

CEC eChartbook Portal Extract

SEPSIS KILLS

Recognise • Resuscitate • Refer



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SEPSIS KILLS PROGRAM

Recognise • Resuscitate • Refer

Why is this important? Sepsis is the primary cause of death from infection and is a medical emergency and its recognition mandates urgent attention. Sepsis arises when the body's response to infection injures its own tissues and organs [1]. It can develop in any patient and in any clinical setting. Severe sepsis is sepsis plus organ dysfunction, including hypotension and/or hypoperfusion of the organs. Septic shock occurs when there is severe sepsis and hypotension that is unresponsive to intravenous fluid resuscitation. It can lead to multi-organ failure and death. There is an increase in mortality as the patient moves along the sepsis continuum.

Appropriate recognition and timely management of patients with severe infection and sepsis is a significant problem in NSW hospitals and health care organisations around the world. Severe sepsis and septic shock are associated with high morbidity and mortality of around 25 percent [1] and have significant impact on the patient and the health care system. The mortality rate for patients with septic shock has been shown to increase by 7.6 percent for every hour of delay in starting antibiotic therapy [2].

Sepsis has been identified by the NSW Clinical Risk Review Committee as a recurrent problem. The findings from the Clinical Excellence Commission (CEC) Clinical Focus Report on the Recognition and Management of Sepsis [3] demonstrated significant deficits in its identification and management, in a range of clinical settings. Preliminary NSW sepsis data suggests that 30 percent of adult inpatients who need a Rapid Response are septic.

The CEC's SEPSIS KILLS Economic Analysis [4] estimated that "if the status quo was to be maintained over the following ten years, sepsis-related conditions in the NSW health system would constitute a cost of \$3.7 billion, 1.3 million bed days, 701,000 cost-weighted separations and an unknown number of potentially avoidable deaths."

The *SEPSIS KILLS* program was developed by the CEC, in collaboration with clinicians, to improve recognition and treatment of sepsis and septic shock and

to reduce their impact on mortality and financial costs in NSW. It was introduced into NSW public hospitals in a phased approach, starting with emergency departments in 2011, paediatrics in 2013 and extending to inpatient wards in 2014.

Links between the CEC's programs - *Between the Flags, Falls Prevention, In Safe Hands, Partnering with Patients, Antimicrobial Stewardship, Healthcare Associated Infections*, and the Agency for Clinical Innovation's *Delirium* program [5] have been strongly established, ensuring an integrated and comprehensive approach in the management of patients with sepsis.

Findings: The Clinical Excellence Commission's Sepsis Data Collection provides a tool to collect and analyse data, to facilitate improvement in the recognition and management of sepsis in the NSW health system. It is a web-based application, via the NSW Health intranet system. Data entry allows facilities and local health districts/networks to evaluate the impact and effectiveness of the change in the clinical management of sepsis patients.

Data has been entered by facilities since the introduction of the CEC SEPSIS KILLS program in May 2011. The database collects a minimum dataset, including: date of birth; triage time and date; triage category; observations (including systolic blood pressure); lactate, administration time and date of first intravenous antibiotic; the presumptive source of sepsis; and, the disposition of patients following emergency department treatment.

A total of 44,097 records, with triage dates from 1 August 2009 to 31 December 2018, were entered into the database. This data was submitted by 137 facilities across 17 local health districts/specialty networks (LHDs/SNs). The sepsis records comprises data from; Principle referral hospitals (33.6 percent), Paediatric specialty (0.2 percent), Referral (1.3 percent), Major hospitals (29.9 percent), District hospitals (30.7 percent), Community (2.7 percent), Psychiatry, Multi-purpose, Rehabilitation and Sub-acute (1.4 percent combined).

Of the total records, 42,175 relate to adult patients aged 16 years and over and were included in the analysis. Of this, 39,716 records (94.2 percent) belong to patients who presented at emergency departments and 2,459 to patients admitted to wards.

Patients with sepsis ranged from 16 to 112 years old, with 62.8 percent being aged 65 years or older. Emergency Department (ED) patients were triaged to all categories, with 3.1 percent Category 1 (n=1,245, immediately life-threatening), 64.0 percent Category 2 (n=25,416, imminently life-threatening) and 28.3 percent Category 3 (n=11,256, potentially life-threatening).

The time to administration of the first intravenous antibiotic, is measured from triage or sepsis recognition and the goal is for antibiotics administration to be commenced within 60 minutes of sepsis identification. In 2016 this goal was revised in consultation with infectious disease expert clinicians to 120 minutes for patients with sepsis and 60 minutes for patients with severe sepsis or septic shock.

As the data are highly skewed due to outliers, the median time to antibiotic was used instead of the mean as the measure of central tendency. In summary, the state's median time has steadily decreased from an average of 104.0 minutes in 2009-11 (pre-pathway) to 59.0 minutes in 2018 (Chart SK01). In 2018, around 4 in 5 patients (80.4 percent) were administered an IV antibiotic within 2 hours, an increase from 56.6 percent in 2009-11 (Chart SK04).

Administration of intravenous fluid resuscitation following sepsis recognition has continued to be difficult to measure. As a process measure the time to the second litre of intravenous fluids is no longer collected and is therefore not reported here.

