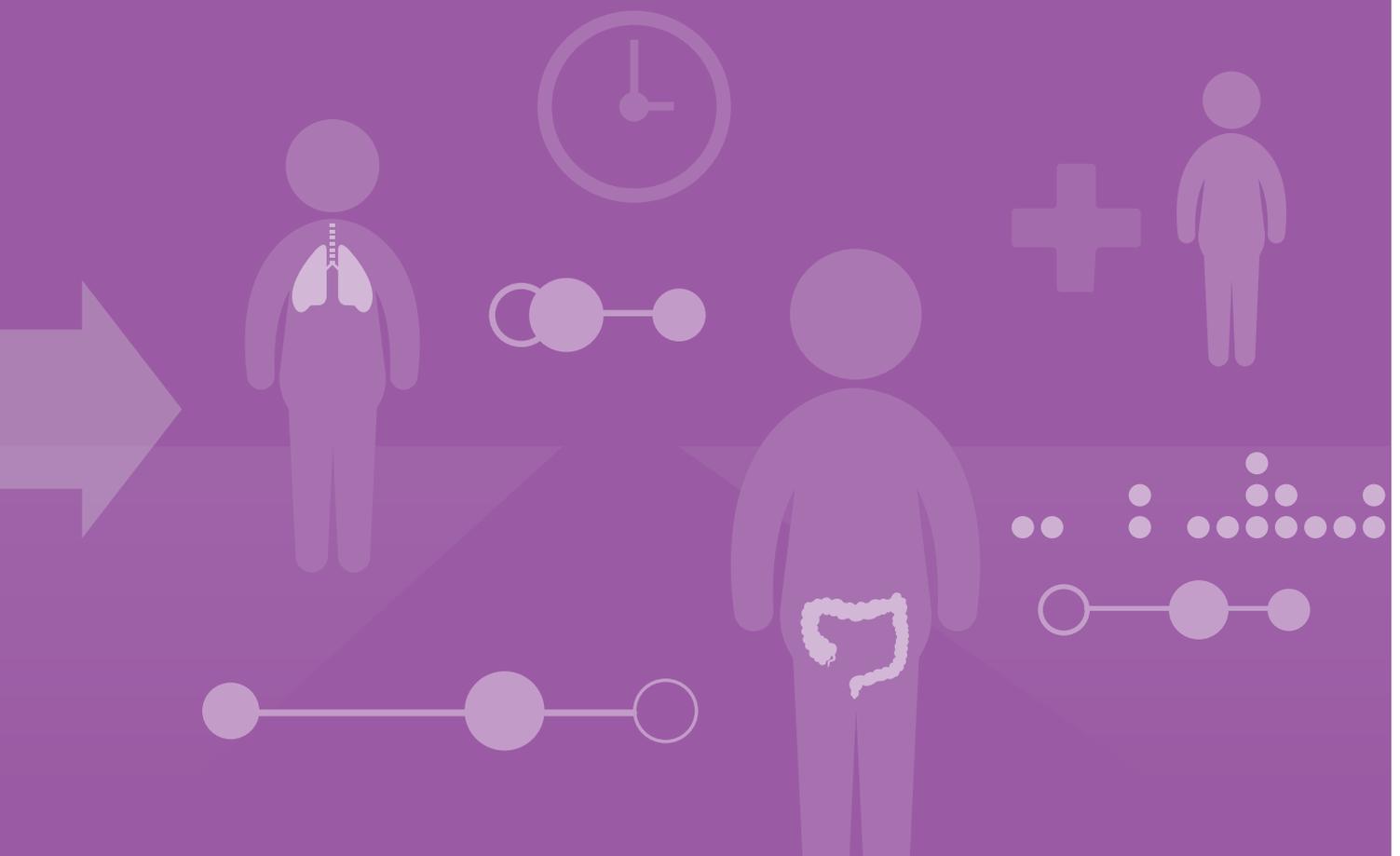The Insights Series

Emergency department utilisation by people with cancer

NSW public hospitals
Cohort diagnosed between 2006 and 2009

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Foreword

Cancer is a group of diseases that affects us all, either directly or indirectly, through the experience of our family, our friends, or our colleagues. Receiving a cancer diagnosis is often the starting point for an intense period of treatment usually followed by remission or cure.

Upon diagnosis, cancer care routines are established around specialised oncology networks and expert providers. At the same time, cancer patients often need to consult with more general sources of care such as primary care services or emergency departments (EDs). These interactions tend to be unplanned and may be prompted by complications of cancer treatments, or by symptoms related to chronic diseases, or by other illness unrelated to cancer. Achieving integration of care across the interface between specialist cancer services and other more generalist services can be challenging.

While visiting an ED can provide immediate, timely and reassuring care for many people living with cancer, for others it can be a less appropriate place to receive care and can represent an additional stressor in an already difficult situation. This is especially the case for people who have been immunocompromised as a result of their cancer treatment and for those in the last days of their life.

Understanding ED utilisation by people with cancer is therefore an important topic that can reflect both on the performance of cancer services as well as on the performance of EDs for this specific patient group. Until now however, little was known in NSW about patterns of ED use among cancer patients, or about relative patterns of ED performance in providing prompt and appropriate treatment. Nor was there robust evidence about the factors associated with people with cancer visiting an ED and the extent to which receiving cancer care in different hospitals was associated with variation in the subsequent use of EDs.

This report aims to provide insights into the interaction between EDs and cancer care services by providing a first assessment of the factors associated with ED use and the ED utilisation rates for specific hospitals. Using historical data linking cancer registry, ED and hospital databases, it describes how people with cancer use hospital EDs in NSW and provides a unique opportunity to inform the system and lay the foundation for further analyses and reporting in the future.

The report:

- Examines patterns of, and reasons for, ED visits by cancer patients, pre- and post-diagnosis

- Reports ED timeliness measures, such as time to treatment, for patients with cancer compared with all patients in NSW

- Reports variation in ED timeliness measures for people with cancer across NSW hospitals

- Identifies factors that are associated with ED use by cancer patients, such as comorbidity or cancer type

- Investigates whether, after taking into account patient level factors and case mix, there are hospitals where volumes of ED visits among cancer patients are significantly different to expected.

The Bureau of Health Information and the Cancer Institute NSW are pleased to have collaborated to ensure the realisation of this work.

Dr Jean-Frédéric Lévesque
Chief Executive, Bureau of Health Information

Professor David Currow
Chief Cancer Officer, NSW
Chief Executive Officer, Cancer Institute NSW

Key messages

Cancer is a complex group of diseases. There are many types of cancer and the treatment of cancer depends on the type and stage of cancer as well as the patient's preferences. Treatment for cancer may include admission to hospital for surgery, attendance at an outpatient clinic for either chemotherapy or radiotherapy or both. Cancer treatment can also include allied health and palliative care services.

People with cancer typically have a treatment plan which aims to structure care in a patient-centred and predictable way. However, they may also need to make an unplanned visit to a hospital emergency department (ED).

People with cancer may present to an ED with symptoms associated with their diagnosis, because of side effects of treatment or with symptoms near the end of life.

Some ED visits may be potentially preventable with appropriate care and community support. Characterising patterns of ED visits made by people with cancer is the first step in understanding how these visits can be minimised.

Emergency department utilisation by people with cancer is a collaborative project of the Cancer Institute NSW and the Bureau of Health Information and is the first population based study of ED utilisation by people with cancer in NSW.

The report focuses on people diagnosed with cancer between January 2006 and December 2009 who visited a NSW ED up to 12 months before and 12 months after their diagnosis.

How often do people with cancer visit an ED and why?

- 30% of people with cancer visited an ED in the year preceding diagnosis

- 40% of people with cancer visited an ED in the year following diagnosis

- People with cancer visited an ED frequently with 10% making three or more visits in the year following their diagnosis

- Among people with cancer who visited the ED, 15% had respiratory cancer and 14% had colorectal cancer

- Visits can be for non-specific symptoms or for specific disease groups. Viewed together, reasons associated with circulatory, respiratory and digestive systems accounted for 36% of visits. Only 4% of visits were attributed specifically to cancer.

- Among people who died within a year of a cancer diagnosis, almost half (47%) visited an ED in the 30 days preceding their death; and two-thirds (67%) attended in the 90 days preceding their death.

Are results for ED-based timeliness indicators different for cancer patients compared to all ED patients? Do results vary across hospitals?

- People with cancer were triaged as more urgent (55% in triage categories 1 to 3) than NSW patients overall (39% in triage categories 1 to 3)

- The median times to start treatment for people with cancer were similar to those for NSW patients overall, except for triage category 5, where people with cancer were seen more quickly (21 minutes) than NSW patients overall (30 minutes)

- There is variation between hospitals in the median time to start treatment. For example, among principal referral and major hospitals (peer groups A1 and B), the median time to start treatment for people with cancer ranged from two to 12 minutes for triage 2, from 11 to 41 minutes for triage 3, from 16 to 60 minutes for triage 4 and from four to 49 minutes for triage 5. All people in triage 1 were seen immediately.

- Almost six in 10 (58%) of all emergency visits to the ED made by people with cancer involved receiving treatment in the ED and subsequent admission to a ward, a critical care unit or an operating suite in the hospital, compared to fewer than three in 10 (27%) of visits made by all patients

- Among principal referral and major hospitals (peer groups A1 and B), the proportion of emergency ED visits made by people with cancer that ended in hospital admission ranged from 45% to 76%. Conversely, the proportion of emergency ED visits made by people with cancer that ended in discharge from the ED ranged from 18% to 49%.

- For emergency ED visits made by people with cancer, the median time from presentation to leaving the ED was three hours and 59 minutes. For all ED visits in NSW overall, the median time to leaving the ED was three hours and 17 minutes.

- For emergency ED visits made by people with cancer, 44% resulted in the patient leaving the ED within four hours of presentation. This is a lower percentage than for all NSW ED visits (59%). Cases that are more urgent or admitted to hospital are less likely to leave the ED within four hours.

- Among principal referral and major hospitals (peer groups A1 and B), the percentage of visits made by people with cancer that were completed within four hours of presentation ranged from 31% to 55%

- Among people with cancer whose visit to an ED ended in admission to hospital, 30.5% left the ED within four hours. This compares to 21.6% of visits for all NSW ED patients that ended in admission to hospital.

What patient level factors are associated with people with cancer visiting the ED?

- People with a distant stage of cancer at diagnosis had 92% (SHR 1.92; 95% CI 1.87–1.97) higher risk of an emergency ED visit (using localised stage at diagnosis as a reference category)

- People with neurological cancer (SHR 2.71; 95% CI 2.52–2.91) and lymphohaematopoietic cancer (SHR 2.39; 2.28–2.51) had the highest risks of attending an ED (using people with skin cancer as a reference category)

- People with cancer who had comorbidities, such as hypertension (SHR 1.17; 95% CI 1.15–1.20), had a higher risk of attending an ED (using people with no comorbidities as a reference category)

- People with cancer living in more socio-economically disadvantaged areas had a higher risk of attending an ED. People living in the most disadvantaged areas (SHR 1.64; 95% CI 1.59–1.69) had the highest risk of attending an ED (using the least disadvantaged areas as a reference category).

After taking into account patient level factors and case mix, are there hospitals where the volume of ED visits among cancer patients are significantly higher or significantly lower than expected?

- For people diagnosed with breast cancer, there were 42 hospitals (79%) with ED visits no different to the number expected. Four hospitals had fewer than the expected number of ED visits and seven hospitals had more than the expected number of ED visits.

- For people diagnosed with colorectal cancer, there were 79 hospitals (92%) with ED visits no different to the number expected. Three hospitals had fewer than the expected number of ED visits and four hospitals had more than the expected number of ED visits.

- For people diagnosed with respiratory cancer, there were 99 hospitals (93%) with ED visits no different to the number expected. Three hospitals had fewer than the expected number of ED visits and five hospitals had more than the expected number of ED visits.

Introduction

Context and background

Cancer is a group of diseases characterised by the uncontrolled growth and spread of abnormal cells.

There are around 100 different types of cancer, most of which are named for the organ or type of cell in which they start. For example, cancer that originates in the breast is called breast cancer; cancer that begins in leucocytes (white blood cells) is called leukaemia. The most common types of cancer are shown in Figure 1.

People with cancer typically have a treatment plan tailored to their type and stage of cancer. There are three main types of treatment, often used in combination: surgery, drug therapies (including chemotherapy), and radiotherapy. Cancer treatment can also include allied health and palliative care services.

In addition to these planned treatments, people with cancer may also attend hospital for unplanned visits to the emergency department (ED), before or after their cancer diagnosis.

While there is an abundance of information about cancer epidemiology, clinical care and treatment modalities, there are very few population-based studies of ED utilisation by people with cancer and none specific to NSW.

Figure 1   Different cancer types featured in this report, NSW, incidence and mortality, 2008[5]

All Cancers

Incidence
36,611 cases diagnosed in 2008

Mortality
13,213 deaths in 2008

Colorectal

Incidence
4,741
cases diagnosed in 2008

Mortality
1,716
deaths in 2008

Breast

Incidence
4,418
cases diagnosed in 2008

Mortality
909
deaths in 2008

Respiratory

Incidence
3,506
cases diagnosed in 2008

Mortality
2,868
deaths in 2008

Lymphohae-matopoietic

Incidence
3,328
cases diagnosed in 2008

Mortality
1,457
deaths in 2008

Upper Gastrointestinal

Incidence
2,734
cases diagnosed in 2008

Mortality
2,078
deaths in 2008

Neurological

Incidence
523
cases diagnosed in 2008

Mortality
347
deaths in 2008

Cancer facts

Incidence

- Australia/New Zealand has the highest aged-standardised cancer incidence rate in the world for men, and second highest for women.[6]

- In Australia and NSW, the risk of developing cancer by the age of 85 is 1 in 2 for men and 1 in 3 for women.[7,8]

- In NSW, 36,611 people were diagnosed with cancer in 2008.[5]

- The five most commonly diagnosed cancers in NSW are: prostate, colorectal, breast, melanoma and lung.[8]

Survival

- The overall five-year relative survival from cancer in Australia is 66%, which is on par with the best healthcare systems in the world.[12]

Mortality

- Cancer is the number one cause of death worldwide. Cancer has surpassed ischaemic heart disease (excluding stroke) as the leading cause of death globally, with 8.2 million cancer deaths reported in 2012.[6,9,10]

- In Australia and NSW, the risk of dying from cancer by the age of 85 is 1 in 4 for men and 1 in 6 for women.[5,7]

- In NSW, cancer was responsible for 13,213 deaths in 2008, equivalent to 28% of all NSW deaths in 2008.[5,11]

- The five cancers causing the most deaths in NSW are: lung, colorectal, prostate, breast and pancreatic.[5]

People with increased risk

- Aboriginal people are more likely to die from cancer. In NSW, the standardised mortality ratio for all cancers in Aboriginal people is 1.7, compared with the total NSW population.[13]

- People living in rural areas are more likely to have advanced cancer at diagnosis. In NSW, the odds of presenting with localised cancer range from 4% lower for people in remote areas to 14% lower for very remote areas, compared with other areas.[14]

This project

A collaborative project involving the Cancer Institute NSW and the Bureau of Health Information, this work brought together expertise on cancer epidemiology and treatment, statistical analysis, research design, public reporting and the communication of complex healthcare information.

