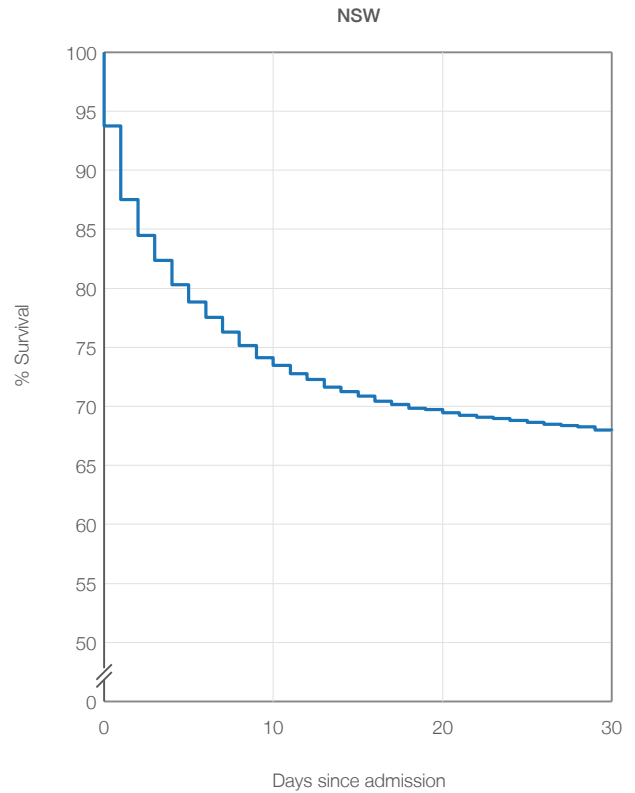
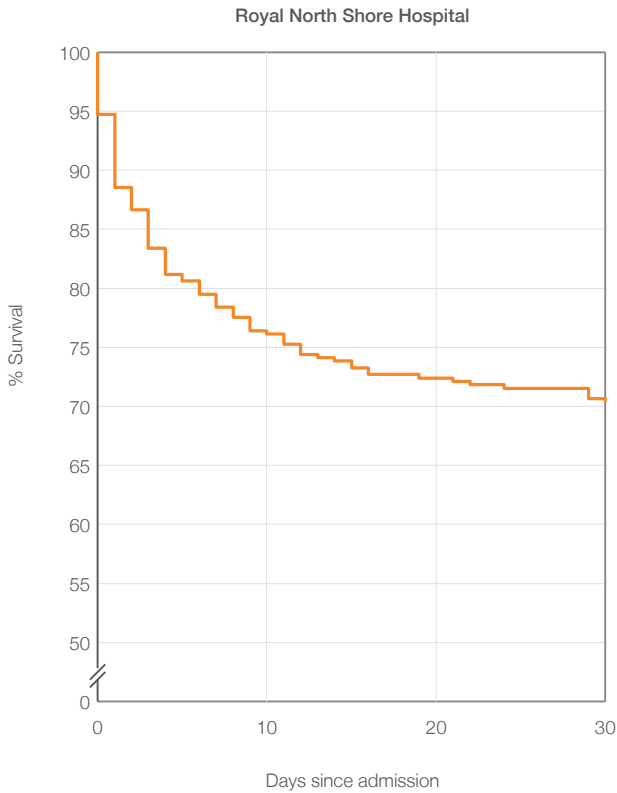
Significant patient factors and comorbidities, index cases³



Royal North Shore Hospital profile July 2009 - June 2012
 30-day mortality following hospitalisation for haemorrhagic stroke

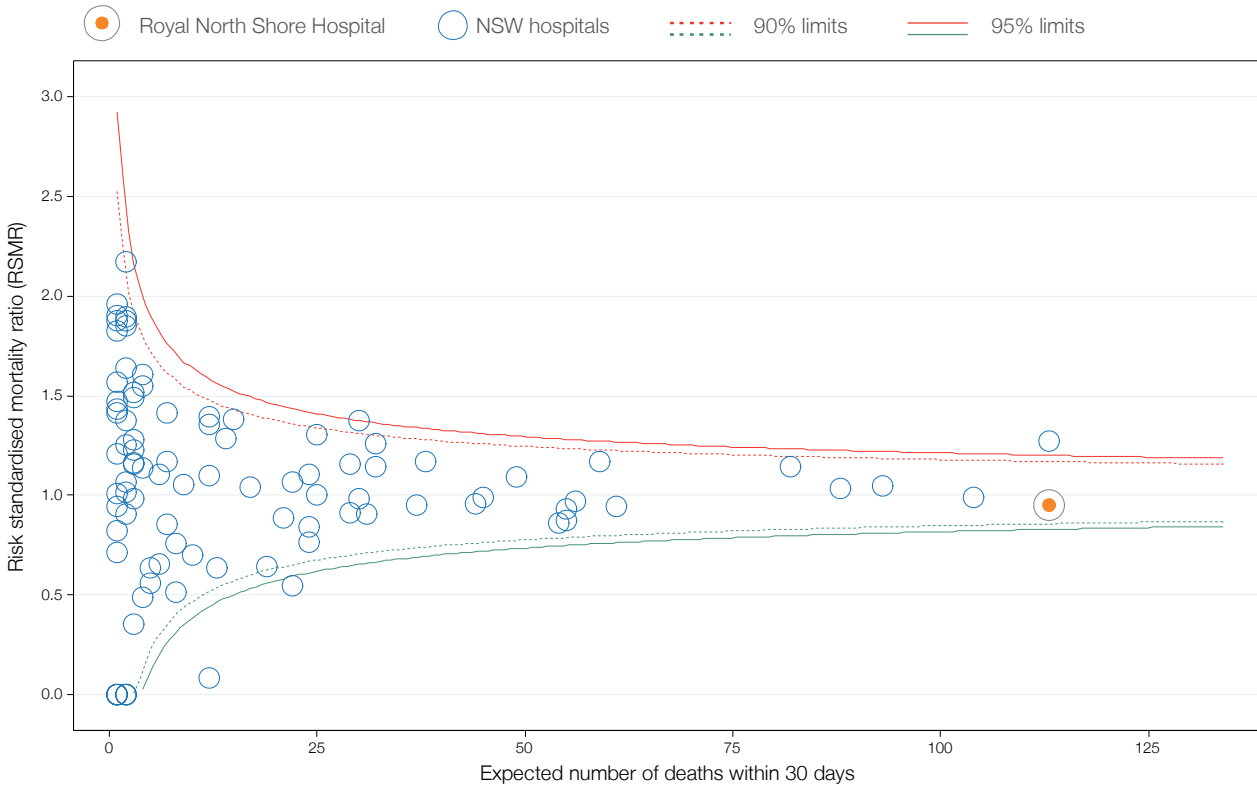
Mortality (all causes) among 333 haemorrhagic stroke index cases ⁴	This hospital percentage	NSW percentage
Percentages: index cases who died within 30 days of hospitalisation	32%	
Of all deaths:		
percentage in this hospital	80%	(76%)
percentage in another hospital following transfer	0%	(3%)
percentage after discharge	20%	(21%)
percentage on day of admission	19%	(20%)
percentage within 7 days	74%	(75%)