Analysis of the data is focussed on defining the outcome for patients with sepsis, depending upon their triage category, systolic blood pressure, lactate measurement, time to antibiotics and presumptive source of sepsis.

Implications: Over eight years of the *SEPSIS KILLS* program, the data demonstrates a significant and sustained improvement in its management and recognition. There are improvements in the time to intravenous antibiotic administration per facility, over a period of time. A key preliminary finding is

that triage category is a significant determinant of the time to intravenous antibiotic administration (see Charts SK02 and SK03).

NSW LHDs/SHNs and facilities are encouraged to analyse their sepsis data and chart their results, to demonstrate progress and identify opportunities for further improvement.

While efforts continue to make improvement in emergency departments, the focus is now on inpatient wards. The inpatient pathway and other tools were launched in May 2014. An important aspect is the sepsis 48-hour management plan, to ensure that the patient is closely monitored, test results and antibiotics are reviewed in appropriate timeframes and the management plan is adjusted as necessary.

Since the start of the program, there has been a significant improvement in sepsis recognition and management state wide. A number of issues have been raised for patients in wards, which include management of the deteriorating patient and antimicrobial stewardship.

What we don't know: LHDs/SHNs did not receive additional resources for data collection. Facilities have, however, entered 44,097 records in eight years (2011-19). Due to limited data management resources in the LHDs/SHNs, a guideline for periodic audit was developed and disseminated in early 2014. It remains unknown what impact periodic audit may have on the statistical significance of the data. Matching of data has occurred with the state wide dataset (HIE) to December 2013 and analysis was discussed in a 2016 MJA article <https://www.mja.com.au/journal/2016/204/2/sepsis-kills-early-intervention-saves-lives> [6]. It is anticipated that this process will be repeated for the 2009-19 data.

Investigation into delays in administration of antibiotics has not been undertaken by the CEC. Facilities and LHDs/SHNs are encouraged to review this data locally.

References:

[1] The Australasian Resuscitation in Sepsis Evaluation (ARISE) Investigators and the Australian and New Zealand Intensive Care Society (ANZICS) Adult Patient Database (APD) Management Committee. The outcome of patients

with sepsis and septic shock presenting to emergency departments in Australia and New Zealand. *Critical Care and Resuscitation*. 2007 Mar;9(1): 8-18.

[2] Kumar A, Roberts D, Wood KE, Light B, Parrillo JE, Sharma S, Suppes R, Feinstein D, Zanotti S, Taiberg L, Gurka D, , Cheang M. Duration of hypotension before initiation of effective antimicrobial therapy is the critical determinant of survival in human septic shock. *Critical Care Medicine*. 2006 Jun; 34(6): 1589-96.

[3] Clinical Excellence Commission. Clinical Focus Report from review of root cause analysis (RCA) and/or Incident Information Management System (IIMS) data: Recognition and management of sepsis, December 2009. Sydney: Clinical Excellence Commission.

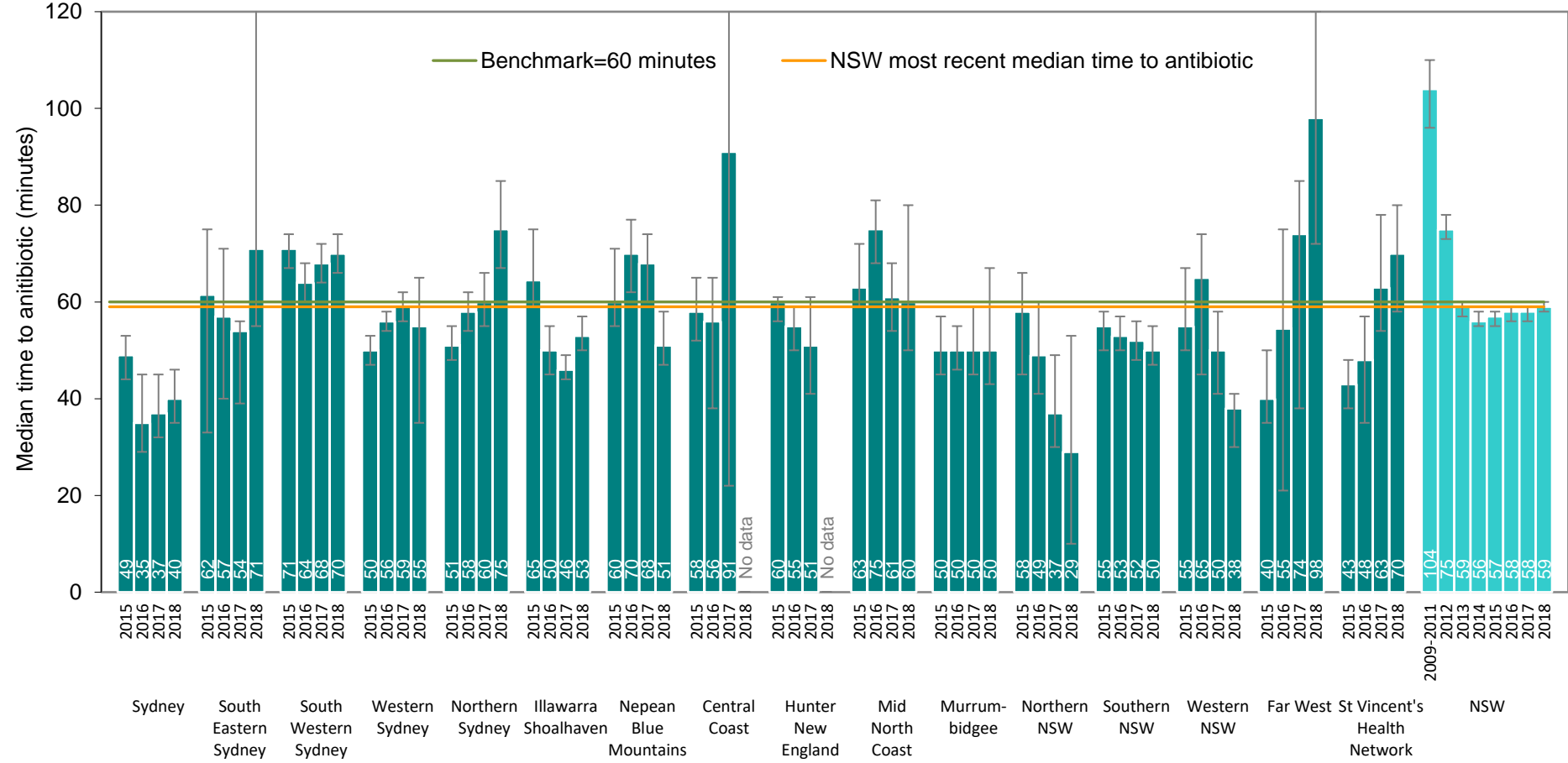
[4] Agency for Clinical Innovation and Clinical Excellence Commission. Cost effective analysis, stage one: do nothing and the case for change. 2011.