The work is developmental in two key ways. First it represents the first time that data from the NSW Central Cancer Registry has been linked with data from the Emergency Department Data Collection, allowing new insights to be developed about cancer patient journeys and flows in NSW.

Second, it introduces a new contribution to help gauge performance in cancer care – namely a risk-standardised ED utilisation ratio (RSUR). This measure, based on established methods for risk-standardised mortality ratios (RSMRs) and risk-standardised readmission ratios (RSRRs), uses statistical modelling to calculate for each hospital an expected rate of ED visits within 28 days of cancer-hospitalisation discharges given its case mix.[11,12,13] This expected rate is compared to the observed rate and expressed as a ratio that is higher, lower, or no different to expected.

Methods and data

For this project, the NSW Ministry of Health's Centre for Health Record Linkage (CHeReL) assigned a Project Person Number using probabilistic record linkage software to link records across a range of data sources:

- Central Cancer Registry (CCR)

- Clinical Cancer Registry (ClinCR)

- Admitted Patient Data Collection (APDC)

- Emergency Department Data Collection (EDDC)

- Registry of Births, Deaths and Marriages (RBDM)

- Australian Bureau of Statistics Mortality Data (ABS).

For many epidemiological studies the primary unit of analysis is a cancer type or diagnosis. This report differs in focusing on patients as the primary unit of analysis. It relies on the use of linked data to provide information relevant to understanding patient journeys and pathways, integration of care across healthcare sectors, and how well care is coordinated for people with complex healthcare needs.

The data for this project relate to people with cancer diagnosed in the period January 2006–December 2009. ED visits up to 12 months before and 12 months after diagnosis were captured. Given the age of the available data, hospitals are not nominally reported.

More information on data and methods is available in the accompanying report *Spotlight on Measurement: Emergency department utilisation by people with cancer.*

Project questions

This study sought to explore the use of NSW public hospital EDs by people with cancer. It focused on four key questions:

1. How often do people with cancer visit an ED and why?

2. Are results for ED-based timeliness indicators different for cancer patients compared to all ED patients? Do results vary across hospitals?

3. What patient level factors are associated with cancer patients visiting the ED?

4. After taking into account patient level factors and case mix, are there hospitals where volumes of ED visits among people with cancer are significantly higher or significantly lower than expected?

Answering these questions requires conceptualising ED visits among cancer patients in different ways.

First, ED visits can be used as a measure of utilisation. Providing descriptive information, utilisation data can reveal patterns of provision across hospitals; across cancer types (see Appendix 1 for clinical groupings used in this report); and reasons for visiting the ED.

Second, ED visits can be examined in terms of specific process measures. For example, how quickly were cancer patients seen and treated when they presented to the ED? Did they leave the ED within the recommended time period?

Third, ED visits can be used as outcome measures. The project also conceptualised ED visits as events that are affected both by patient characteristics and by the quality of cancer care. To explore ED visits as an outcome, the analysis:

• Developed a statistical model to identify those patient characteristics associated with visiting an ED

• Used this information to calculate, for each NSW public hospital, an expected rate of ED visits, given its cancer patient case mix and compared that to the actual rate that occurred (Figure 2).

Figure 2   Research questions addressed in this report
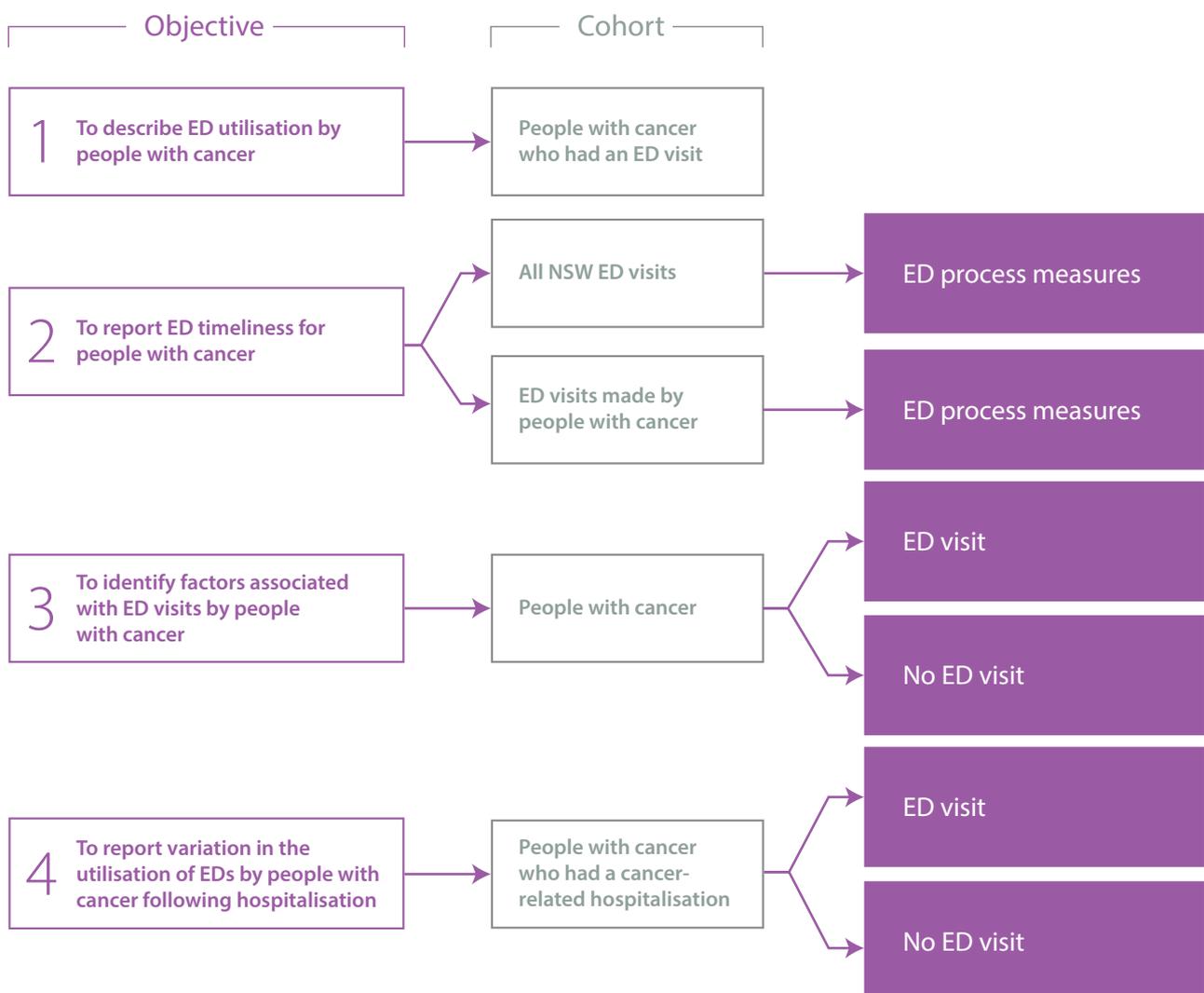
How often do people with cancer visit the ED?

One in 10 people with cancer visit the ED three or more times in the year post diagnosis

People with cancer typically have a treatment plan tailored to their type and stage of cancer. It may include admission to hospital for surgery, attendance at an outpatient clinic for either chemotherapy or radiotherapy or both.

Patient treatment plans aim to structure care in a patient-centred and predictable way. However, people with cancer may also attend hospital for unplanned visits to the ED.

Some ED visits may be potentially preventable with appropriate care and community support. Characterising patterns of ED visits made by people with cancer is the first step in understanding how these visits can be minimised.

In 2011–12, there were 7.3 million people in NSW. Of these, 5.9 million (81%) did not attend an ED; 929,509 (13%) attended an ED once; 264,466 (4%) attended an ED twice and 181,061 (2%) attended an ED three or more times.[14]

Among all people in NSW, two in 10 visit an ED in the course of a year. In contrast, three in 10 people with cancer (30%) visited an ED in the year preceding their diagnosis and four in 10 (40%) visited an ED in the year following their diagnosis (Figure 3).

In the year following diagnosis, people with cancer visited an ED frequently, with 10% of people making three or more visits (Figure 4).[a]

Some people with cancer present to an ED as the first step in receiving a cancer diagnosis.[15] This may be a reflection of limited access to appropriate primary care. However for many cancer patients, ED visits are not for cancer but for other health problems.

Colorectal and respiratory cancers are common cancers that have an insidious and diffuse set of symptoms that can present in ED. Among all people diagnosed with cancer between 2006 and 2009, 13% had colorectal and 10% had respiratory cancer. For people diagnosed with colorectal cancer, 68% had no ED visits in the year preceding their diagnosis while for those with respiratory cancers, 56% had no ED visits (Figure 5).

Figure 3 Frequency of ED visits, NSW people diagnosed with cancer, 2006–2009

Between 2006 and 2009 there were 141,461 people diagnosed with cancer

In the year preceding their diagnosis	**99,401** (70%) did not attend an ED
	25,490 (18%) attended an ED once
	9,169 (6%) attended an ED twice
	7,401 (5%) attended an ED three or more times
In the year following their diagnosis	**85,199** (60%) did not attend an ED
	28,942 (20%) attended an ED once
	13,065 (9%) attended an ED twice
	14,255 (10%) attended an ED three or more times

a. See *Spotlight on Measurement: Emergency department utilisation by people with cancer, NSW public hospitals, Cohort diagnosed 2006–2009*, Table 2 for differences in age and sex profiles

Figure 4 Frequency of ED visits, all NSW people, 2011–2012 and NSW people diagnosed with cancer, 2006–2009

| No ED visits | Visited once | Visited twice | Visited three or more times |

All NSW people | 81% | 13% | 4% / 2% |

People with cancer in the year preceding diagnosis | 70% | 18% | 6% | 5% |

People with cancer in the year following diagnosis | 60% | 20% | 9% | 10% |

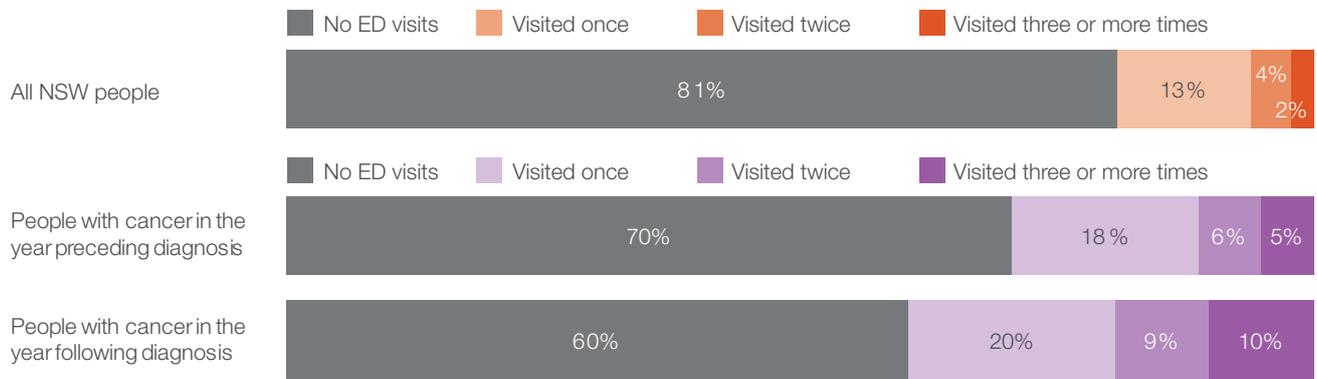**Figure 5** Frequency of ED visits within the year preceding diagnosis, NSW people diagnosed with colorectal or respiratory cancer, 2006–2009

| No ED visits | Visited once | Visited twice | Visited three or more times |

People with colorectal cancer | 68% | 20% | 7% | 5% |

People with respiratory cancer | 56% | 26% | 10% | 9% |

Why do people with cancer visit an ED?

Less than 4% of ED visits were attributed specifically to cancer

Between 2005 and 2010, there were 199,785 ED visits made by people who were diagnosed with cancer in the period 2006–2009. While almost all (97%) of these visits were considered emergency visits, 3% of visits were non-emergencies, such as a planned return visit, attending an outpatient clinic or pre-arranged admission to hospital.

The reason for ED presentation is based on the principal diagnosis code recorded in the Emergency Department Data Collection (EDDC). Reasons for presentation are categorised according to ICD-10-AM codes and the most commonly recorded reasons are shown in Figure 6.

People with cancer visit an ED for a range of reasons – some are categorised as non-specific symptoms, others are categorised within specific disease groups – many of these are related to their underlying cancer. Almost three in 10 ED visits made by people with cancer (28.6%) were for symptoms and signs, in particular related to circulatory, respiratory and digestive systems. These three systems, alongside trauma and injury, were also among the most prevalent diseases groups, comprising a sizeable proportion of ED visits made by people with cancer.

In contrast, only 3.8% of ED visits were attributed specifically to cancer (Figure 6).