Survival of index cases following hospitalisation for haemorrhagic stroke ⁵
 Adjusted for average age and Charlson comorbidity score



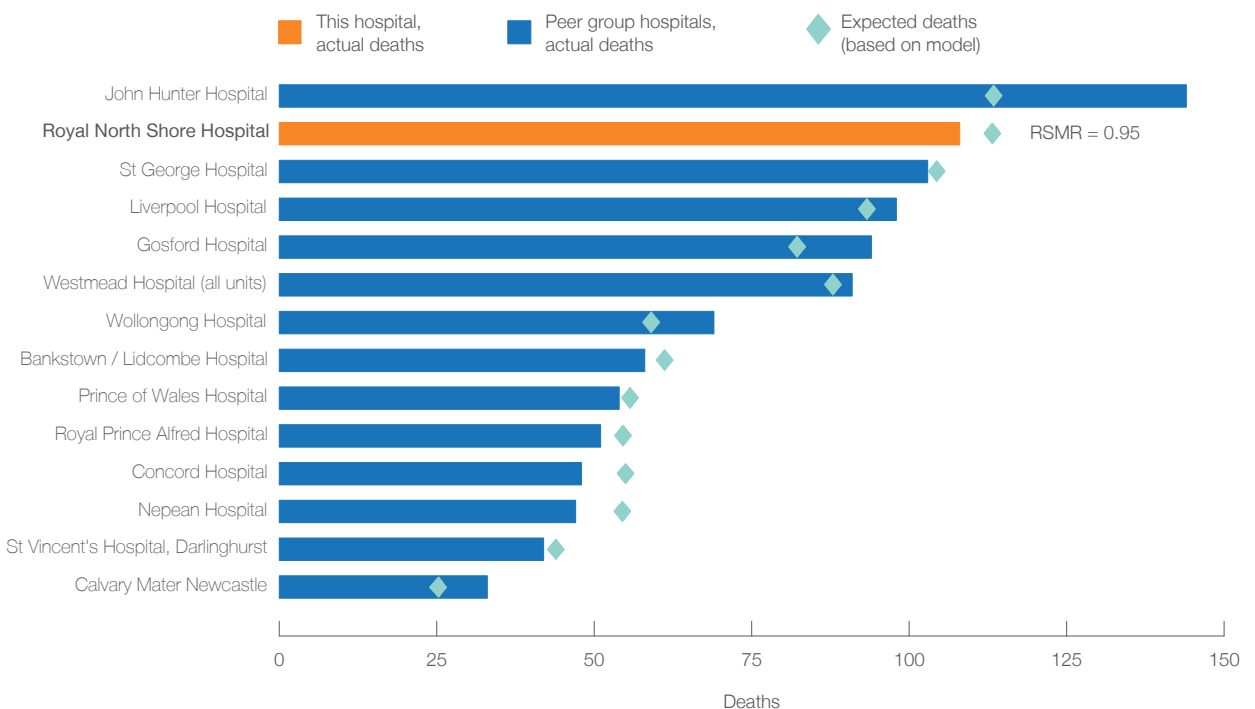
Royal North Shore Hospital profile July 2009 - June 2012

Hospital-level haemorrhagic stroke risk-standardised mortality ratio by number of expected deaths, NSW public hospitals



Hospital-specific RSMRs report the ratio of actual or 'observed' number of deaths to the 'expected' number of deaths. A hierarchical logistic regression model draws on the NSW patient population's characteristics and outcomes to estimate the expected number of deaths for each hospital, given the characteristics of its patients.




Actual and expected deaths, compared to local peers



Royal North Shore Hospital profile July 2009 - June 2012
 30-day mortality following hospitalisation for haemorrhagic stroke




Illustrating the effect of standardisation, July 2009 - June 2012

In order to make fair comparisons, a number of risk adjustments are made to mortality data. These take into account patient level factors that influence the likelihood of dying. The table below illustrates the cumulative effect of the statistical adjustments. For each ratio, hospitals are compared to the average NSW result, given their case mix.

 Lower mortality  No difference  Higher mortality

Unadjusted ratio	Age and sex standardised ratio	Risk-standardised mortality ratio
0.96	0.95	0.95

Time series risk-standardised mortality ratio, July 2000 - June 2012 ⁶

 Lower mortality  No difference  Higher mortality

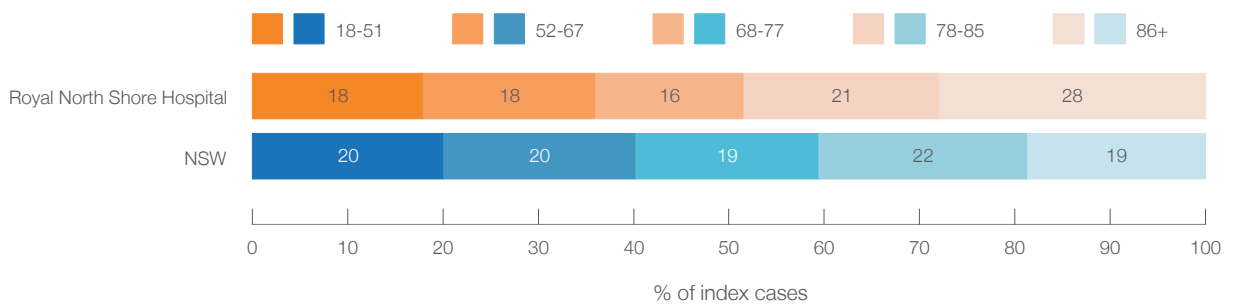
Year (financial years)	2000-02	2003-05	2006-08	2009-11
Risk-standardised mortality ratio	0.99	0.89	0.80	0.95