[5] Agency for Clinical Innovation, Delirium Brochure.
http://www.aci.health.nsw.gov.au/__data/assets/pdf_file/0004/162643/Delirium-Brochure.pdf

[6] Burrell AR, McLaws M-L, Fullick M, Sullivan RB, Sindhusake D. 'SEPSIS KILLS: early intervention saves lives. *Med J Aust*. 2016 Feb 1;204(2):73.

Chart SK01 – Median time to first antibiotic by year and LHD/SN

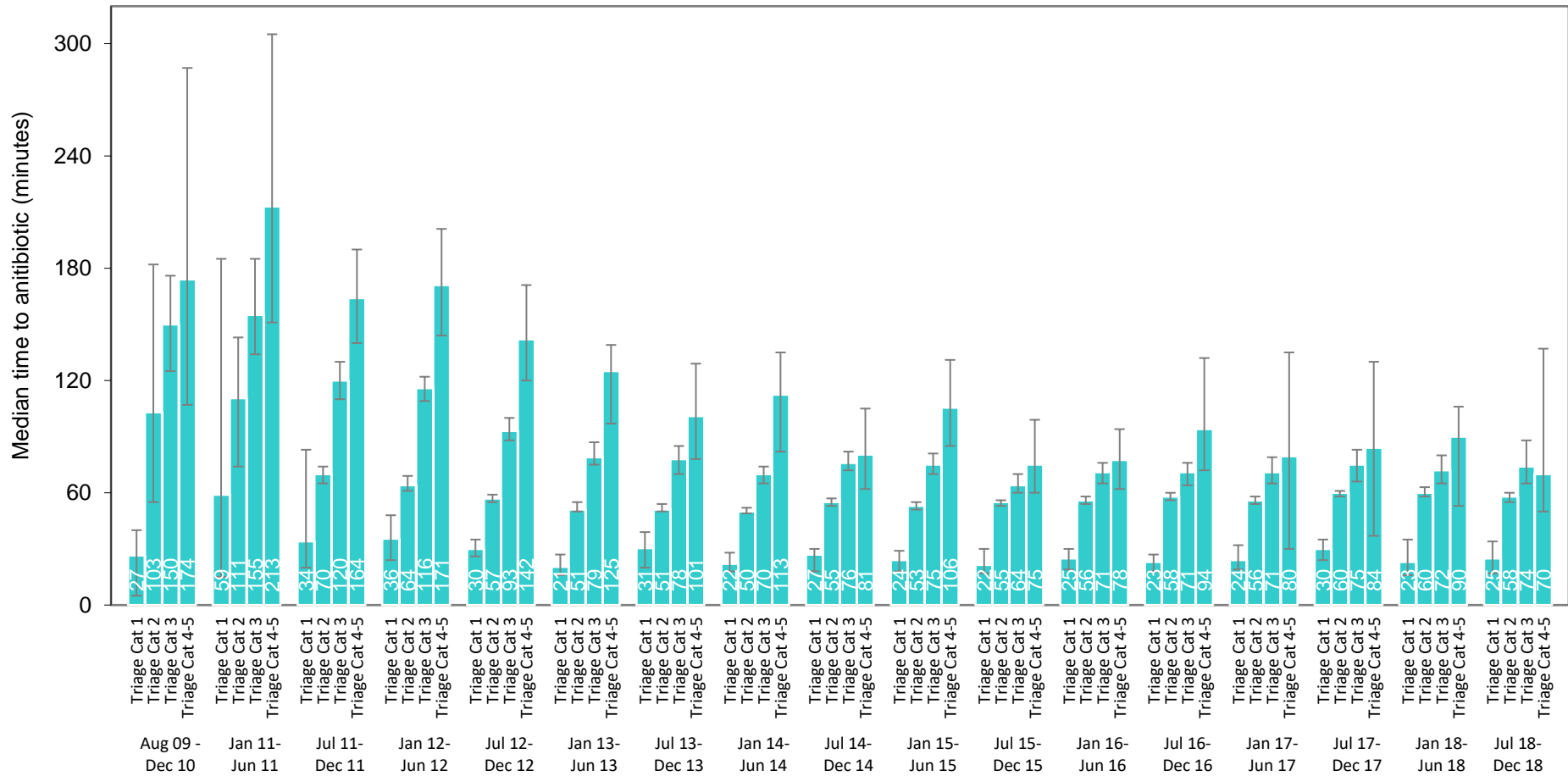
Median time to first antibiotic (patients* aged 16 years and over) by LHD/SN, NSW, 2015 - 2018