Other diseases
of blood and
blood-forming organs
(2,987)

**Diseases
of the blood
and blood-forming
organs disorders
3.7%
(7,124 visits)**

Aplastic and
other anaemias
(3,357)

Malignant neoplasms
(6,263)

**Cancer
(neoplasms)
3.8%
(7,374 visits)**

Soft tissue
disorders
(1,267)

Arthropathies
(2,869)

**Diseases of the
musculoskeletal
system
4.0%
(7,737 visits)**

Dorsopathies
(3,446)

Kidney failure
(1,261)

**Diseases of the
genitourinary
system
4.5%
(8,636 visits)**

Other diseases of
urinary system
(4,116)

Cerebrovascular
diseases
(1,499)

Diseases of veins,
lymphatic vessels
and lymph nodes, not
elsewhere classified
(1,566)

IHD
(2,155)

**Diseases of the
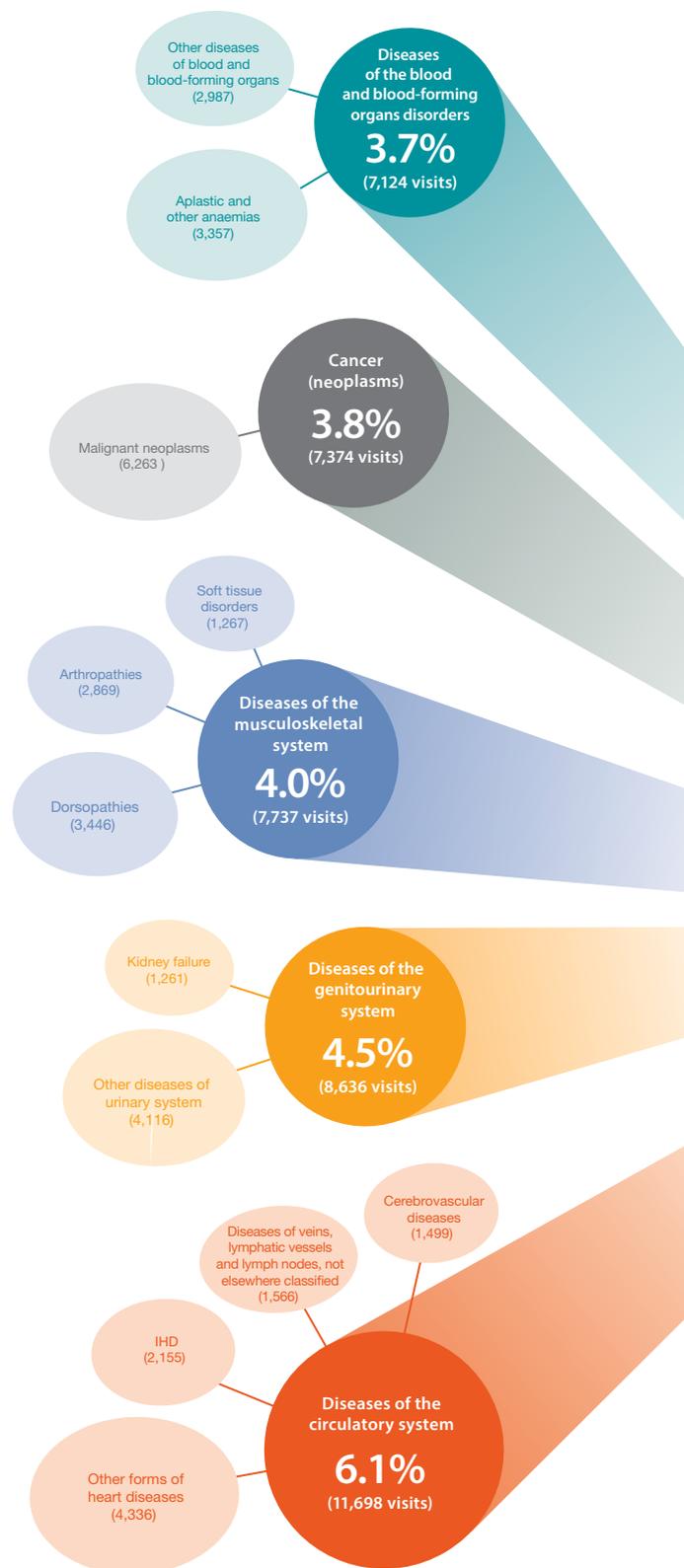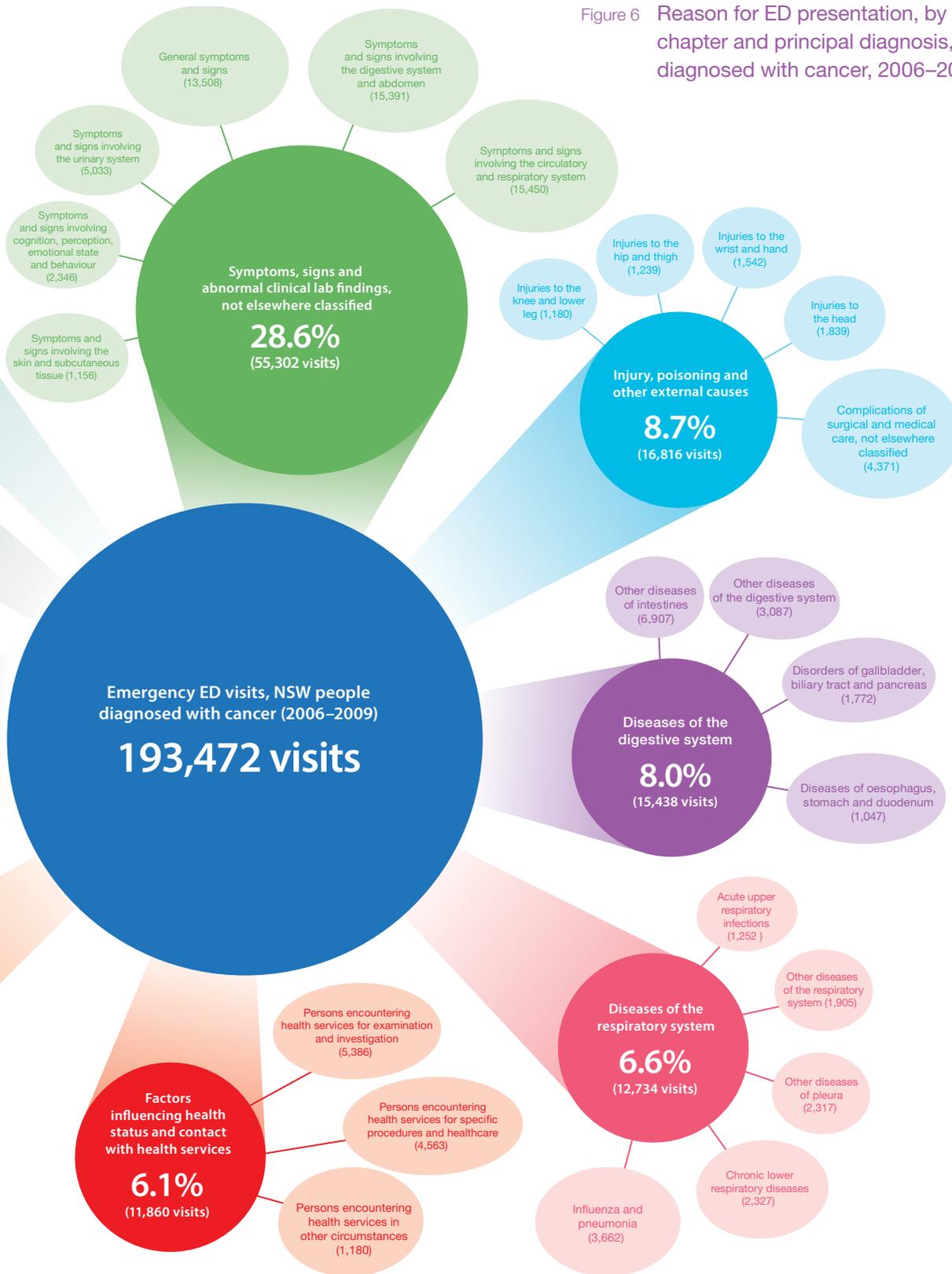circulatory system
6.1%
(11,698 visits)**

Other forms of
heart diseases
(4,336)

Figure 6 Reason for ED presentation, by ICD-10-AM chapter and principal diagnosis, NSW people diagnosed with cancer, 2006–2009[b]

Symptoms, signs and abnormal clinical lab findings, not elsewhere classified
28.6%
(55,302 visits)

General symptoms and signs (13,508)

Symptoms and signs involving the digestive system and abdomen (15,391)

Symptoms and signs involving the urinary system (5,033)

Symptoms and signs involving the circulatory and respiratory system (15,450)

Symptoms and signs involving cognition, perception, emotional state and behaviour (2,346)

Symptoms and signs involving the skin and subcutaneous tissue (1,156)

Emergency ED visits, NSW people diagnosed with cancer (2006–2009)
193,472 visits

Injury, poisoning and other external causes
8.7%
(16,816 visits)

Injuries to the hip and thigh (1,239)

Injuries to the wrist and hand (1,542)

Injuries to the knee and lower leg (1,180)

Injuries to the head (1,839)

Complications of surgical and medical care, not elsewhere classified (4,371)

Diseases of the digestive system
8.0%
(15,438 visits)

Other diseases of intestines (6,907)

Other diseases of the digestive system (3,087)

Disorders of gallbladder, biliary tract and pancreas (1,772)

Diseases of oesophagus, stomach and duodenum (1,047)

Factors influencing health status and contact with health services
6.1%
(11,860 visits)

Persons encountering health services for examination and investigation (5,386)

Persons encountering health services for specific procedures and healthcare (4,563)

Persons encountering health services in other circumstances (1,180)

Diseases of the respiratory system
6.6%
(12,734 visits)

Acute upper respiratory infections (1,252)

Other diseases of the respiratory system (1,905)

Other diseases of pleura (2,317)

Chronic lower respiratory diseases (2,327)

Influenza and pneumonia (3,662)

b. Reasons for ED presentation were mapped to ICD-10-AM codes. Chapters with fewer than 5,000 visits in the six year period (2005–2010) are not shown. Principal diagnoses with <1,000 visits are not shown.

Factors associated with emergency ED visits

Comorbidities, socioeconomic status and more advanced cancer confer greater risk

Among the 141,461 people diagnosed with cancer between 2006 and 2009, 56,262 (40% of the total) attended an ED in the year following their diagnosis.

Patterns of ED use vary with cancer type. People with a respiratory cancer comprise 10% of the cancer cohort but represented 15% of cancer patients who visited the ED. In contrast, people diagnosed with prostate cancer comprise 18% of the cancer patient cohort but represented 12% of cancer patients who visited an ED (Figure 7).

Multivariable Fine and Gray competing risk approach[16, 17] was used to identify the patient level factors most strongly associated with ED visits; and to estimate the heightened risk

those factors confer (expressed as subhazard ratios or SHRs; see Appendix 2). A range of factors were associated with a higher risk of presenting to an ED (Figure 8), including:

- A distant stage of cancer at diagnosis (SHR 1.92; 95% CI 1.87–1.97), or a 92% higher risk of an emergency ED visit (using localised stage at diagnosis as a reference category)

- Being diagnosed with some types of cancer such as neurological cancer (SHR 2.71; 95% CI 2.52–2.91) (using skin cancer as a reference category)

- Some comorbidities, such as hypertension (SHR 1.17; 95% CI 1.15–1.20) (using no comorbidities as a reference category).