(1) Index cases refer to patients discharged between July 2009 and June 2012 who were initially admitted to this hospital (regardless of whether they were subsequently transferred) in their last period of care.
 (2) Age at admission date.
 (3) Only those conditions that were shown to have a significant impact on mortality (P<0.05) are shown. Many are a result of end-organ damage resulting from comorbidities, such as diabetes. A broader set of comorbidities was screened for potential impacts on mortality. Comorbidities as recorded on patient record, with one year look back. STEMI refers to ST-elevation myocardial infarction.
 (4) Deaths are from any cause, in or out of hospital within 30 days of the index hospitalisation admission date.
 (5) Kaplan-Meier survival curve for 30-day following admission for haemorrhagic stroke, adjusted for average age and average Charlson comorbidity score. Survival curves depict the proportion of patients who were alive, day 0 – day 30.
 (6) To make RSMRs comparable over time, a reference population is required. Time series RSMRs for each hospital are based on the reference years (July 2009 - June 2012). Control limits are based on the NSW average within each period.
 (†) Data for hospitals with an expected mortality of <1 are suppressed.
 (◇) Between 90% and 95% upper control limits; (◇◇) Outside 95% upper control limits.
 (□) Between 90% and 95% lower control limits; (□□) Outside 95% lower control limits.
 Details of analyses and risk adjustment are available in *Spotlight on Measurement: risk-standardised mortality ratios*
 Data source: SAPHaRI, Centre for Epidemiology and Evidence, NSW Ministry of Health.

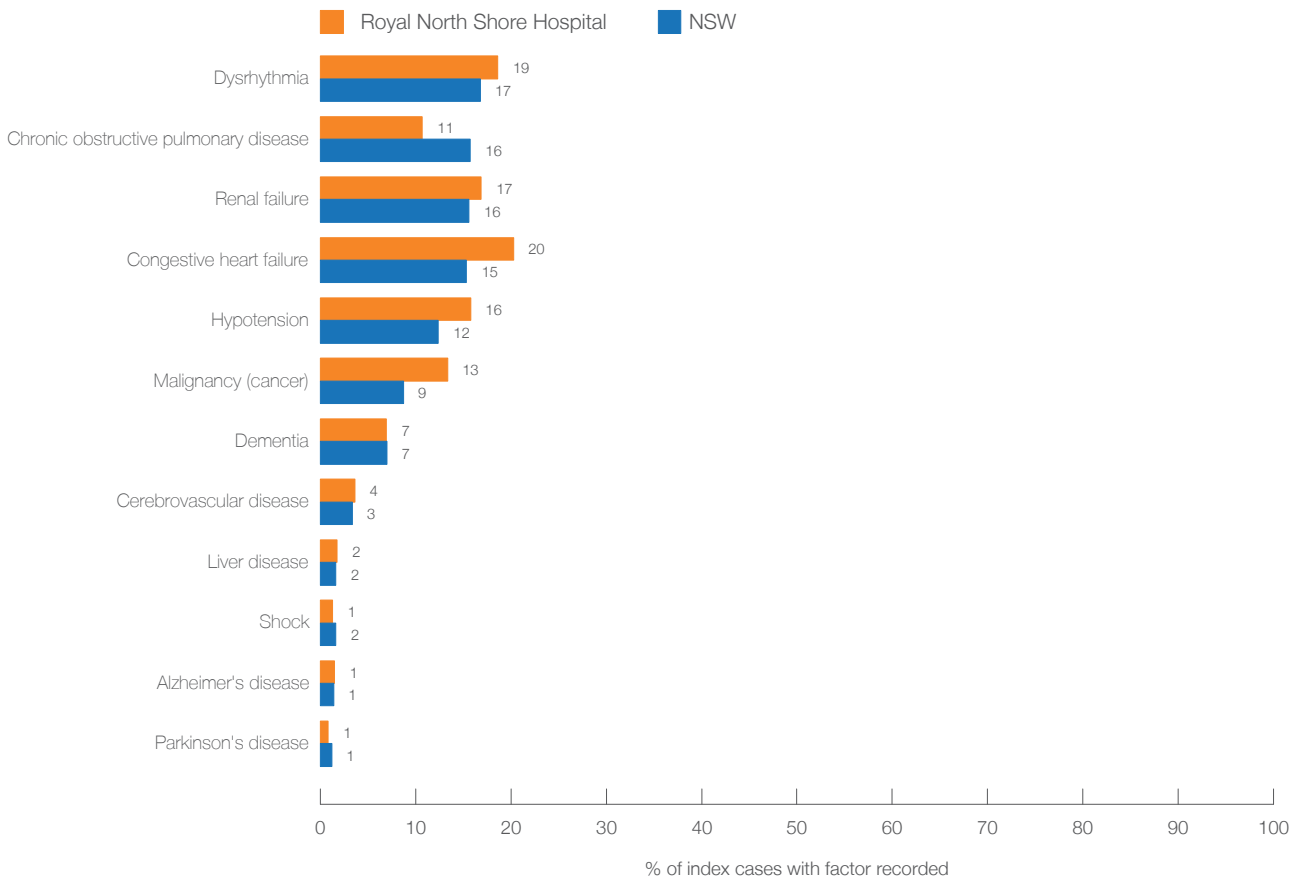
Royal North Shore Hospital profile July 2009 - June 2012
 30-day mortality following hospitalisation for pneumonia