Source: SEPSIS KILLS Team, Clinical Excellence Commission. This static chart presents the same data as the default view of dynamic chart. *Public hospitals only. See 'Definitions' for 95% CI calculation.

Chart SK02 – Median time to first antibiotic by time and triage category

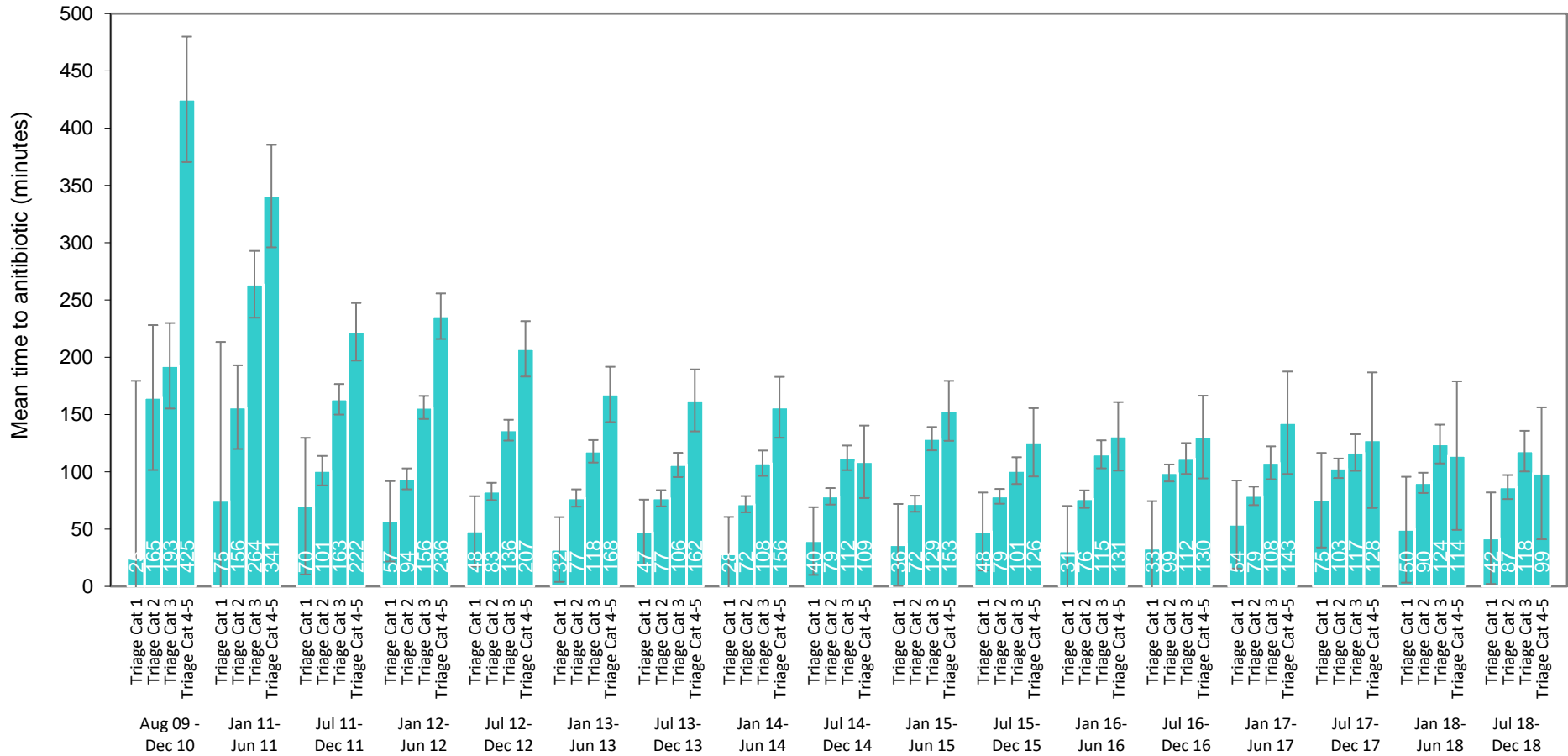
Median time between Triage to first antibiotic (Emergency Department patients*aged 16 years & over) by triage category, NSW, Aug 2009 – Dec 2018



Source: SEPSIS KILLS Team, Clinical Excellence Commission. *Public hospitals only. See 'Definitions' for 95% CI calculation.