Figure 7   Distribution of cancer clinical groups, among cohort and among ED visits, NSW people diagnosed with cancer, 2006–2009
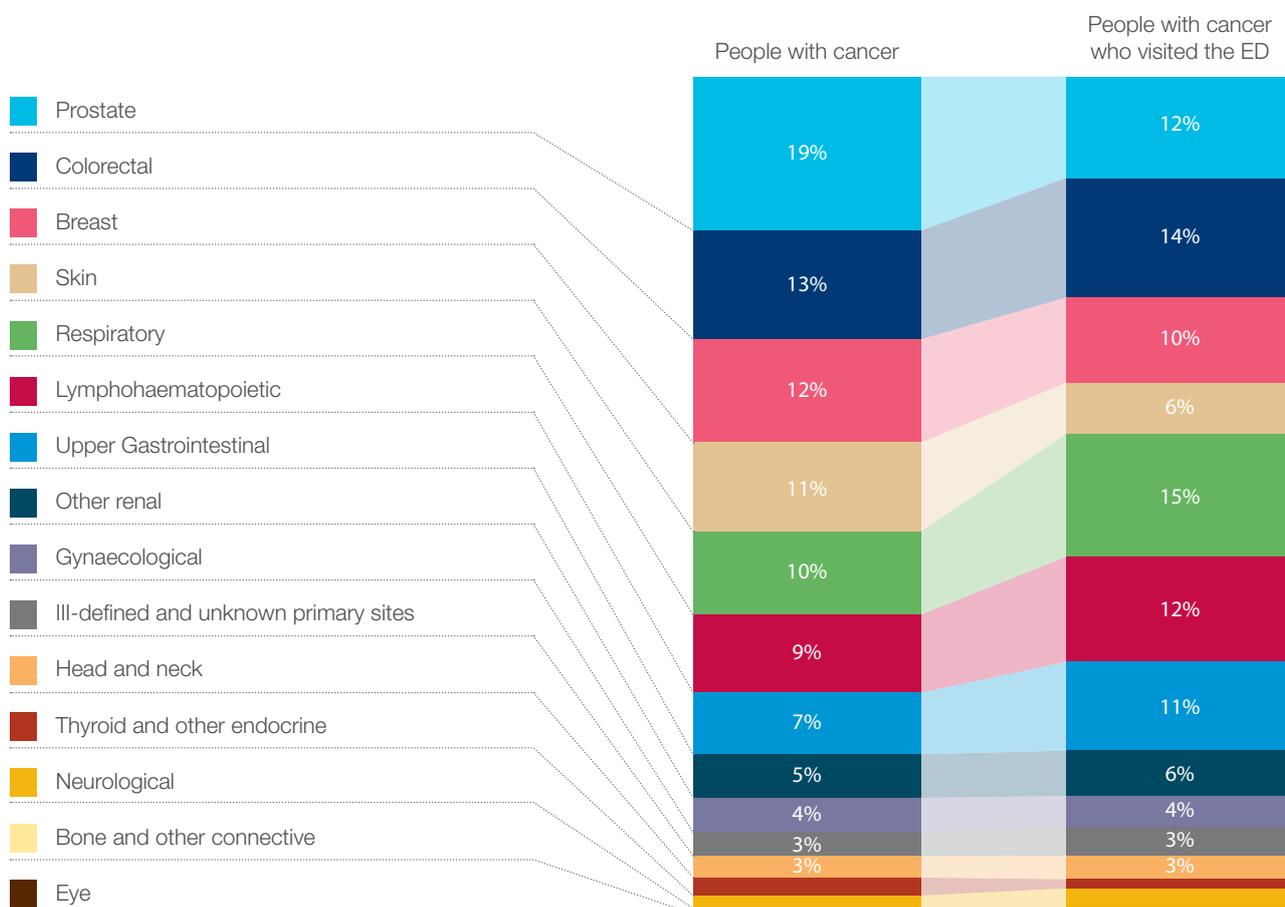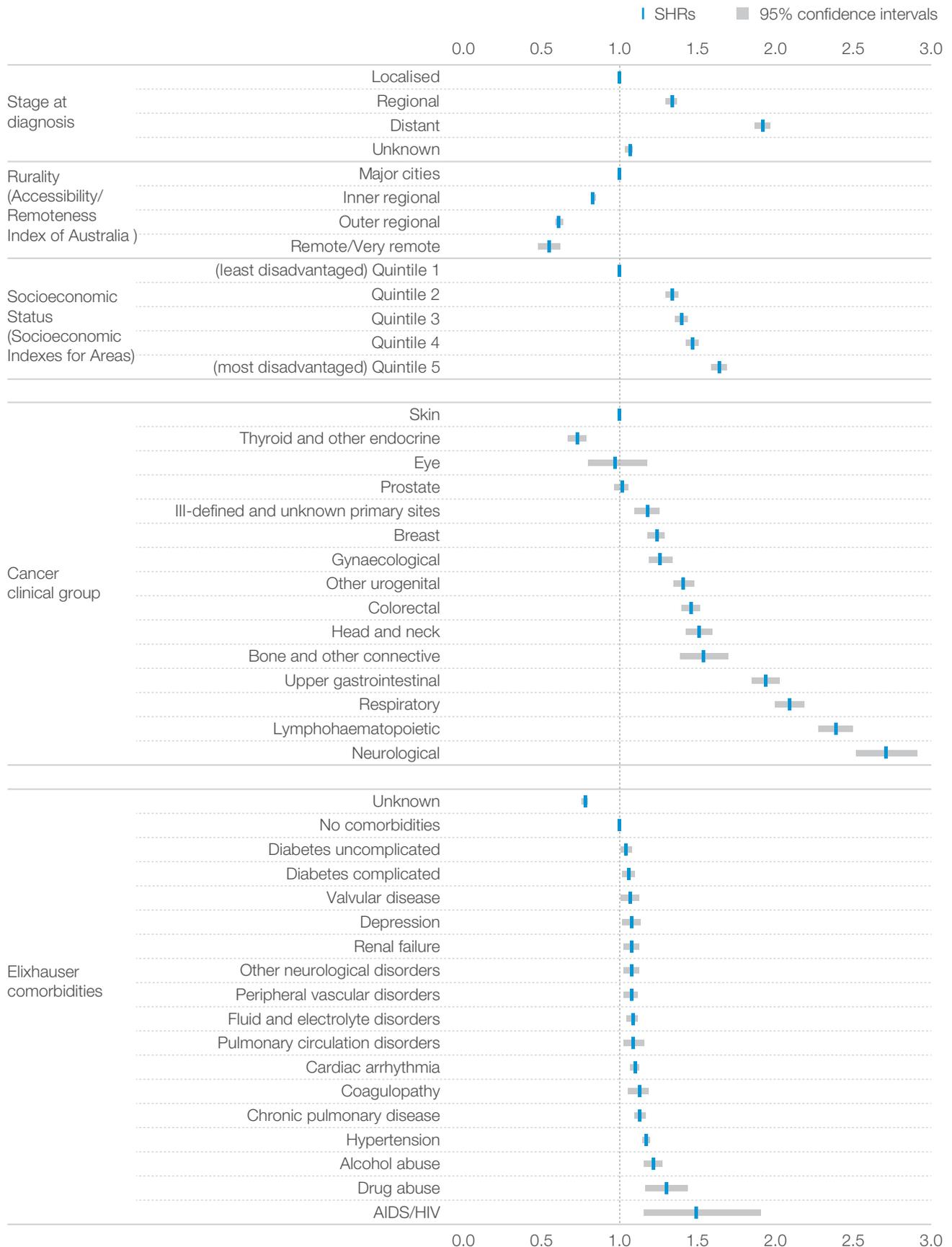

People with cancer | People with cancer who visited the ED

- Prostate
- Colorectal
- Breast
- Skin
- Respiratory
- Lymphohaematopoietic
- Upper Gastrointestinal
- Other renal
- Gynaecological
- Ill-defined and unknown primary sites
- Head and neck
- Thyroid and other endocrine
- Neurological
- Bone and other connective
- Eye

People with cancer: 19%, 13%, 12%, 11%, 10%, 9%, 7%, 5%, 4%, 3%, 3%

People with cancer who visited the ED: 12%, 14%, 10%, 6%, 15%, 12%, 11%, 6%, 4%, 3%, 3%

Figure 8 ED presentation subhazard ratios for patient characteristics in the year following diagnosis, NSW people diagnosed with cancer, 2006–2009[c,d]

| | SHRs | 95% confidence intervals |

Stage at diagnosis
- Localised
- Regional
- Distant
- Unknown

Rurality (Accessibility/ Remoteness Index of Australia)
- Major cities
- Inner regional
- Outer regional
- Remote/Very remote

Socioeconomic Status (Socioeconomic Indexes for Areas)
- (least disadvantaged) Quintile 1
- Quintile 2
- Quintile 3
- Quintile 4
- (most disadvantaged) Quintile 5

Cancer clinical group
- Skin
- Thyroid and other endocrine
- Eye
- Prostate
- Ill-defined and unknown primary sites
- Breast
- Gynaecological
- Other urogenital
- Colorectal
- Head and neck
- Bone and other connective
- Upper gastrointestinal
- Respiratory
- Lymphohaematopoietic
- Neurological

Elixhauser comorbidities
- Unknown
- No comorbidities
- Diabetes uncomplicated
- Diabetes complicated
- Valvular disease
- Depression
- Renal failure
- Other neurological disorders
- Peripheral vascular disorders
- Fluid and electrolyte disorders
- Pulmonary circulation disorders
- Cardiac arrhythmia
- Coagulopathy
- Chronic pulmonary disease
- Hypertension
- Alcohol abuse
- Drug abuse
- AIDS/HIV

c. Other factors included in the final multivariable model were age at diagnosis, year of diagnosis and Indigenous status.

d. See *Spotlight on Measurement: Emergency department utilisation by people with cancer, NSW public hospitals, Cohort diagnosed 2006–2009*, Risk adjustment for details of Elixhauser comorbidities.

Visiting an ED around diagnosis and near the end of life

Among people with cancer who died, half visited an ED in the 30 days preceding their death

People with cancer may present to an ED with symptoms associated with their diagnosis, because of the side effects of treatment or with symptoms related to other health problems near the end of life. Whilst many of these visits to an ED are warranted and the appropriate course of action, for many patients accessible and appropriate palliative and community care can render ED visits unnecessary.[18]

Ensuring that appropriate care options are available for patients dying of cancer can reduce the distress related to an ED visit and minimise inappropriate use of ED resources.

In NSW, people with cancer visited an ED at different times throughout their journey (Figure 9). They visited an ED preceding their diagnosis, following their diagnosis and near the end of life (Figure 10). Among people who died within a year of a cancer diagnosis, almost half (47%) visited an ED in the 30 days preceding their death; and two-thirds (67%) attended in the 90 days preceding their death (Figure 11).

Figure 9   Patterns of ED visits, NSW people diagnosed with cancer, 2006–2009

Between 2006 and 2009 there were 141,461 NSW people diagnosed with cancer

Use of ED around date of diagnosis	• 42,060 (30%) attended an ED in the year preceding their diagnosis
	• 56,262 (40%) attended an ED in the year following their diagnosis
	• The median time from diagnosis to the first ED attendance was 62 days

Among the 31,631 people who died within a year of their diagnosis

Use of ED near the end of life	• 14,867 (47%) attended an ED within 30 days of dying
	• 21,193 (67%) attended an ED within 90 days of dying
	• 23,723 (75%) attended an ED within 180 days of dying

Patterns of ED visits within a year of cancer diagnosis

30%
visited the ED

Year preceding
DIAGNOSIS

Year following
DIAGNOSIS

40%
visited an ED

Figure 11   Patterns of ED visits near the end of life, NSW people diagnosed with cancer, 2006–2009
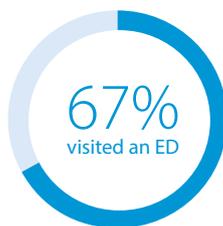
Patterns of ED visits near the end of life
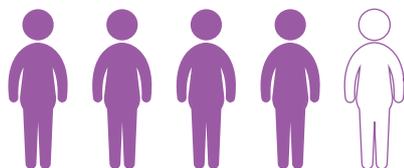
One in five people with cancer died within a year of diagnosis
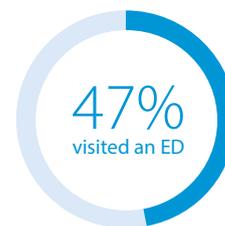
Of those who died

75%
visited an ED
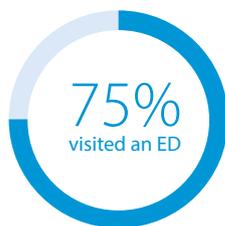
in the last
180 days of life

Of those who died

67%
visited an ED

in the last
90 days of life

Of those who died

47%
visited an ED

in the last
30 days of life

ED timeliness indicators: arriving at an ED

People with cancer were triaged to more urgent categories

Patients arriving at an ED are allocated to one of five urgency (triage) categories: resuscitation (triage 1), emergency (triage 2), urgent (triage 3), semi-urgent (triage 4) or non-urgent (triage 5).

All emergency ED visits in NSW in 2010 have been used to contextualise ED timeliness measures for people with cancer who visited an ED between January 2005 to December 2010.

There were 193,472 emergency visits to NSW EDs by people with cancer between January 2005 to December 2010. Of these: 1% were triaged to triage category 1, 11% to triage 2, 43% to triage 3, 36% to triage 4 and 9% to triage 5. People with cancer tended to be triaged to more urgent categories than NSW patients overall in 2010 where 1% were triaged to triage category 1, 9% to triage 2, 30% to triage 3, 45% to triage 4 and 16% to triage 5.

The neurological, respiratory and lymphohaematopoeitic clinical groups had slightly more patients triaged more urgently (triage categories 1 to 3) compared to all cancers (Figure 12).

Among people with cancer presenting to an ED, the median time to start treatment for the emergency category (triage 2) was seven minutes, the urgent category (triage 3) 24 minutes, the semi-urgent category (triage 4) 36 minutes and the non-urgent category (triage 5) 21 minutes. The median times to start treatment for people with cancer were similar to those for all NSW ED patients, except for triage category 5, where people with cancer were seen more quickly than all NSW ED patients at 30 minutes.[e]
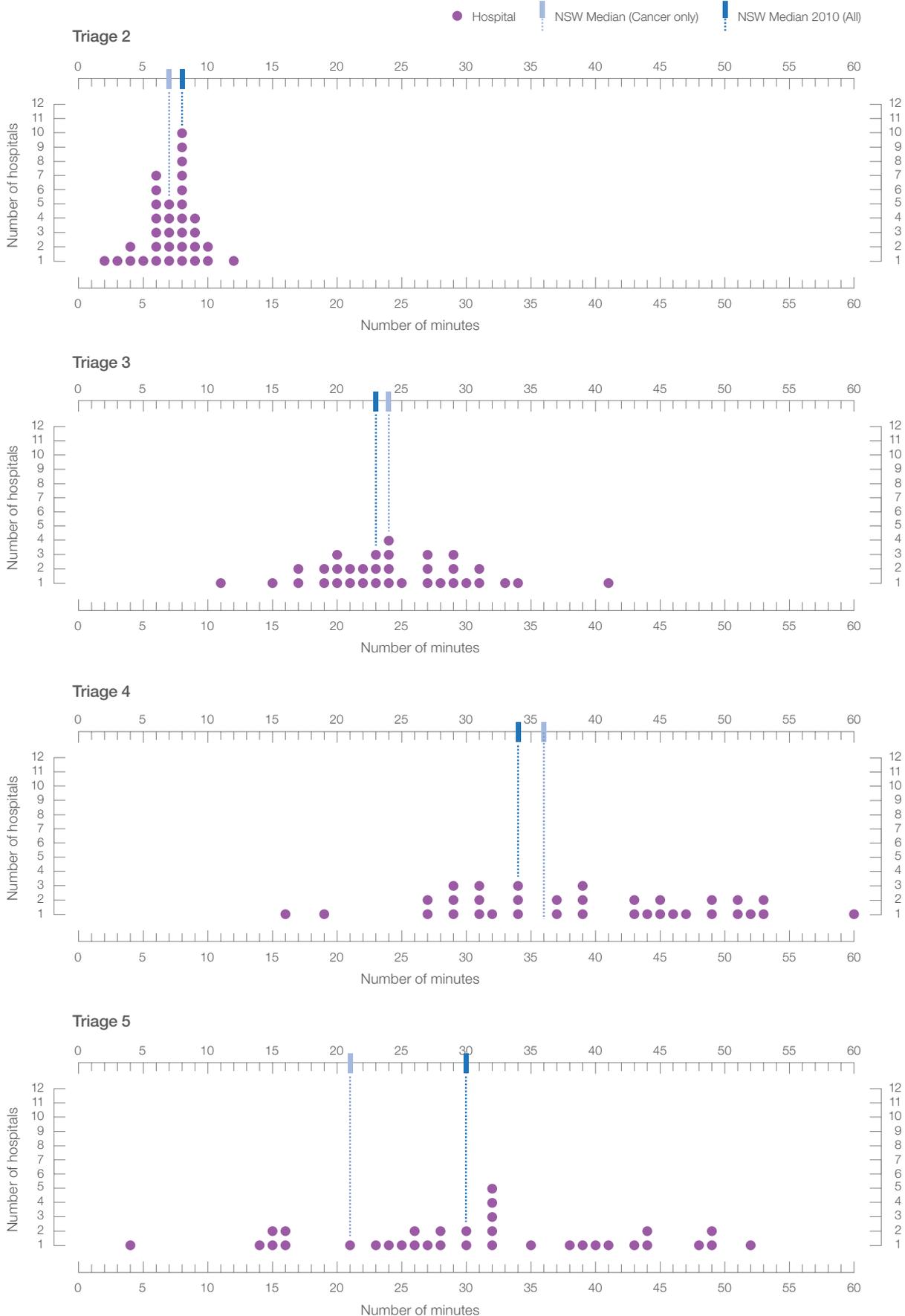
There is variation between hospitals in the median time to start treatment. For example, among principal referral and major hospitals (peer groups A1 and B), the median time to start treatment for people with cancer ranged from two to 12 minutes for triage 2, from 11 to 41 minutes for triage 3, from 16 to 60 minutes for triage 4 and from four to 49 minutes for triage 5 (Figure 13).