	This hospital	NSW
Total pneumonia hospitalisations	1,213	50,644
Pneumonia patients		
Presenting patients (index cases)¹	1,086	44,059
Patients not transferred to another hospital	1,011	39,655
Patients transferred out to another hospital	75	4,404

Age profile, index cases²



Significant patient factors and comorbidities, index cases³



Royal North Shore Hospital profile July 2009 - June 2012

30-day mortality following hospitalisation for pneumonia

Mortality (all causes) among 1,086 pneumonia index cases⁴

Percentages: index cases who died within 30 days of hospitalisation

Of all deaths:

percentage in this hospital

percentage in another hospital following transfer

percentage after discharge

percentage on day of admission

percentage within 7 days

This hospital percentage	NSW percentage
-----------------------------	-------------------

14%

68% (66%)

3% (3%)

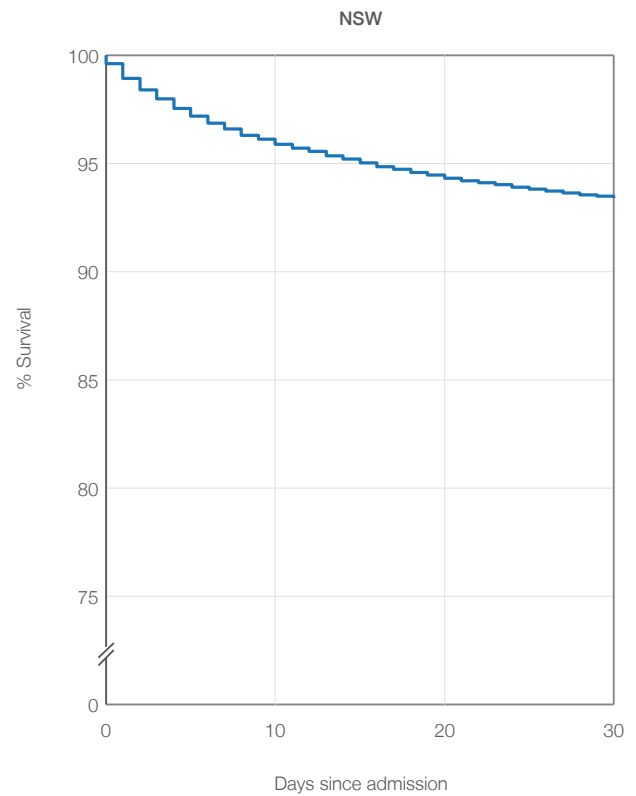
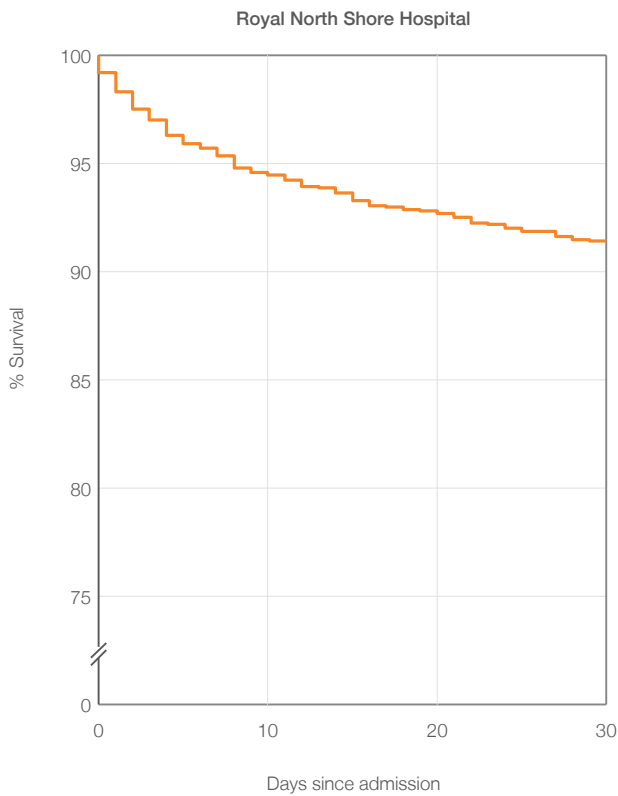
29% (31%)

10% (6%)

57% (54%)

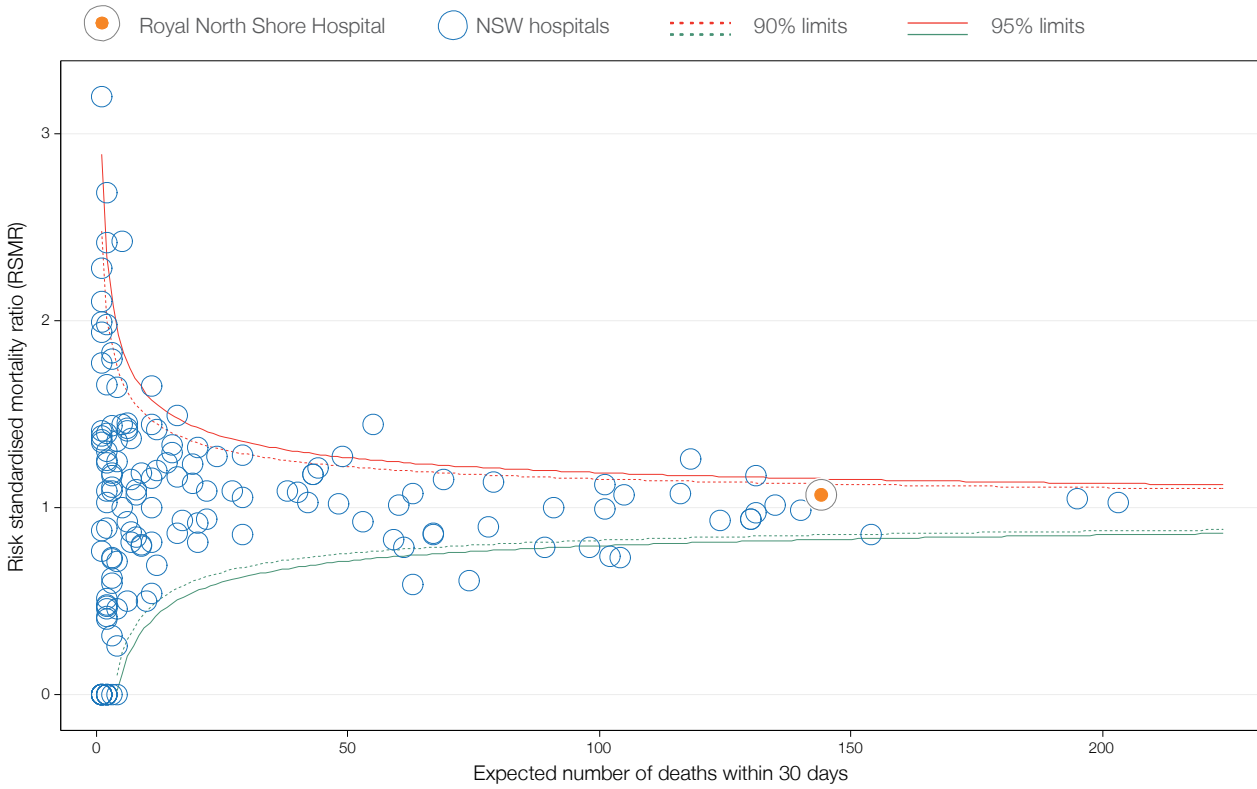
Survival of index cases following hospitalisation for pneumonia⁵

