

# Reduction in national orthopaedic and cardiac surgical site infection rates following sustained improvement in process measures

N Grae, AJ Morris, SA Roberts on behalf of the Health Quality & Safety Commission New Zealand’s infection prevention and control programme. [www.hqsc.govt.nz](http://www.hqsc.govt.nz)

## Introduction

- The Health Quality & Safety Commission’s national Surgical Site Infection Improvement (SSII) programme started collecting data in 2013 with hip and knee arthroplasty and 2016 for cardiac procedures.
- The programme aims to improve the standard of care by measuring compliance with evidence-based interventions known to reduce the risk of surgical site infections (SSI) and to use high-quality data to inform quality improvement (QI) initiatives that improve patient outcomes.
- Most health care in New Zealand is publicly funded and delivered by 20 district health boards (DHBs); all perform orthopaedic and five perform cardiac procedures.
- The quality and safety markers (QSMs) and outcome measure are published quarterly on public-facing online dashboards on the Commission’s website [www.hqsc.govt.nz](http://www.hqsc.govt.nz)
- DHBs have access to additional data such as risk factors.
- The SSII programme provides coordination, communication, quality improvement expertise, clinical leadership and data analysis to stakeholders.



## Methods

- Data was collected for all publicly funded hip and knee arthroplasty and cardiac procedures using a standardised SSI surveillance form.
- The National Healthcare Safety Network (NHSN) definitions were applied.
- A national database (National Monitor) was used for data collection.
- The compliance with process measures (antibiotic prophylaxis and skin preparation) were measured and reported against nationally agreed QSM targets.



## Results

- Orthopaedic surgery:
  - Between July 2013 and December 2018, over 56,000 hip and knee arthroplasty procedures were performed.
  - A significant aggregated improvement in all QSM performance was achieved ( $p < 0.01$ ) (Figure 1).
  - Significant reduction in national orthopaedic median SSI rate from 1.18% to 0.85% (Figure 2).
  - The mean SSI rate for orthopaedic surgery decreased from 1.24 (95% CI 1.14–1.33) to 0.94 (95% CI 0.88–1.00) ( $p = 0.003$ ).
- Cardiac surgery:
  - Between July 2016 and December 2018, over 6,800 adult and paediatric cardiac procedures were performed.
  - The QSM compliance for antibiotic timing, choice and dose and skin preparation was high at the start and has been sustained (Figure 3).
  - Significant reduction in the national cardiac median SSI rate from 4.8% to 3.6% (Figure 4).
  - The mean SSI rate for cardiac surgery significantly decreased from 4.69 (95% CI 4.20–5.20) to 3.62 (95% CI 3.20–4.03) ( $p = 0.04$ ).
- Both orthopaedic and cardiac procedures have seen at least a 25% reduction in the national SSI rate.
- The odds of an SSI occurring in a procedure that received all three programme interventions were 43% lower than one that did not (OR 0.57 95% CI 0.39–0.85) ( $p = 0.005$ ).

**Figure 1:** Process measures for orthopaedic SSI surveillance, July 2013 to December 2018

**Dosing:** the first choice for antimicrobial prophylaxis is  $\geq 2g$  of cefazolin or  $\geq 1.5g$  of cefuroxime (target 95%).