Figure 12 Emergency visits by triage category, all NSW people 2010, and NSW people diagnosed with cancer, 2006–2009
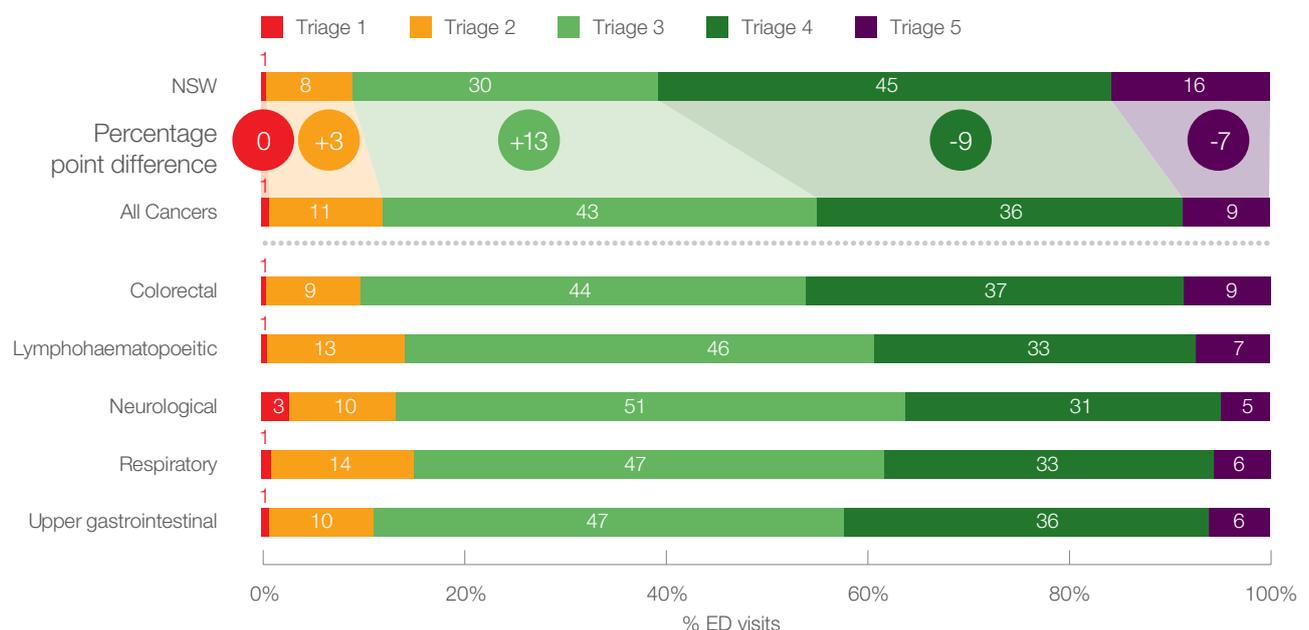
e. Triage 1 patients are the most urgent and are treated within 2 minutes. Clinicians treating them are focused on providing immediate and essential care, rather than recording times, therefore times to start treatment are not generally reported

Figure 13 Variation across public hospitals in median time to treatment, principal referral and major hospitals, NSW people diagnosed with cancer, 2006–2009 [f]

Triage 2

Triage 3

Triage 4

Triage 5

Legend: ● Hospital   ▮ NSW Median (Cancer only)   ▮ NSW Median 2010 (All)

f. Hospitals that are not a principal referral or major hospital (peer groups A1 and B) are not shown in the graphs but contribute to the cancer and NSW median. A principal referral hospital is a very large hospital providing a broad range of services including specialised units at a state or national level. A major hospital is a large metropolitan or non-metropolitan hospital.

Where do patients go when they leave an ED?

Over half of emergency ED visits made by people with cancer ended in admission to hospital

There are different ways that patients can leave an ED. The majority leave after their treatment is complete or when they are admitted to hospital. Some patients choose not to wait to begin or complete treatment, some are transferred to other hospitals. The way a patient leaves the ED is referred to as the 'mode of separation'.

The mode of separation provides important context for interpreting measures of timeliness in ED visits. Visits that end in admission to hospital generally result in longer periods in the ED, and visits made by people with cancer more frequently end in admission, compared to all NSW ED patients.

All emergency ED visits in NSW in 2010 have been used to compare the mode of separation for people with cancer who visited an ED between January 2005 and December 2010.

- 35% of emergency visits to the ED by people with cancer involved treatment in the ED and discharge home. In contrast, 62% of all emergency ED visits in NSW in 2010, involved treatment and discharge.

- 58% of all emergency visits to the ED made by people with cancer involved receiving treatment in the ED and subsequent admission to a ward, a critical care unit or an operating suite in the hospital, compared to 27% of visits made by all NSW ED patients

- A small proportion of emergency ED visits made by people with cancer (3%) involved receiving treatment in an ED and subsequent transfer to another hospital. This is similar to all NSW ED patients overall at 2%.

- An equally small proportion of visits (3%) ended with people with cancer leaving the ED without, or before, completing treatment. The equivalent proportion for all NSW ED patient visits is 8%.

Looking across the five main clinical cancer groups of interest (colorectal, lymphohaematopoeitic, neurological, respiratory and upper gastrointestinal) the proportion of visits that resulted in hospital admission was higher than for all people with cancer, ranging from 61% for colorectal to 67% for respiratory and upper gastrointestinal (Figure 14).

At a hospital level, the proportion of emergency ED visits made by people with cancer that ended in hospital admission ranged from 45% to 76%. Conversely, the proportion of emergency ED visits made by people with cancer that ended in discharge from the ED ranged from 18% to 49% (Figure 15).

Of all the ED presentations made by people with cancer, 4% were re-presentations, that is, they were preceded by an ED visit in the previous 48 hours. The proportion of visits that were re-presentations was consistent across the five clinical cancer groups and was similar to all NSW ED patients. Among principal referral and major hospitals (peer groups A1 and B), the proportion of emergency ED visits that were re-presentations ranged from 3% to 9% (Figure 16).

Figure 14 Emergency visits by mode of separation, all NSW people 2010, and NSW people diagnosed with cancer, 2006–2009
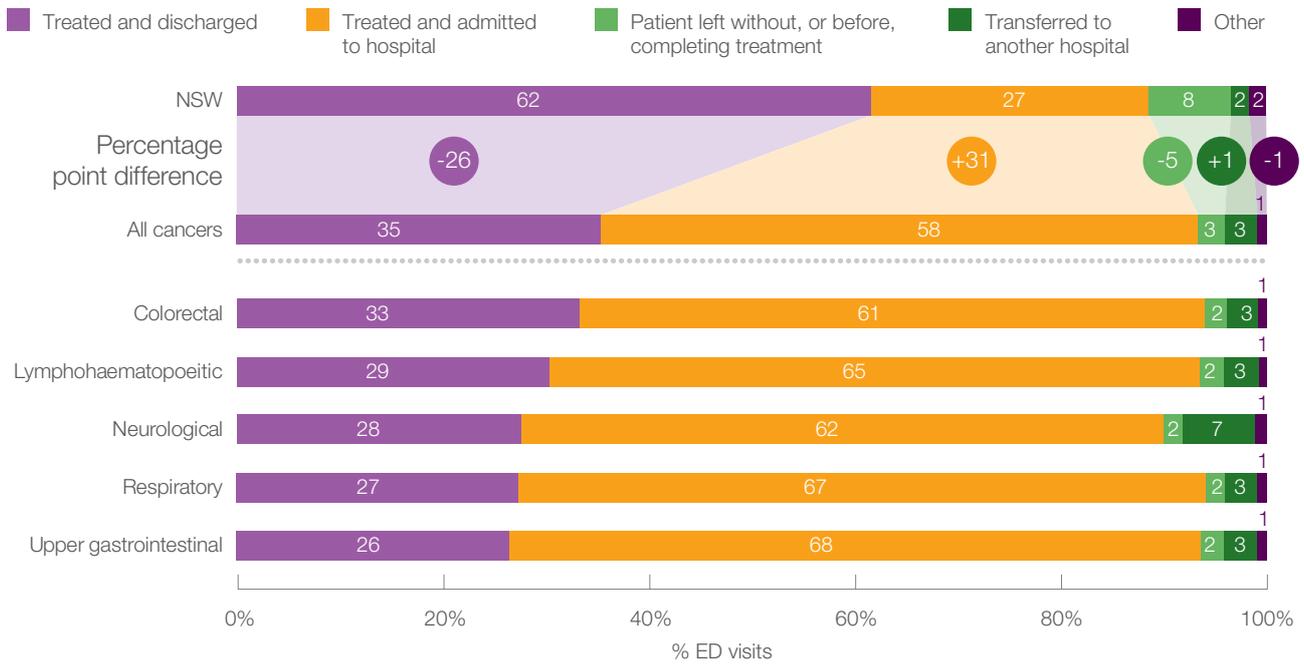

Legend:
- Treated and discharged
- Treated and admitted to hospital
- Patient left without, or before, completing treatment
- Transferred to another hospital
- Other

	Treated and discharged	Treated and admitted	Patient left	Transferred	Other
NSW	62	27	8	2	2
Percentage point difference	-26	+31	-5	+1	-1
All cancers	35	58	3	3	1
Colorectal	33	61	2	3	1
Lymphohaematopoeitic	29	65	2	3	1
Neurological	28	62	2	7	1
Respiratory	27	67	2	3	1
Upper gastrointestinal	26	68	2	3	1

% ED visits

Figure 15 Variation across hospitals in the proportion of visits that ended in discharge from an ED, principal referral and major hospitals, NSW people diagnosed with cancer, 2006–2009

Legend: Hospital, NSW (All), NSW (Cancer only)

Number of hospitals

% of visits that ended in discharge from the ED
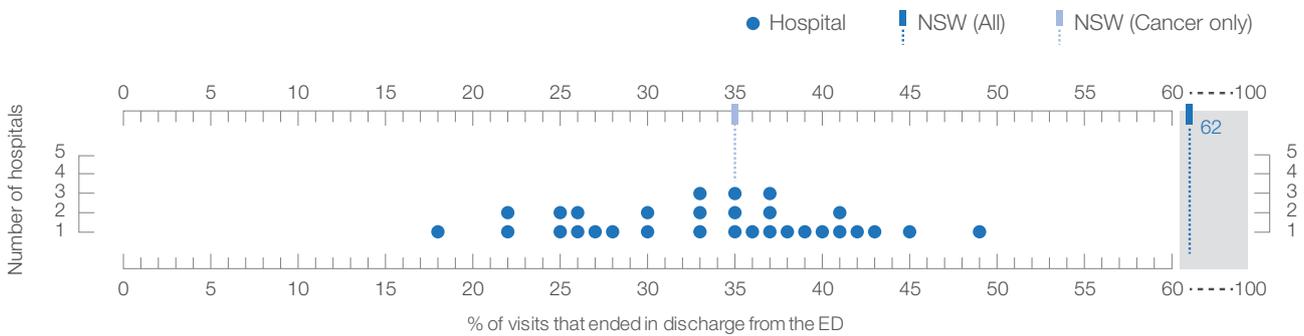
Figure 16 Variation across hospitals in the proportion of ED visits that were re-presentations within 48 hours, NSW people diagnosed with cancer 2006–2009

Legend: Hospital, NSW (All), NSW (Cancer only)

Number of hospitals

% of representations
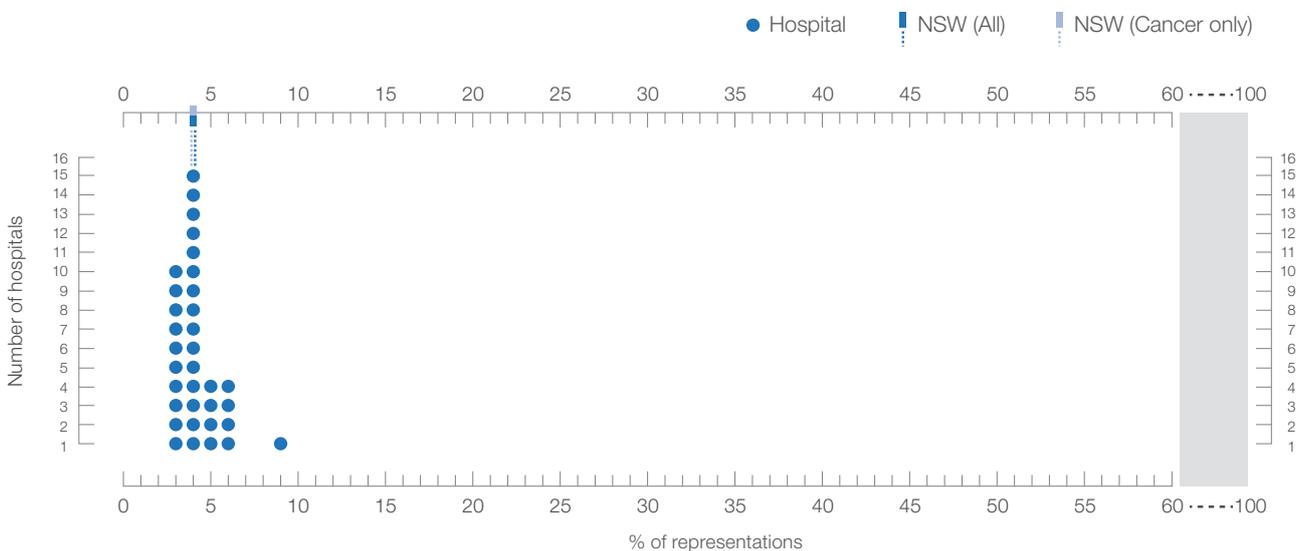
ED timeliness indicators: leaving the ED

The median time to leaving the ED was just under four hours for people with cancer

For all NSW ED patient visits, the median time to leaving the ED in 2010 was three hours and 17 minutes. Among people diagnosed with cancer between 2006 and 2009, who made an ED visit within a year of diagnosis, the median time from presentation to leaving the ED was three hours and 59 minutes. For the five main clinical cancer groups of interest (colorectal, lymphohaematopoeitic, neurological, respiratory and upper gastrointestinal), the median time to leaving the ED was longer than for visits made by all people with cancer (Figure 17).