Adjusted for average age and Charlson comorbidity score



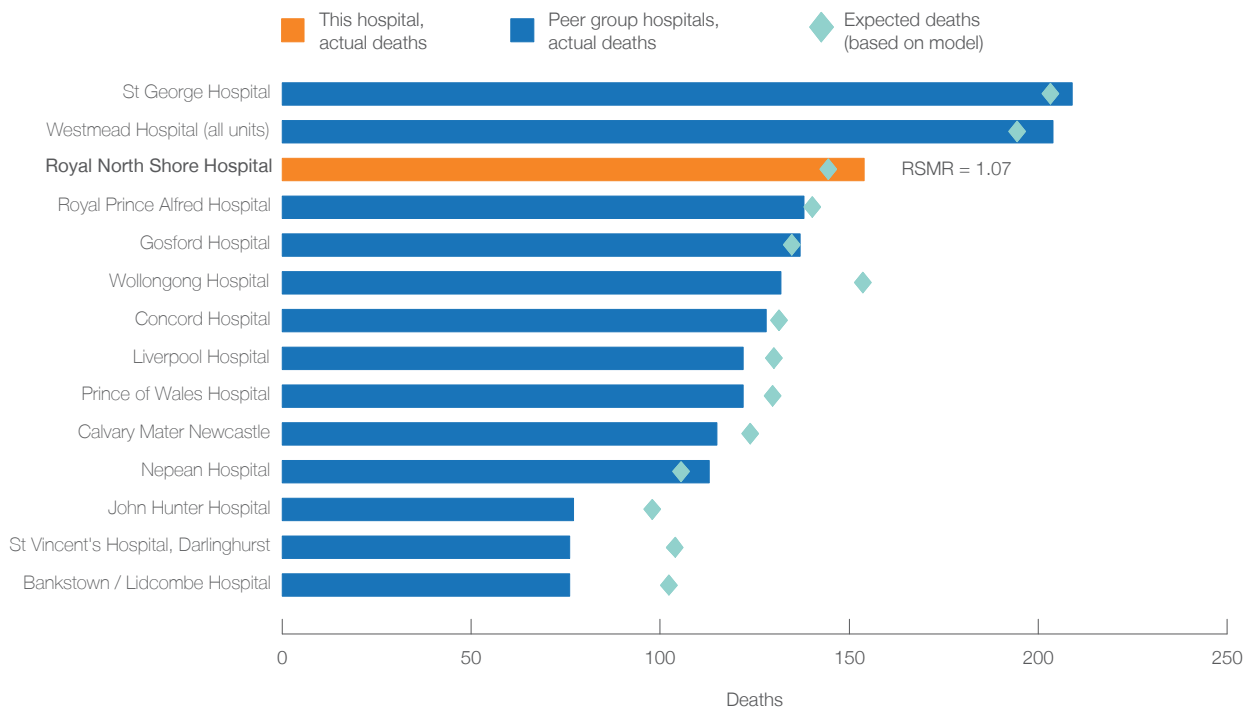
Royal North Shore Hospital profile July 2009 - June 2012

Hospital-level pneumonia risk-standardised mortality ratio by number of expected deaths, NSW public hospitals



Hospital-specific RSMRs report the ratio of actual or 'observed' number of deaths to the 'expected' number of deaths. A hierarchical logistic regression model draws on the NSW patient population's characteristics and outcomes to estimate the expected number of deaths for each hospital, given the characteristics of its patients.

Actual and expected deaths, compared to local peers



Royal North Shore Hospital profile July 2009 - June 2012

30-day mortality following hospitalisation for pneumonia

Illustrating the effect of standardisation, July 2009 - June 2012

In order to make fair comparisons, a number of risk adjustments are made to mortality data. These take into account patient level factors that influence the likelihood of dying. The table below illustrates the cumulative effect of the statistical adjustments. For each ratio, hospitals are compared to the average NSW result, given their case mix.