Chart SK03 – Mean time to first antibiotic by time and triage category

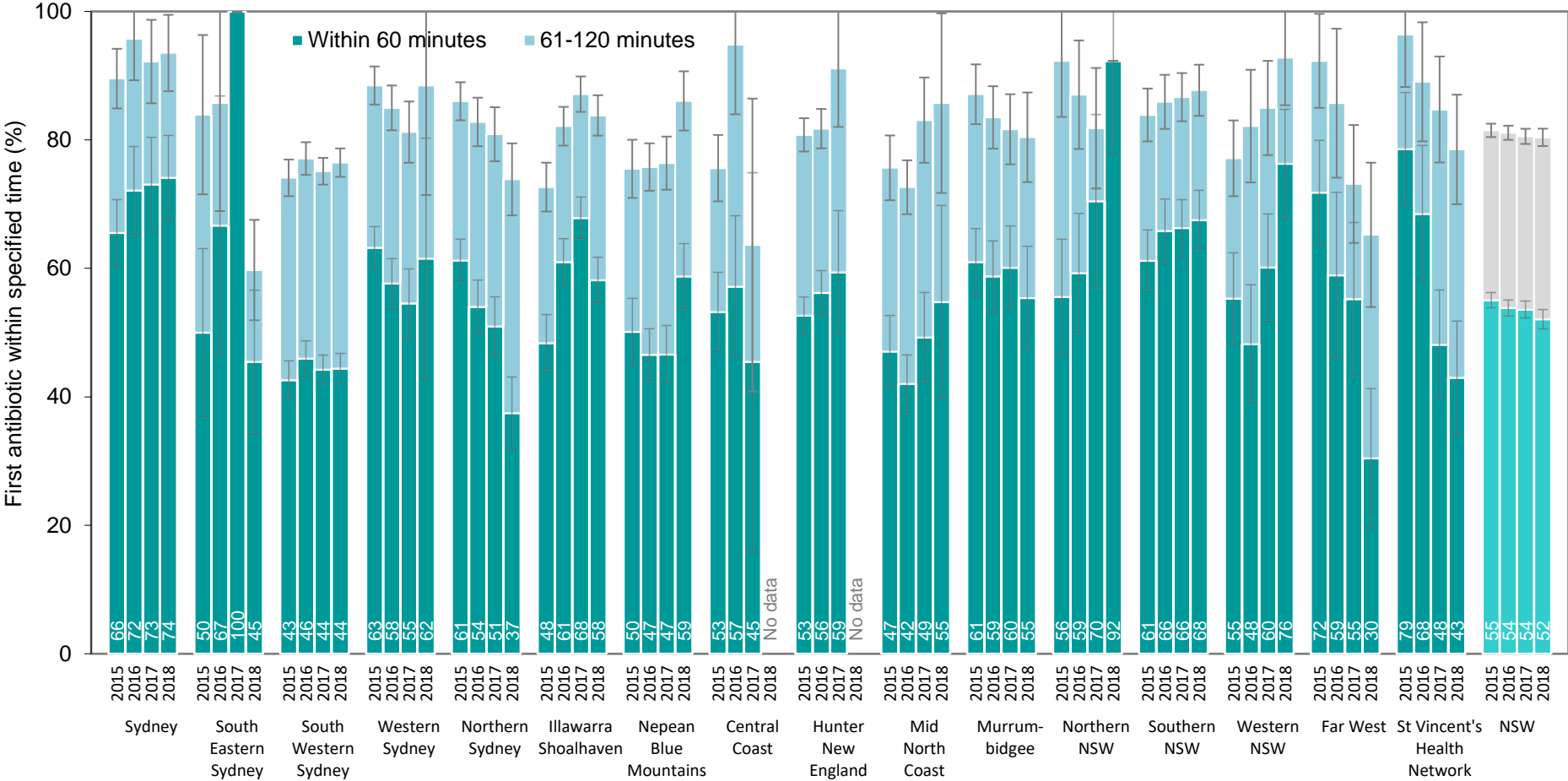
Mean time to first antibiotic (Emergency Department patients* aged 16 years and over) by triage category, NSW, Aug 2009 – Dec 2018



Source: SEPSIS KILLS Team, Clinical Excellence Commission. *Public hospitals only.