For emergency ED visits made by people with cancer, 44% resulted in the patient leaving the ED within four hours of presentation. This is a lower percentage than for all NSW ED visits in 2010 (59%).[g] Cases that are urgent or admitted to hospital are less likely to leave the ED within four hours.

Across the five main clinical cancer groups, ED visits made by people with upper gastrointestinal cancers had the lowest percentage (38%) of visits that were completed within four hours.

The percentage of ED visits made by people with cancer for which the patient left the ED within four hours ranged across principal referral and major hospitals (peer groups A1 and B) from 31% to 55%.

Among people with cancer whose visit to an ED ended in admission to hospital, 30.5% left the ED within four hours. This compares to 21.6% of visits for all NSW ED patients that ended in admission to hospital.

When data are stratified into visits that ended in discharge and those that ended in hospital admission, a different pattern emerges. For visits ending in discharge, the percentage of patients who left the ED within four hours ranged from 40% to 80%. For visits ending in hospital admission, the percentage of patients who left the ED within four hours ranged from 17% to 43% (Figure 18).

Figure 17 Median time to leaving the ED, NSW people diagnosed with cancer, 2006–2009
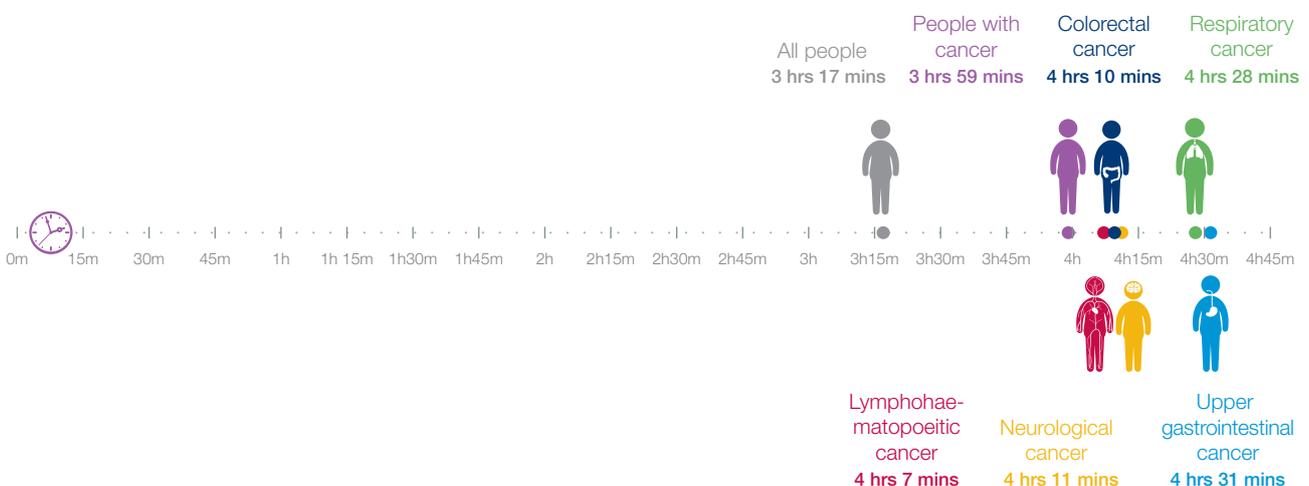
g. The Federal Government has adopted a National Emergency Access Target (NEAT) which states that by 2015, 90% of patients presenting to a public hospital ED will physically leave the ED within four hours, regardless of whether they are admitted, transferred to another hospital or discharged. NSW performance against this target is reported by national reporting agencies, using slightly different data definitions to those used here. The Bureau of Health Information's *Hospital Quarterly April to June 2014* report shows that 72% of NSW ED visits resulted in the patient leaving the ED within four hours of presentation.

Figure 18 Variation across hospitals in percentage of ED presentations leaving the ED within four hours by mode of separation, principal referral and major hospitals, NSW people diagnosed with cancer, 2006–2009

○ Treated and admitted   ● Treated and discharged

% of presentations leaving the ED within four hours
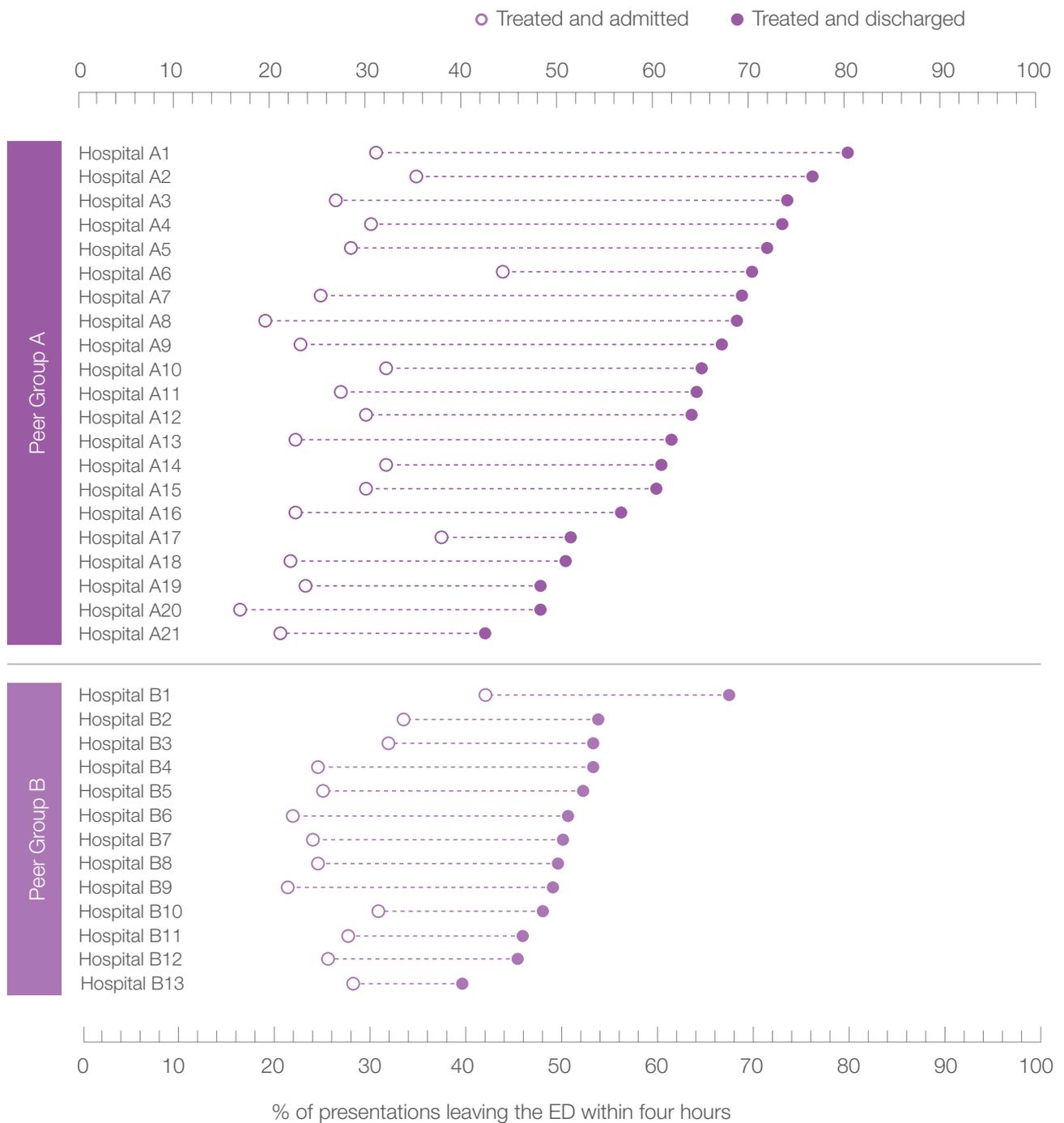
ED presentations within 28 days of discharge from hospital for adults with breast cancer

Seven hospitals had more ED presentations than expected and four had fewer than expected

Breast cancer is the most common cancer in women in NSW. It predominantly affects women, with less than 1% of cases occurring in men.[4] People with breast cancer usually have planned treatments and ED visits should be minimised. This analysis examines the extent to which there were higher or lower than expected rates of ED visits following hospitalisation for breast cancer, taking into account a range of patient level factors such as the stage at diagnosis and comorbidities.

Between January 2006 and December 2009, there were 17,258 people diagnosed with breast cancer. In the year following their diagnosis, 13,821 of these people were hospitalised with a principal diagnosis of breast cancer 19,371 times. There were 61 people who died during a hospitalisation.

Of the 19,371 hospitalisations, 56% were in private hospitals and 44% were in public hospitals. The results presented in Figures 19 and 20 focus on public hospital patients.

Across public hospitals that admitted at least 50 patients, unadjusted rates of ED visits within 28 days of discharge ranged from 3.7 to 22.4 visits per 100 patients. Unadjusted rates however, have limitations as indicators of hospital performance. More meaningful information is provided by statistical techniques such as risk-standardised utilisation ratios (RSURs). RSURs use data for all breast cancer patients admitted to NSW public hospitals to generate an expected rate of ED visits for each hospital based on case mix and the characteristics of their patients.

This expected rate can be compared with the observed number of ED visits and presented as a ratio. Ratios greater than 1.0 suggest higher than expected ED visit rates. Funnel plots are used to assess the extent to which ratios are significantly higher or lower than expected (see Appendix 3).

Figure 20 shows the breast cancer 28-day RSURs for public hospitals in the state, using a funnel plot. There were 42 hospitals (79%) with ED visits no different to the number expected. Four hospitals had fewer than the expected number of ED visits and seven hospitals had more than the expected number of ED visits.[h]

Hospitals with fewer than expected ED visits were distributed across peer groups A–C. ED visits exceeded the expected number in one principal referral hospital (peer group A) and one district hospital (peer group C) but were concentrated in five major hospitals (peer group B).

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h. Hospitals have been anonymised since the data are over five years old.

Figure 19 Breast cancer ED visits within 28 days of discharge from hospital at a glance

Among people diagnosed with breast cancer, there were 8,313 admissions to public hospitals with the principal diagnosis of breast cancer[i]

In the year following diagnosis there were...	• 6,474 (78%) overnight admissions
	• 1,839 (22%) day only admissions
	• 7,821 (94%) for surgical procedures
	• 488 (6%) for non-surgical procedures
The stage at diagnosis	• 4,019 (48%) had localised stage
	• 3,566 (43%) had regional stage
	• 607 (7%) had distant stage
	• 121 (1%) had an unknown stage

There were 8,177 admission records included in the calculation of RSURs[j]

| Calculating the RSUR | • 1,032 presented to an ED within 28 days of discharge from hospital |
| | • This corresponds to an unadjusted ED presentation rate of 12.6 per 100 patients |

Figure 20 Breast cancer risk-standardised utilisation ratios (RSURs), ED visits within 28 days of discharge from hospital, NSW public hospitals, adults diagnosed with breast cancer, 2006–2009[k]
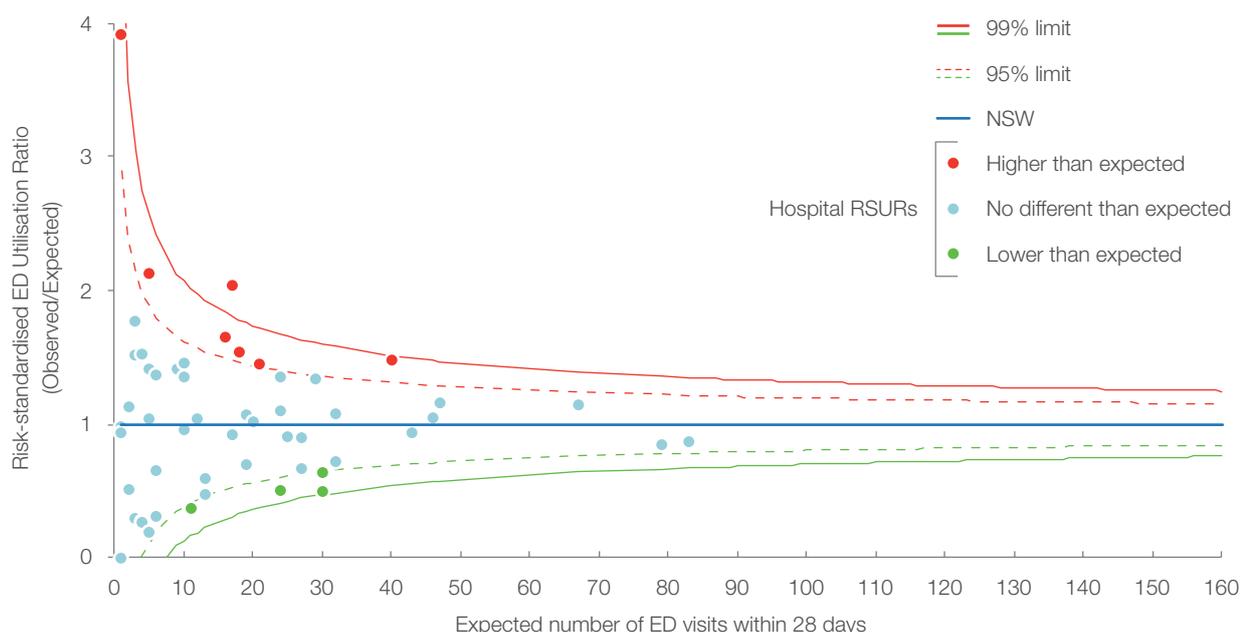
i. See *Spotlight on Measurement: Emergency department utilisation by people with cancer, NSW public hospitals, Cohort diagnosed 2006–2009*, Appendix 4 for exclusions.
j. Records with missing procedure type, an unknown stage at diagnosis or with fewer than 28 days of follow up information were excluded from the calculation of RSURs.
k. Data for hospitals with an expected number of ED visits of <1 are supressed. See *Spotlight on measurement: Emergency department utilisation by people with cancer,* for details.