■ Lower mortality
 ■ No difference
 ■ Higher mortality

Unadjusted ratio	Age and sex standardised ratio	Risk-standardised mortality ratio
1.32	1.20	1.07

Time series risk-standardised mortality ratio, July 2000 - June 2012 ⁶

■ Lower mortality
 ■ No difference
 ■ Higher mortality

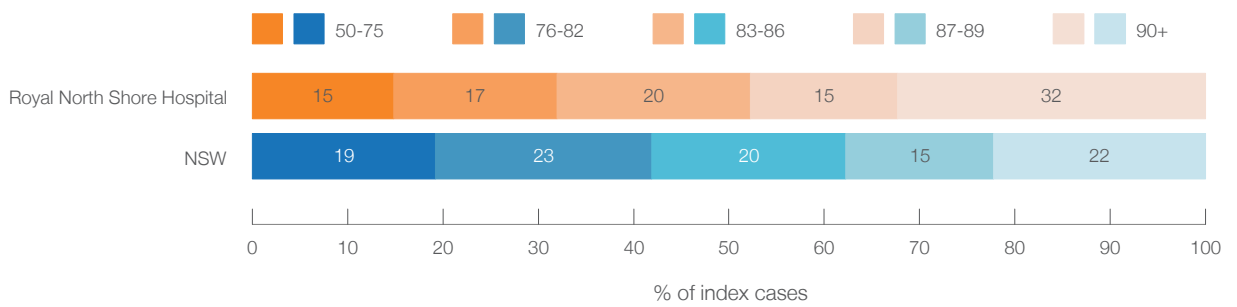
Year (financial years)	2000-02	2003-05	2006-08	2009-12
Risk-standardised mortality ratio	1.30	1.14	1.09	1.07

- (1) Index cases refer to patients discharged between July 2009 and June 2012 who were initially admitted to this hospital (regardless of whether they were subsequently transferred) in their last period of care.
 - (2) Age at admission date.
 - (3) Only those conditions that were shown to have a significant impact on mortality ($P < 0.05$) are shown. Many are a result of end-organ damage resulting from comorbidities, such as diabetes. A broader set of comorbidities was screened for potential impacts on mortality. Comorbidities as recorded on patient record, with one year look back. STEMI refers to ST-elevation myocardial infarction.
 - (4) Deaths are from any cause, in or out of hospital within 30 days of the index hospitalisation admission date.
 - (5) Kaplan-Meier survival curve for 30-day following admission for haemorrhagic stroke, adjusted for average age and average Charlson comorbidity score. Survival curves depict the proportion of patients who were alive, day 0 – day 30.
 - (6) To make RSMRs comparable over time, a reference population is required. Time series RSMRs for each hospital are based on the reference years (July 2009 - June 2012). Control limits are based on the NSW average within each period.
 - (†) Data for hospitals with an expected mortality of < 1 are suppressed.
 - (◇) Between 90% and 95% upper control limits; (◇◇) Outside 95% upper control limits.
 - (□) Between 90% and 95% lower control limits; (□□) Outside 95% lower control limits.
- Details of analyses and risk adjustment are available in *Spotlight on Measurement: risk-standardised mortality ratios*
 Data source: SAPHaRI, Centre for Epidemiology and Evidence, NSW Ministry of Health.

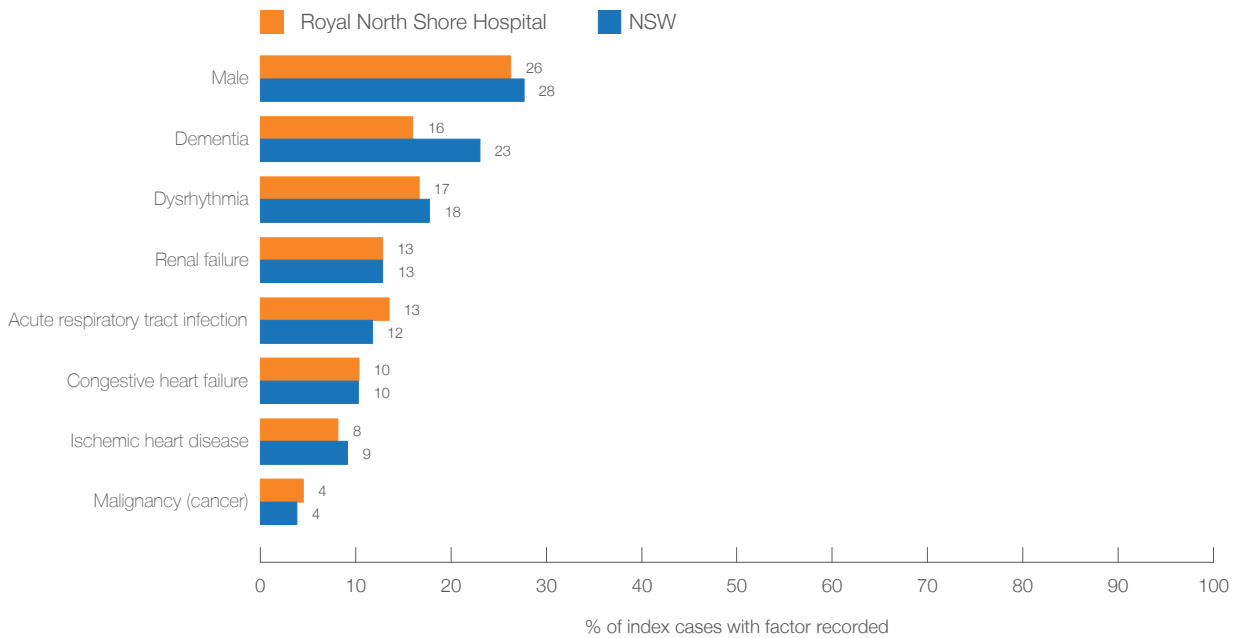
Royal North Shore Hospital profile July 2009 - June 2012
 30-day mortality following hospitalisation for hip fracture surgery

	This hospital	NSW
Total hip fracture surgery hospitalisations	629	16,355
Hip fracture surgery patients		
Presenting patients (index cases)¹	601	15,836
Patients not transferred to another hospital	477	10,739
Patients transferred out to another hospital	124	5,097

Age profile, index cases²



Significant patient factors and comorbidities, index cases³



Royal North Shore Hospital profile July 2009 - June 2012
 30-day mortality following hospitalisation for hip fracture surgery