Chart SK04 – Antibiotic administered within specified time (%) by year and LHD/SN

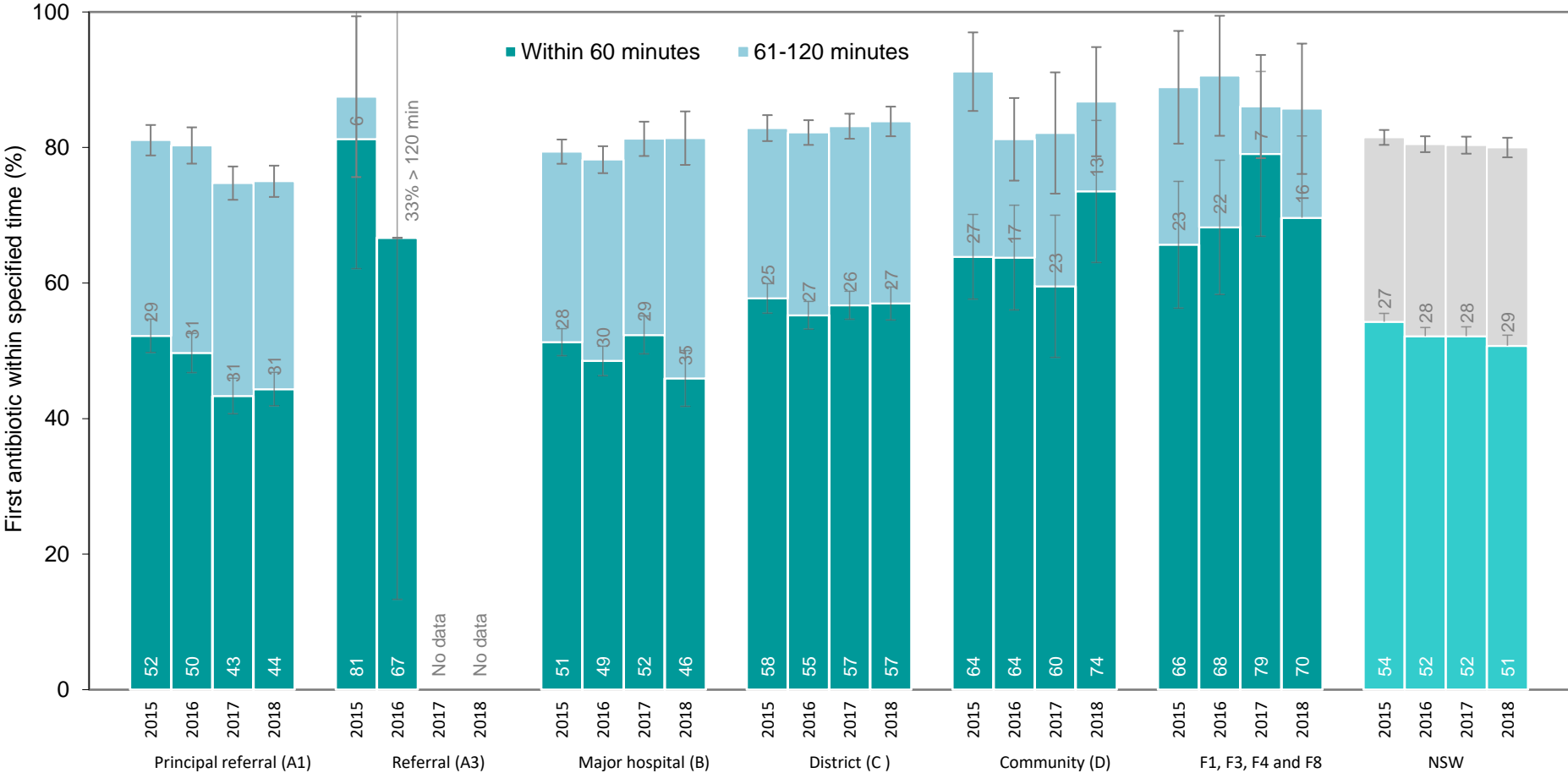
Antibiotic administered within specified time (patients* aged 16 years and over) by LHD/SN, NSW, 2015 - 2018



Source: SEPSIS KILLS Team, Clinical Excellence Commission. *Public hospitals only.