**Timing:** antimicrobial prophylaxis is administered as a single dose 0–60 minutes before knife to skin (target 100%).

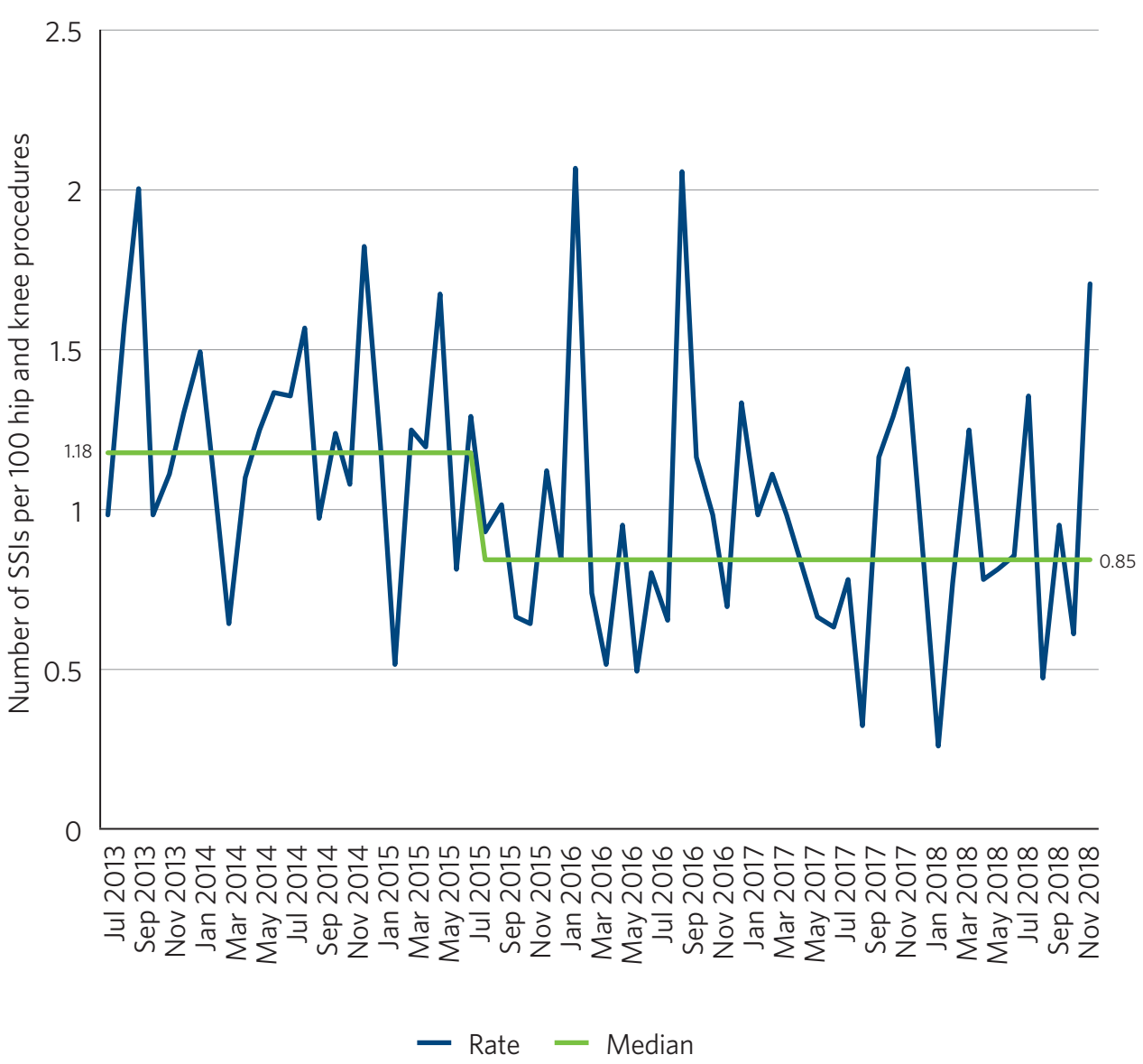
**Postoperative antibiotics:** surgical antimicrobial prophylaxis is discontinued within 24 hours (target 100%).

**Skin preparation:** alcohol-based skin antisepsis is always used (target 100%).

Target achieved (95% for dosing)  
From 95% to the target (90% for dosing)  
Below 95% (90% for dosing)

Quality and safety marker	Q3 2013	Q4 2013	Q1 2014	Q2 2014	Q3 2014	Q4 2014	Q1 2015	Q2 2015	Q3 2015	Q4 2015	Q1 2016	Q2 2016	Q3 2016	Q4 2016	Q1 2017	Q2 2017	Q3 2017	Q4 2017	Q1 2018	Q2 2018	Q3 2018	Q4 2018
Dosing	65	75	83	91	94	95	95	95	96	95	96	96	96	97	97	97	97	97	98	98	98	98
Timing	90	90	93	94	96	95	96	96	97	97	97	98	98	98	97	97	98	98	99	97	98	98
Postoperative antibiotics	60	74	77	75	80	85	92	96	96	95	95	97	97	98	97	97	97	98	97	98	97	98
Skin preparation	74	79	93	97	98	98	99	99	99	100	99	99	99	99	100	100	99	99	100	99	99	99