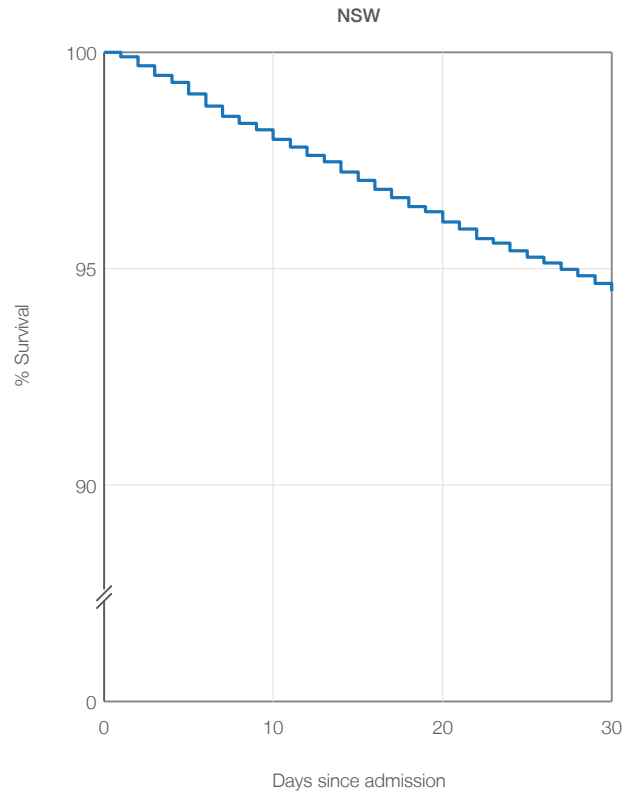
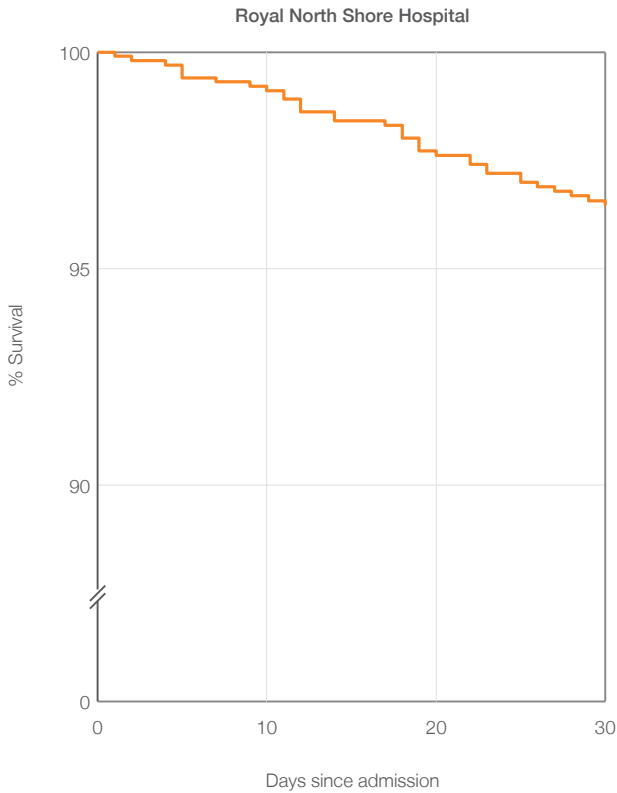
Mortality (all causes) among 601 hip fracture surgery index cases⁴

Percentages: index cases who died within 30 days of hospitalisation

Of all deaths:

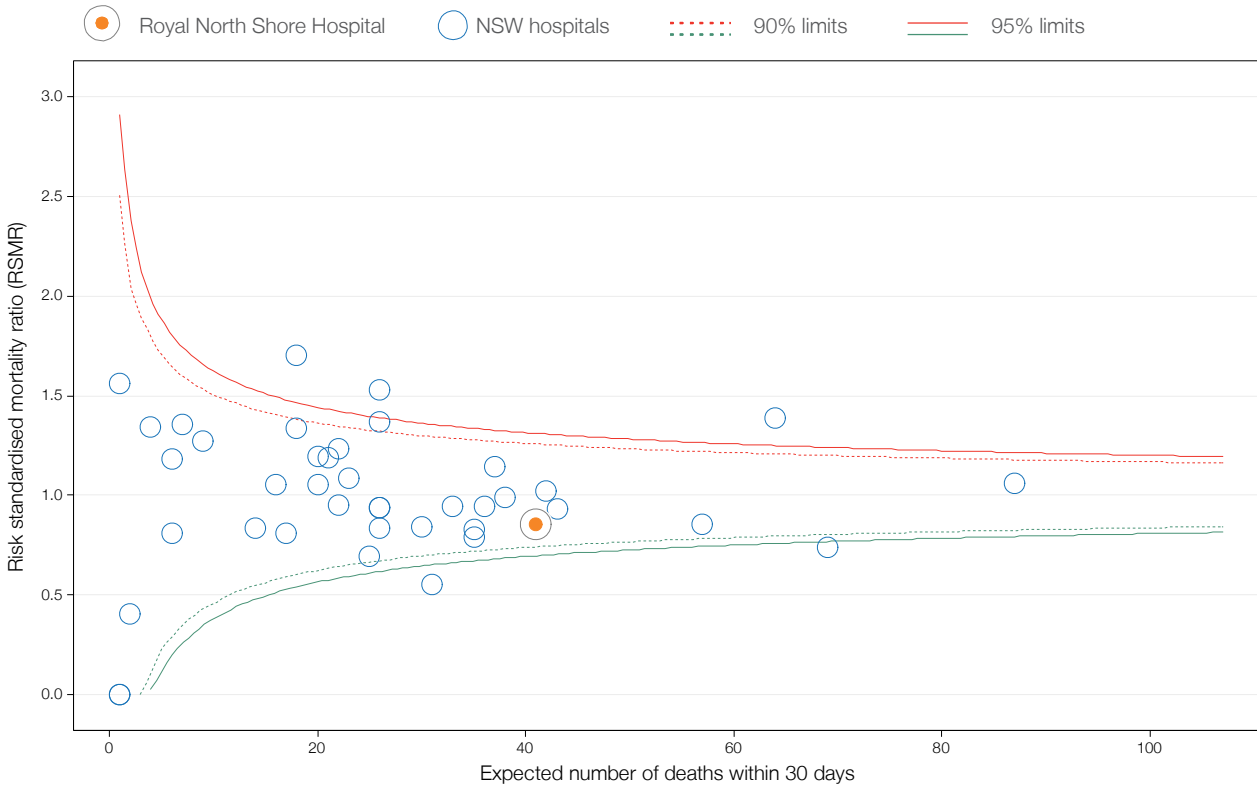
	This hospital percentage	NSW percentage
percentage in this hospital	40%	(50%)
percentage in another hospital following transfer	0%	(0%)
percentage after discharge	60%	(50%)
percentage on day of admission	not applicable for hip fracture surgery	
percentage within 7 days	20%	(27%)