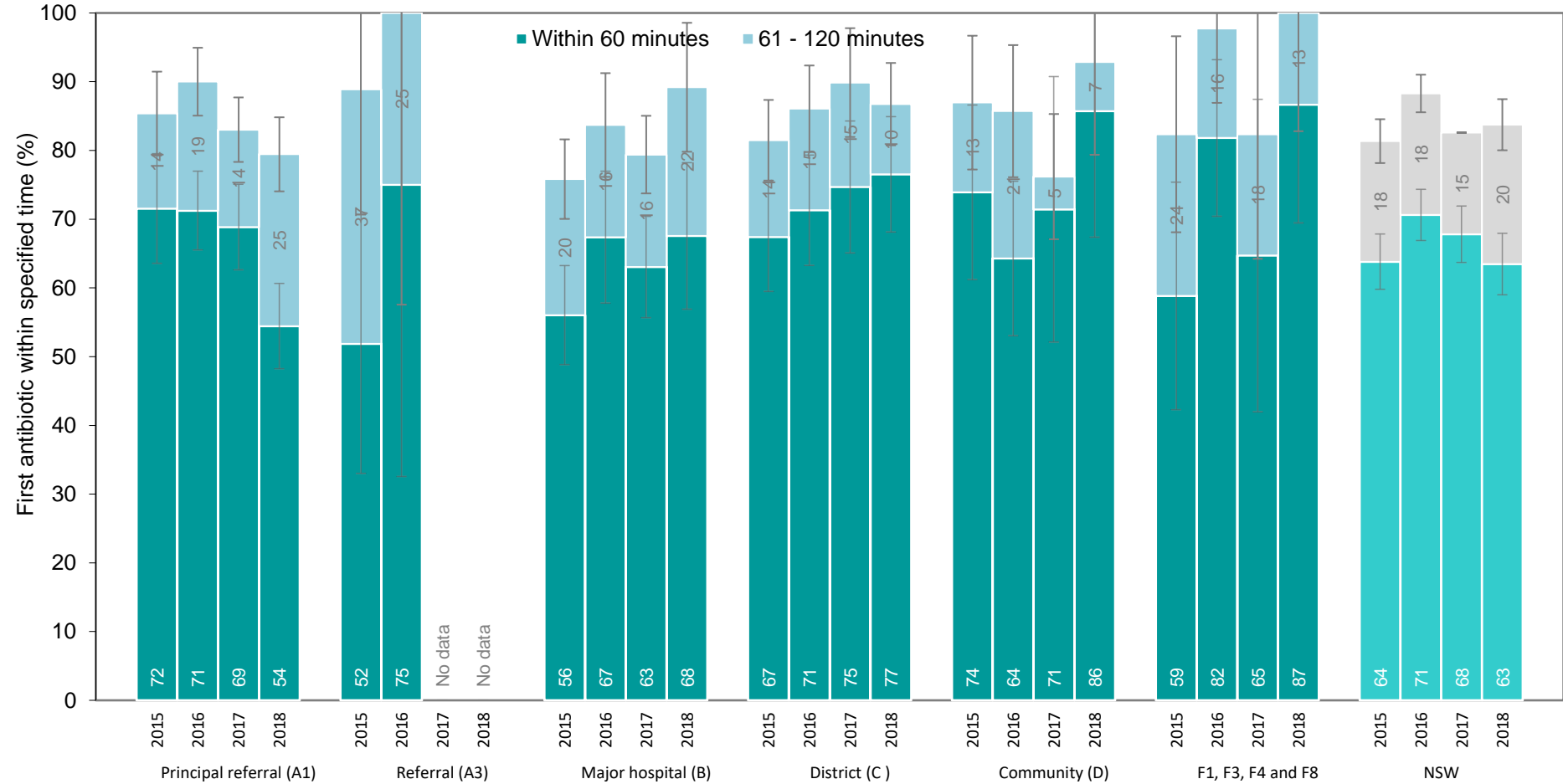
Chart SK05 – Antibiotic administered within specified time (%) by year and Hospital peer group

Antibiotic administered within specified time (Emergency Department patients* aged 16 years & over) by Peer group, 2015 - 2018



Source: SEPSIS KILLS Team, Clinical Excellence Commission. *Public hospitals only.

Chart SK06 – Antibiotic administered within specified time (%) by year and Hospital peer group
 Antibiotic administered within specified time (Ward patients* 16 years and over) by Peer group, NSW, 2015 - 2018



Source: SEPSIS KILLS Team, Clinical Excellence Commission. *Public hospitals only.

Data Definitions

Chart:	SK01
Admin Status:	Current, Dec 2018
Indicator Name:	Median time to first antibiotic by year and LHD/SN
Description:	Median time (minute) to first antibiotic (patients aged 16 years and over who were admitted to NSW public hospitals) by LHD/SN and NSW, 2015 - 2018
Dimension:	Patients safety
Clinical Area:	Initiatives in safety and quality
Data Inclusions:	All patients aged 16 years and over who were admitted to NSW public hospitals between Jan 2015 and Dec 2018, entered into the CEC sepsis database
Data Exclusions:	Paediatric patients and ward inpatients
Numerator:	Median time to first antibiotic by year and LHD/SN
Denominator:	Total number of sepsis patients by year and LHD/SN
Standardisation:	None (median and mean by triage category calculated)
Data Source:	CEC sepsis database
Comments:	The 95% confidence intervals for medians in this chart were calculated using the approach described in "Campbell MJ, Gardner MJ. Calculating confidence intervals for some non-parametric analyses. Stat Med 1988;296:1454-6."

Chart:	SK02
Admin Status:	Current, Dec 2018
Indicator Name:	Median time to first antibiotic by year and triage category
Description:	Median time (minute) to first antibiotic (patients aged 16 years and over who were admitted to Emergency Department in NSW public hospitals) by triage category, NSW, Aug 2009 – Dec 2018
Dimension:	Patients safety
Clinical Area:	Initiatives in safety and quality
Data Inclusions:	Emergency patients aged 16 years and over who were admitted to NSW public hospitals between Aug 2009 and Dec 2018, entered into the CEC sepsis database
Data Exclusions:	Paediatric patients and ward inpatients
Numerator:	Median time to first antibiotic by triage category and time
Denominator:	Total number of sepsis patients by triage category and time
Standardisation:	None (median and mean by triage category calculated)
Data Source:	CEC sepsis database
Comments:	The 95% confidence intervals for medians in this chart were calculated using the approach described in “Campbell MJ, Gardner MJ. Calculating confidence intervals for some non-parametric analyses. Stat Med 1988;296:1454-6.”