**Figure 2:** Outcome measure for orthopaedic SSI surveillance, July 2013 to December 2018



**Figure 3:** Process measures for cardiac SSI surveillance, July 2016 to December 2018

**Dosing:** the first choice for antimicrobial prophylaxis is  $\geq 2g$  of cefazolin (target 95%).

**Timing:** antimicrobial prophylaxis is administered as a single dose 0–60 minutes before knife to skin (target 100%).

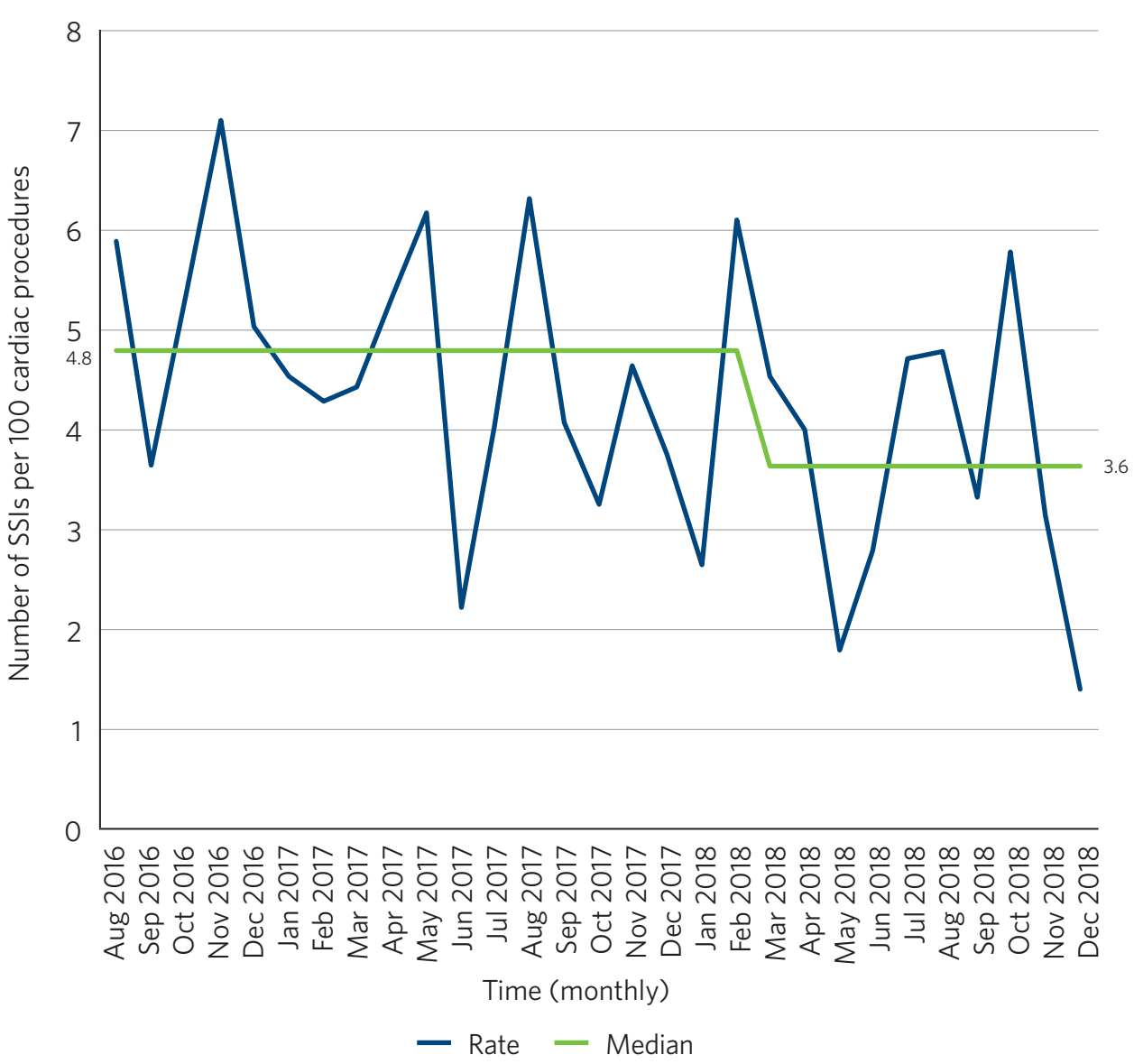
**Postoperative antibiotics:** surgical antimicrobial prophylaxis is discontinued within 48 hours (target 100%).

**Skin preparation:** alcohol-based skin antisepsis is always used (target 100%).

Target achieved (95% for dosing)  
From 95% to the target (90% for dosing)  
Below 95% (90% for dosing)

Quality and safety marker	Q3 2016	Q4 2016	Q1 2017	Q2 2017	Q3 2017	Q4 2017	Q1 2018	Q2 2018	Q3 2018	Q4 2018
Dosing	96	96	98	97	98	98	97	97	97	98
Timing	97	97	98	97	98	98	96	97	96	96
Postoperative antibiotics	87	90	90	89	90	98	93	94	93	96
Skin preparation	100	100	100	100	99	100	99	99	100	100

**Figure 4:** Outcome measure for cardiac SSI surveillance, July 2016 to December 2018



## Conclusions

- This sector-led, national QI programme has resulted in improved quality of care for patients and a decrease in SSI rates.
- Improvement in the compliance with the process measures for orthopaedic procedures is a probable driver of the decreasing SSI rate.
- Compliance with process measures was high from the start of the cardiac surgery programme, however, a reduction in the SSI rate has still occurred.
- There has been a high level of engagement with the programme by surgical services, supported by timely and transparent feedback of process and outcome measures.
- Delivery of the SSII programme has been dependent on strong clinical leadership, an engaged workforce, quality improvement expertise and a measurement and evaluation framework to support change in practice.
- This national QI programme has provided insight into how best to deliver a successful national healthcare associated infection QI programme.