ED presentations within 28 days of discharge from hospital for adults with colorectal cancer

Four hospitals had more ED presentations than expected and three had fewer than expected

Colorectal cancer is the second most common cancer among people in NSW.[4] People with colorectal cancer usually have planned treatments and ED visits should be minimised. This analysis examines the extent to which there were higher or lower than expected rates of ED visits following hospitalisation for colorectal cancer, taking into account a range of patient level factors such as the stage at diagnosis and comorbidities.

Between January 2006 and December 2009, there were 18,353 people diagnosed with colorectal cancer. In the year following their diagnosis, 14,996 of these people were hospitalised with a principal diagnosis of colorectal cancer 22,880 times. There were 738 people who died during a hospitalisation.

Of the 22,880 hospitalisations, 44% were in private hospitals and 56% were in public hospitals. The results presented in Figures 21 and 22 focus on public hospital patients.

Across public hospitals that admitted at least 50 patients, unadjusted rates of ED visits within 28 days of discharge ranged from 7.0 to 25.8 visits per 100 patients. Unadjusted rates however, have limitations as indicators of hospital performance.

More meaningful information is provided by statistical techniques such as risk-standardised utilisation ratio (RSURs). RSURs use data for all colorectal cancer patients admitted to NSW public hospitals to generate an expected rate of ED visits for each hospital based on case mix and the characteristics of their patients.

This expected rate can be compared with the observed number of ED visits and presented as a ratio. Ratios greater than 1.0 suggest higher than expected ED visit rates. Funnel plots are used to assess the extent to which ratios are significantly higher or lower than expected.

Figure 22 shows the colorectal cancer 28-day RSURs for public hospitals in the state, using a funnel plot (see Appendix 3). There were 79 hospitals (92%) with ED visits no different to the number expected. Three hospitals had fewer than the expected number of ED visits and four hospitals had more than the expected number of ED visits.[l]

Hospitals with fewer than expected ED visits were distributed across peer groups A–C. ED visits exceeded the expected number in two district hospitals (peer group C) and in two principal referral hospitals (peer group A).

**Figure 21** Colorectal cancer ED visits within 28 days of discharge from hospital at a glance

Among people diagnosed with colorectal cancer, there were 11,957 admissions to public hospitals with the principal diagnosis of colorectal cancer[m]

In the year following diagnosis there were...	• 1,761 (91%) overnight admissions
	• 174 (9%) day only admissions
	• 7,984 (67%) for surgical procedures
	• 3,956 (33%) for non-surgical procedures
The stage at diagnosis	• 3,893 (33%) had localised stage
	• 4,976 (42%) had regional stage
	• 2,419 (20%) had distant stage
	• 669 (6%) had an unknown stage

There were 11,195 admission records included in the calculation of RSURs[n]

| Calculating the RSUR | • 1,819 presented to an ED within 28 days of discharge from hospital |
| | • This corresponds to an unadjusted ED presentation rate of 16.2 per 100 patients |

Figure 22 Colorectal cancer risk-standardised utilisation ratios (RSURs), ED visits within 28 days of discharge from hospital, NSW public hospitals, adults diagnosed with colorectal cancer, 2006–2009[o]
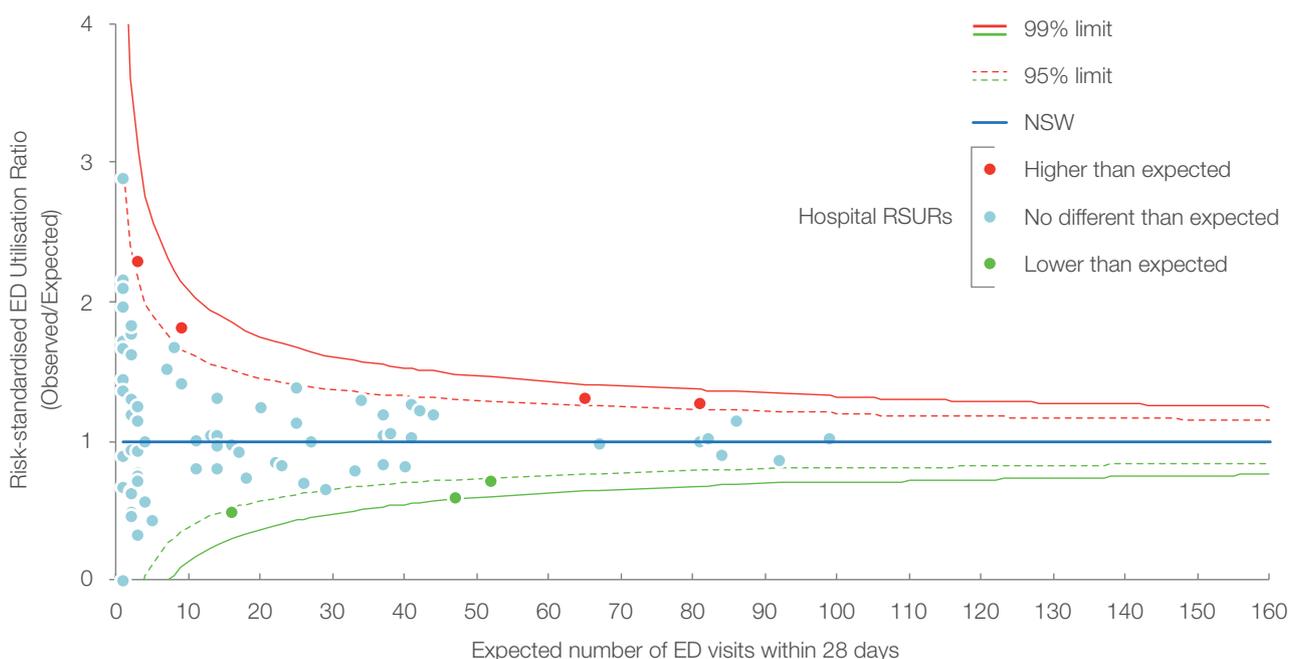
m. See *Spotlight on Measurement: Emergency department utilisation by people with cancer, NSW public hospitals, Cohort diagnosed 2006–2009*, Appendix 5 for exclusions.
n. Records with missing procedure type, an unknown stage at diagnosis or with fewer than 28 days of follow up information were excluded from the calculation of RSURs.
o. Data for hospitals with an expected number of ED visits of <1 are supressed. See *Spotlight on measurement: Emergency department utilisation by people with cancer,* for details.

ED presentations within 28 days of discharge from hospital for adults with respiratory cancer

Five hospitals had more ED presentations than expected and three had fewer than expected

Lung cancer is the fifth most common cancer in people in NSW and it is the leading cause of cancer deaths. Lung cancer comprises over 90% of respiratory cancers.[4]

People with respiratory cancer usually have planned treatments and ED visits should be minimised. This analysis examines the extent to which there were higher or lower than expected rates of ED visits following hospitalisation for respiratory cancer, taking into account a range of patient level factors such as the stage at diagnosis and comorbidities.

Between January 2006 and December 2009, there were 13,895 people diagnosed with respiratory cancer. In the year following their diagnosis, 7,926 of these people were hospitalised with a principal diagnosis of respiratory cancer 12,533 times. There were 1,899 people who died during a hospitalisation.

Of the 12,533 hospitalisations 26% were in private hospitals and 74% were in public hospitals. The results presented in Figures 23 and 24 focus on public hospital patients.

Across public hospitals that admitted at least 50 patients, unadjusted rates of ED visits within 28 days of discharge ranged from 19.2 to 44.1 visits per 100 patients. Unadjusted rates however, have limitations as indicators of hospital performance.

More meaningful information is provided by statistical techniques such as risk-standardised utilisation ratios (RSURs). RSURs use data for all respiratory cancer patients admitted to NSW public hospitals to generate an expected rate of ED visits for each hospital based on case mix and the characteristics of their patients.

This expected rate can be compared with the observed number of ED visits and presented as a ratio. Ratios greater than 1.0 suggest higher than expected ED visit rates. Funnel plots are used to assess the extent to which ratios are significantly higher or lower than expected (see Appendix 3).

Figure 24 shows the respiratory cancer 28-day RSURs for public hospitals in the state, using a funnel plot. There were 99 hospitals (93%) with ED visits no different to the number expected. Three hospitals had fewer than the expected number of ED visits and five hospitals had more than the expected number of ED visits.[p]

Hospitals with fewer than expected ED visits were recorded in one major hospital (peer group B) and two principal referral hospitals (peer group A). ED visits exceeded the expected number in one major hospital (peer group B) and in four district hospitals (peer group C).

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p. Hospitals have been anonymised since the data are over five years old.

Figure 23 Respiratory cancer ED visits within 28 days of discharge from hospital at a glance

Among people diagnosed with respiratory cancer, there were 7,468 admissions to public hospitals with the principal diagnosis of respiratory cancer[q]

In the year following diagnosis there were...	• 6,211 (83%) overnight admissions
	• 1,257 (17%) day only admissions
	• 1,661 (22%) for surgical procedures
	• 5,783 (77%) for non-surgical procedures
The stage at diagnosis	• 1,925 (26%) had localised stage
	• 1,623 (22%) had regional stage
	• 3,008 (40%) had distant stage
	• 912 (12%) had an unknown stage

There were 6,483 admission records included in the calculation of RSURs[r]

Calculating the RSUR	• 1,785 presented to an ED within 28 days of discharge from hospital
	• This corresponds to an unadjusted ED presentation rate of 27.5 per 100 patients

Figure 24 Respiratory cancer risk-standardised utilisation (RSURs), ED visits within 28 days of discharge from hospital, NSW public hospitals, adults diagnosed with respiratory cancer, 2006–2009[s]
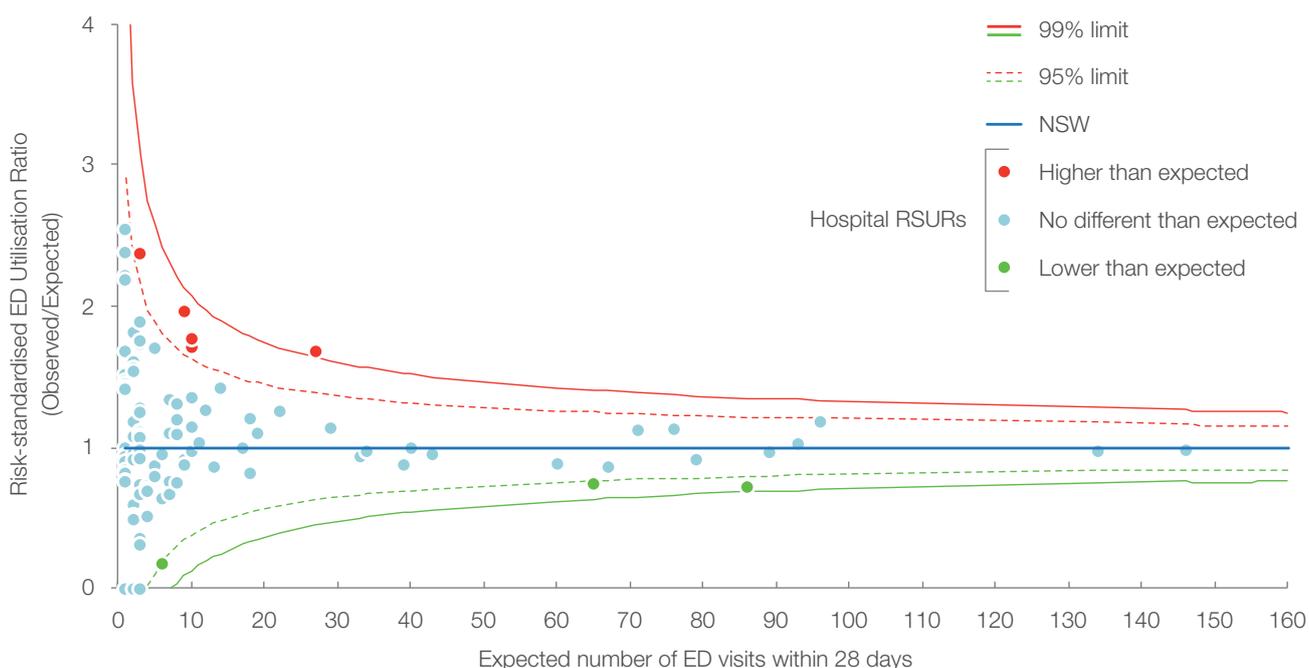
q. See *Spotlight on Measurement: Emergency department utilisation by people with cancer, NSW public hospitals, Cohort diagnosed 2006–2009*, Appendix 6 for exclusions.

r. Records with an unknown stage at diagnosis or with fewer than 28 days of follow up information were excluded from the calculation of RSURs.

s. Data for hospitals with an expected number of ED visits of <1 are supressed. See *Spotlight on measurement: Emergency department utilisation by people with cancer*, for details.