Survival of index cases following hospitalisation for hip fracture surgery⁵
 Adjusted for average age and Charlson comorbidity score



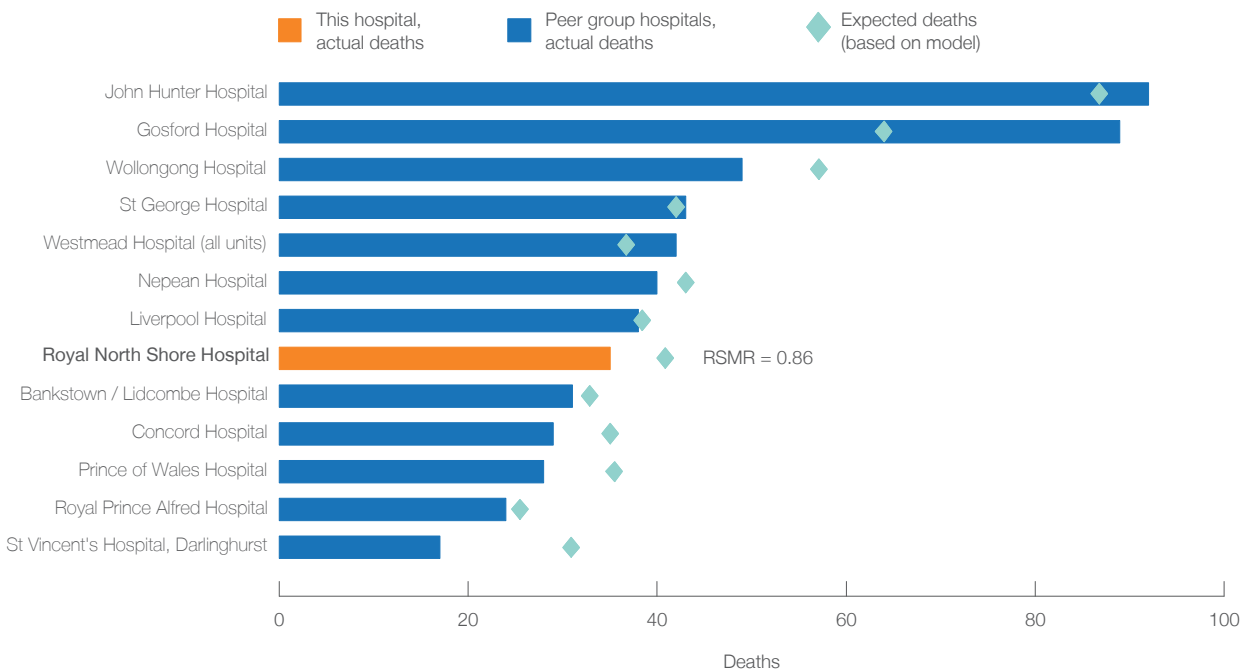
Royal North Shore Hospital profile July 2009 - June 2012

Hospital-level hip fracture surgery risk-standardised mortality ratio by number of expected deaths, NSW public hospitals



Hospital-specific RSMRs report the ratio of actual or 'observed' number of deaths to the 'expected' number of deaths. A hierarchical logistic regression model draws on the NSW patient population's characteristics and outcomes to estimate the expected number of deaths for each hospital, given the characteristics of its patients.




Actual and expected deaths, compared to local peers



Royal North Shore Hospital profile July 2009 - June 2012
 30-day mortality following hospitalisation for hip fracture surgery




Illustrating the effect of standardisation, July 2009 - June 2012

In order to make fair comparisons, a number of risk adjustments are made to mortality data. These take into account patient level factors that influence the likelihood of dying. The table below illustrates the cumulative effect of the statistical adjustments. For each ratio, hospitals are compared to the average NSW result, given their case mix.

 Lower mortality  No difference  Higher mortality

Unadjusted ratio	Age and sex standardised ratio	Risk-standardised mortality ratio
0.85	0.77	0.86

Time series risk-standardised mortality ratio, July 2000 - June 2012 ⁶

 Lower mortality  No difference  Higher mortality

Year (financial years)	2000-02	2003-05	2006-08	2009-11
Risk-standardised mortality ratio	1.04	1.13	1.19	0.86

(1) Index cases refer to patients discharged between July 2009 and June 2012 who were initially admitted to this hospital (regardless of whether they were subsequently transferred) in their last period of care.
 (2) Age at admission date.
 (3) Only those conditions that were shown to have a significant impact on mortality (P<0.05) are shown. Many are a result of end-organ damage resulting from comorbidities, such as diabetes. A broader set of comorbidities was screened for potential impacts on mortality. Comorbidities as recorded on patient record, with one year look back. STEMI refers to ST-elevation myocardial infarction.
 (4) Deaths are from any cause, in or out of hospital within 30 days of the index hospitalisation admission date.
 (5) Kaplan-Meier survival curve for 30-day following admission for haemorrhagic stroke, adjusted for average age and average Charlson comorbidity score. Survival curves depict the proportion of patients who were alive, day 0 – day 30.
 (6) To make RSMRs comparable over time, a reference population is required. Time series RSMRs for each hospital are based on the reference years (July 2009 - June 2012). Control limits are based on the NSW average within each period.
 (†) Data for hospitals with an expected mortality of <1 are suppressed.
 (◇) Between 90% and 95% upper control limits; (◇◇) Outside 95% upper control limits.
 (□) Between 90% and 95% lower control limits; (□□) Outside 95% lower control limits.
 Details of analyses and risk adjustment are available in *Spotlight on Measurement: risk-standardised mortality ratios*
 Data source: SAPHaRI, Centre for Epidemiology and Evidence, NSW Ministry of Health.