Chart:	SK03
Admin Status:	Current, Dec 2018
Indicator Name:	Mean time to first antibiotic by year and triage category
Description:	Mean time (minute) to first antibiotic (patients aged 16 years and over who were admitted to Emergency Department in NSW public hospitals) by triage category, NSW, Aug 2009 – Dec 2018
Dimension:	Patients safety
Clinical Area:	Initiatives in safety and quality
Data Inclusions:	Emergency patients aged 16 years and over who were admitted to NSW public hospitals between Aug 2009 and Dec 2018, entered into the CEC sepsis database
Data Exclusions:	Paediatric patients and ward inpatients
Numerator:	Mean time to first antibiotic by triage category and time
Denominator:	Total number of sepsis patients by triage category and time
Standardisation:	None (median and mean by triage category calculated)
Data Source:	CEC sepsis database
Comments:	In recent years, mean time to first antibiotic may vary from the previously published data on the eChartbook as LHDs/SNs continue to update their data. CEC eChartbook data are current and accurate at the time of publication.

Chart:	SK04
Admin Status:	Current, Dec 2018
Indicator Name:	Antibiotic administered within specified time (%) by year and LHD/SN
Description:	Antibiotic administered within specified time of diagnosis (patients aged 16 years and over who were admitted to NSW public hospitals) by LHD/SN and NSW, 2015 - 2018
Dimension:	Patients safety
Clinical Area:	Initiatives in safety and quality
Data Inclusions:	All patients aged 16 years and over who were admitted to NSW public hospitals between 2015 and 2018, entered into the CEC sepsis database
Data Exclusions:	Paediatric patients and ward inpatients
Numerator:	Number of sepsis patients who receive antibiotic within specified time of diagnosis by LHD/SN
Denominator:	Total number of sepsis patients by LHD/SN
Standardisation:	None
Data Source:	CEC sepsis database
Comments:	None

Chart:	SK05
Admin Status:	Current, Dec 2018
Indicator Name:	Antibiotic administered within specified time (%) by year and Hospital peer group
Description:	Antibiotic administered within specified time of diagnosis (patients aged 16 years and over who were admitted to Emergency Department of NSW public hospitals) by Hospital peer group, 2015 - 2018
Dimension:	Patients safety
Clinical Area:	Initiatives in safety and quality
Data Inclusions:	All patients aged 16 years and over who were admitted to Emergency Department of NSW public hospitals between 2015 and 2018, entered into the CEC sepsis database
Data Exclusions:	Paediatric patients and ward inpatients
Numerator:	Number of sepsis patients who receive antibiotic within specified time of diagnosis by Hospital peer group
Denominator:	Total number of sepsis patients by LHD/SN
Standardisation:	None
Data Source:	CEC sepsis database
Comments:	<p>Chart 5 provides peer group as well as description of peer group. Reference is below.</p> <p>A1 = principal referral hospital. A3 = tertiary referral hospital. B1 – major hospital with between 17 000-35 000 acute weighted separations (AWS) and specialist services. B2 = major hospital with 10 000-35 000 AWS and no specialist services. C1 – district group (4000-10 000 AWS) C2 district group (2000-4000 AWS)</p>

	<p>D1a community with surgery (200-2000) D1b – community without surgery F3 – multipurpose including aged care F4 – subacute care</p> <p>Source: NSW Ministry of Health, Clinical Excellence Commission. Public hospitals only. Note: The peer groups used in the analysis are based on the NSW Peer Hospital Groups 2011/12 definitions.</p>
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Chart:	SK06
Admin Status:	Current, Dec 2018
Indicator Name:	Antibiotic administered within specified time (%) by year and Hospital peer group
Description:	Antibiotic administered within specified time of diagnosis (patients aged 16 years and over who were admitted to Wards of NSW public hospitals) by Hospital peer group, 2015 - 2018
Dimension:	Patients safety
Clinical Area:	Initiatives in safety and quality
Data Inclusions:	All patients aged 16 years and over who were admitted to Wards of NSW public hospitals between 2015 and 2018, entered into the CEC sepsis database
Data Exclusions:	Paediatric patients and ward inpatients
Numerator:	Number of sepsis patients who receive antibiotic within specified time of diagnosis by Hospital peer group
Denominator:	Total number of sepsis patients by LHD/SN
Standardisation:	None
Data Source:	CEC sepsis database
Comments:	<p>Chart 6 provides peer group as well as description of peer group. Reference is below.</p> <p>A1 = principal referral hospital. A3 = tertiary referral hospital. B1 – major hospital with between 17 000-35 000 acute weighted separations (AWS) and specialist services. B2 = major hospital with 10 000-35 000 AWS and no specialist services. C1 – district group (4000-10 000 AWS) C2 district group (2000-4000 AWS)</p>

	<p>D1a community with surgery (200-2000) D1b – community without surgery F3 – multipurpose including aged care F4 – subacute care</p> <p>Source: NSW Ministry of Health, Clinical Excellence Commission. Public hospitals only. Note: The peer groups used in the analysis are based on the NSW Peer Hospital Groups 2011/12 definitions.</p>
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