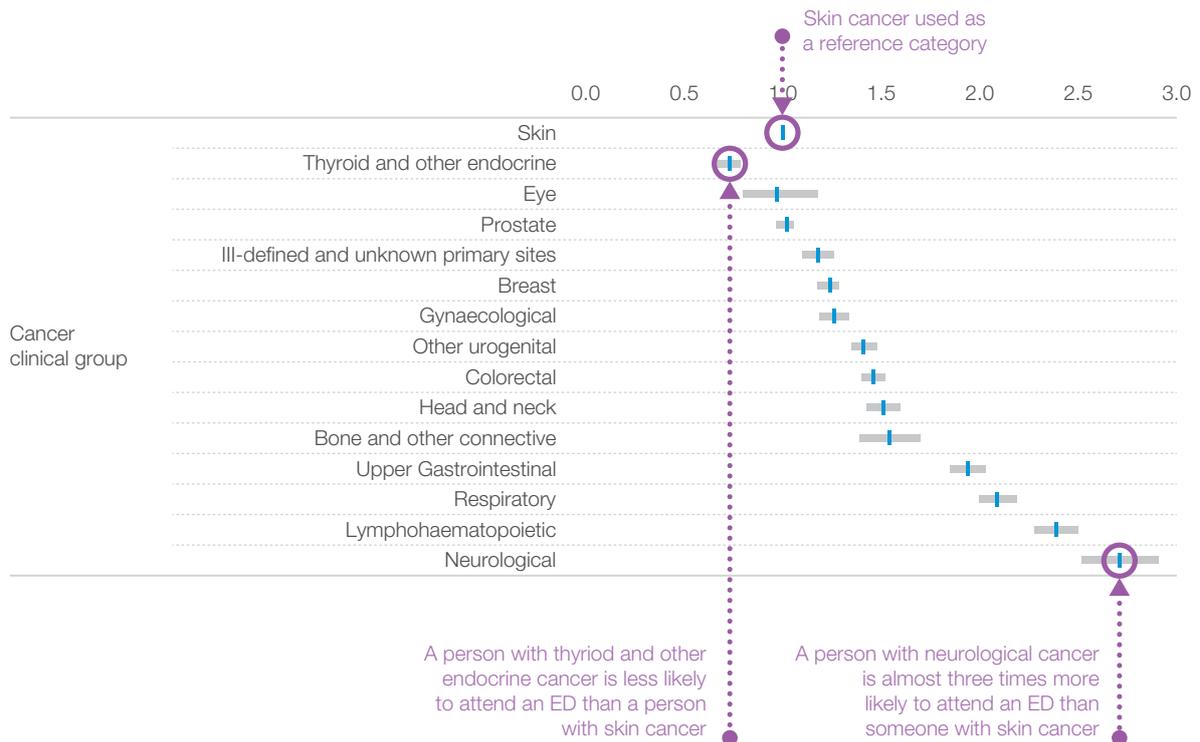# Appendix 1

Clinical groupings

Clinical Group	Report Code	ICD-10
Skin	C00, C43, C46	Lip (ICD-O-3 C00), Melanoma of skin (ICD-O-3 C44 and M872-M879), Kaposi's sarcoma (M914)
Head and Neck	C01, C02, C03-C06, C07, C08, C09, C10, C11, C14, C12, C13, C30, C31, C32	Tongue (ICD-O-3 C01,C02), Mouth (ICD-O-3 C03-C06), Salivary glands (ICD-O-3 C07,C08), Oropharynx (ICD-O-3 C09,C10), Nasopharynx (ICD-O-3 C11), Hypopharynx (ICD-O-3 C12,C13), Other oral cavity & pharynx (ICD-O-3 C14), Nose, sinuses, etc (ICD-O-3 C30, C31), Larynx (ICD-O-3 C32)
Upper Gastrointestinal	C15, C16, C17, C22,C23, C24, C25	Oesophagus (ICD-O-3 C15) , Stomach (ICD-O-3 C16), Small intestine (ICD-O-3 C17), Liver (ICD-O-3 C22), Gallbladder (ICD-O-3 C23,C24), Pancreas (ICD-O-3 C25)
Colorectal	C18, C19, C20, C21	Colon (ICD-O-3 C18), Rectum, rectosigmoid, anus (ICD-O-3 C19-C21)
Respiratory	C33,34,C37, C38, C45	Lung (ICD-O-3 C33, C34), Other thoracic organs (ICD-O-3 C37,C38), Mesothelioma (M905)
Bone and other connective tissue	C40, C41, C47, C49	Bone (ICD-O-3 C40,C41), Connective tissue, peripheral nerves (ICD-O-3 C47,C49)
Breast	C50	Breast (ICD-O-3 C50)
Prostate	C61	Prostate(ICD-O-3 C61)
Other urogenital	C60, C62, C63, C64, C66, C67, C68	Testis (ICD-O-3 C62), Other male genital organs (ICD-O-3 C60,C63), Kidney (ICD-O-3 C64-C66,C68) ,Bladder (ICD-O-3C67)
Gynecological	C53, C54, C55, C56, C57, C58, C59	Cervix (ICD-O-3 C53), Uterus, Body & NOS (ICD-O-3 C54,C55), Ovary (ICD-O-3 C56,C57.0-7), Placenta (ICD-O-3 C58), Other female genital organs (ICD-O-3 C51,C52,C57.8-9)
Eye	C69	(ICD-O-3 C69)
Neurological	C70, C71, C72	Brain (ICD-O-3 C71), C72 Central nervous system (ICD-O-3 C70,C72)
Thyroid and other endocrine	C73, C74, C75	Thyroid (ICD-O-3 C73), Other endocrine glands (ICD-O-3 C74,C75)
Lymphohaematopoietic	C81, C82, C88, C90, C91, C92, C95, M95, M96	Hodgkin's disease (M965-M966), Non-Hodgkin's lymphoma (M959,M967-M972,M974), Multiple myeloma (M973,M976), Acute lymphoblastic leukaemia (M9821), Other lymphoid leukaemias (M9820,M9822-M9827,M994), Acute myeloid leukaemia (M9861), Other myeloid leukaemia (M9860,M9862-8,M987-M988,M9930,M9987), Other specified leukaemias (M984,M985,M989-M993), Unspecifi ed leukaemias (M980), Myeloproliferative disorders, Myelodysplasia (M998)
Ill-defined and unknown primary sites	C26, C39, C48, C76, C80	Other and ill defined digestive organs (ICD-O-3 C26), Other and ill defined respiratory (ICD-O-3 C39), Retroperitoneum and peritoneum (ICD-O-3 C48), Other and ill defined sites (ICD-O-3 C76), Unknown primary site (ICD-O-3 C80)

Appendix 2

How to interpret subhazard ratios

A Fine and Gray competing risks hazard model was used to examine the relationship between the risk of ED attendance and various patient characteristics, expressed as a subhazard ratio.[15] Variables with subhazard ratio estimates larger than 1.0 mean that these variables increased the risk of ED attendance, taking into account the competing risk of death. Variables with subhazard ratio estimates less than 1.0 mean that these variables decreased the risk of ED attendance.

For example, the subhazard ratio for the neurological clinical group in the model was 2.71. This ratio indicates that the risk of attending an ED for a person with neurological cancer are almost three times as high as for someone with skin cancer. The subhazard ratio of 0.73 for the thyroid and other endocrine clinical group in the model indicates that a person with thyroid and other endocrine cancer have 27% (1–0.73) lower risk of attending an ED than a person with skin cancer.

Skin cancer used as a reference category

| | 0.0 | 0.5 | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 |

Cancer clinical group: Skin, Thyroid and other endocrine, Eye, Prostate, Ill-defined and unknown primary sites, Breast, Gynaecological, Other urogenital, Colorectal, Head and neck, Bone and other connective, Upper Gastrointestinal, Respiratory, Lymphohaematopoietic, Neurological

A person with thyriod and other endocrine cancer is less likely to attend an ED than a person with skin cancer

A person with neurological cancer is almost three times more likely to attend an ED than someone with skin cancer

Appendix 3

How to interpret funnel plots

Emergency ED visits are influenced by a wide range of factors that interact in complex ways, meaning there will always be some level of variation in patient outcomes.

The 'funnel' shape that gives the funnel plot its name indicates the tolerance around this variability. Hospitals with fewer patients (those with lower expected number of ED visits, and appearing towards the left hand side of the plot) will inevitably display greater variability and fair judgements about performance should take this into account. Therefore the funnel's 95% and 99% limits are wider for hospitals with fewer patients (see example below).

Some hospitals, particularly those with relatively small numbers of patients with a condition may have high or low ratios simply by chance. Therefore funnel plots have been used to identify those hospitals that individually have a low probability of being high or low simply by chance.

Hospitals above the 95% limits of the funnel are considered to have higher than expected emergency ED visits; those below the 95% control limits are considered to have lower than expected emergency ED visits.

For hospitals outside 99% limits, there is greater confidence about their outlier status.

Risk-standardised ED utilisation ratio (Observed / Expected)

- 99% limit
- 95% limit
- NSW
- Higher than expected
- No different than expected
- Lower than expected

Hospital RSURs

Hospital with higher than expected RSUR (between 95% and 99% control limits)

Hospital with RSUR no different than expected (inside the funnel)

Hospital with higher than expected RSUR (outside 99% control limits)

NSW ED visit rate, scaled to equal 1.0

Hospital with lower than expected RSUR (between 95% and 99% control limits)

Greater tolerance of variation for hospitals with fewer patients

Expected number of ED visits within 28 days

Reflects the number of patients admitted to the hospital

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References

1. Tracey E, Kerr T, Dobrovic A, Currow D. Cancer In NSW: Incidence and Mortality Report 2008. Sydney: Cancer Institute NSW, August 2010.

2. Ferlay J, Soerjomataram I, Ervik M et al. GLOBOCAN 2012 v1.0, Cancer Incidence and Mortality Worldwide: IARC CancerBase No. 11 [Internet]. 2013 [cited 2014 Oct 22]. Available from: http://globocan.iarc.fr

3. Australian Institute of Health and Welfare. Australian Cancer Incidence and Mortality (ACIM) books – All Cancers combined for Australia (ICD10 C00-C97, D45-46, D47.1, D47.3) [Internet]. 2014 [cited 2014 Oct 20]. Available from: http://www.aihw.gov.au/acim-books/

4. Currow D, Thomson W. Cancer in NSW: Incidence Report 2009. Sydney: Cancer Institute NSW, 2014.

5. Stewart BW and Wild CP. World cancer report 2014. IARC Press, International Agency for Research on Cancer [Internet]. 2014 [cited 2014 Oct 22]. Available from: http://www.iarc.fr/en/publications/books/wcr/index.php

6. World Health Organisation. The top 10 causes of death [Internet]. 2014 [cited 2014 Oct 22]. Available from: http://www.who.int/mediacentre/factsheets/fs310/en/

7. Australian Bureau of Statistics. Causes of Death, Australia, 2008. Cat. No. 3303.0 [Internet]. 2010 [cited 2014 Oct 22]. Available from: http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/3303.02008?OpenDocument

8. Australian Institute of Health and Welfare & Australasian Association of Cancer Registries. Cancer in Australia: an overview, 2012. Cancer Series no. 74. Cat. no. CAN 70. Canberra: Australian Institute of Health and Welfare, 2012.

9. Cancer Institute NSW. Cancer in NSW Aboriginal peoples: incidence, mortality and survival. Sydney: Cancer Institute NSW, 2012.

10. Tracey EA, Roder DM & Currow DC. What factors affect the odds of NSW cancer patients presenting with localised as opposed to more advanced cancer? Cancer Causes & Control. 2012; 23(2): 255-262.

11. Krumholz HM, Lin Z, Keenan PS, Chen J, Ross JS, Drye EE, Bernheim SM, Wang Y, Bradley EH, Han LF, Normand SL. Relationship between hospital readmission and mortality rates for patients hospitalized with acute myocardial infarction, heart failure, or pneumonia. JAMA. 2013 Feb 13;309(6):587–93

12. Bernheim SM, Grady JN, Lin Z, Wang Y, Wang Y, Savage SV, Bhat KR, Ross JS, Desai MM, Merrill AR, Han LF, Rapp MT, Drye EE, Normand SL, Krumholz HM. National patterns of risk-standardized mortality and readmission for acute myocardial infarction and heart failure. Update on publicly reported outcomes measures based on the 2010 release. Circ Cardiovasc Qual Outcomes. 2010 Sep;3(5):459–67.

13. Krumholz HM, Wang Y, Chen J, Drye EE, Spertus JA, Ross JS, Curtis JP, Nallamothu BK, Lichtman JH, Havranek EP, Masoudi FA, Radford MJ, Han LF, Rapp MT, Straube BM, Normand SL. Reduction in acute myocardial infarction mortality in the United States: risk-standardized mortality rates from 1995-2006. JAMA. 2009 Aug 19;302(7):767–73.

14. Bureau of Health Information. Healthcare in Focus 2013: How well does NSW measure up? April 2014. Sydney (NSW); BHI; 2014.

15. Elliss-Brookes L, McPhail S, Ives A, Greenslade M, Shelton J, Hiom S, et al. Routes to diagnosis for cancer – determining the patient journey using multiple routine data sets. British Journal of Cancer. 2012;107:1220–6. Epub September 2012.

16. Fine, J. and R. Gray. 1999. A proportional hazards model for the subdistribution of a competing risk. Journal of the American Statistical Association. 94: 496–509.

17. Bureau of Health Information. Spotlight on Measurement: Emergency department utilisation by people with cancer, NSW public hospitals, Cohort diagnosed 2006-2009. Sydney: BHI, 2014.

18. Barbera L, Taylor C, Dudgeon D. Why do patients with cancer visit the emergency department near the end of life? CMAJ. 2010;182:563–8

Acknowledgements

About the Bureau of Health Information

The Bureau of Health Information (BHI) is a board-governed organisation that provides independent reports 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 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 also manages the NSW Patient Survey Program, gathering information from patients about their experiences in public hospitals and healthcare facilities.

www.bhi.nsw.gov.au

About the Cancer Institute NSW

The Cancer Institute NSW is Australia's first statewide cancer control agency, established under the Cancer Institute NSW (2003) Act to lessen the impact of cancer in NSW.

The Institute supports and promotes best practice; working to ensure people across the state, no matter where they live, are provided the same high quality treatment and care that is vital to optimising the outcomes and quality of life for people diagnosed with cancer.

Driven by the purpose and objectives of the NSW Cancer Plan 2011–15, the Institute continuously works to:

- reduce the incidence of cancer

- increase the survival rate for people with cancer

- improve the quality of life of people living with cancer

- provide a source of expertise on cancer control for the government, health service providers, medical researchers and the general community.

In order to achieve this, the Institute engages with the community, health professionals, researchers, governments and charity organisations to:

- provide information, resources and advice about preventing cancer

- promote the importance of early detection through cancer screening programs

- provide grants that build research capacity and foster innovation in, and translation of, cancer research

- maintain quality information repositories about cancer in NSW to inform future policy and health planning

- establish partnerships with cancer healthcare professionals to develop and evaluate programs to improve the quality of cancer treatment and care in NSW.

www.cancerinstitute.org.au