

# Implementation of the Brompton and Harefield Infection Score (BHIS) and PICO<sup>®</sup> Single-Use Negative Pressure Wound Therapy (sNPWT) pathway at the Bristol Heart Institute

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## Introduction

The cost of treating a cardiac surgical site infection (SSI), is among the highest across the surgical specialities, with an approximate range of £13 to £30 million per year across NHS England.<sup>1-3</sup> Sternal SSI is the most common; however SSI of leg vein donor sites also occur for cardiac artery bypass graft (CABG) surgery.<sup>4</sup> This work reports the implementation of a pathway; utilising the BHIS score and single use negative pressure wound therapy device (sNPWT) (PICO, Smith & Nephew); to help reduce SSI in CABG and non-CABG procedures within a major cardiac centre in the United Kingdom.

## Methods

A quality improvement project was carried out; where a baseline cardiac SSI rate was established followed by the introduction of the BHIS and PICO sNPWT pathway, in patients undergoing CABG or Non-CABG procedures. Sternal and leg vein harvest incisions were included in the audit. Figure 1 and 2 illustrates the BHIS score and the PICO<sup>®</sup> sNPWT device. BHIS5 categorises patients as low, medium or high risk, as outlined in figure 1. As per the pathway (figure 3): low risk patients should receive a standard post-op dressing; for medium risk patients the operating surgeon should consider applying a PICO device; for patients categorised as high risk a PICO sNPWT device should be applied. The baseline cardiac SSI rate was compared to the SSI rate post pathway implementation. SSI rates were recorded as diagnosed in hospital and also patient reported during routine 30 day follow up. The costs described in table 1 were used to calculate the cost effectiveness of introducing the BHIS scoring system and sNPWT. The cost of a cardiac SSI was a calculated as a weighted average, based on the cost reported in the Jenks et al (2014) publication and the prevalence of SSI; inpatient/readmission and patient reported; from the baseline and quality improvement audit conducted at the Bristol Heart Institute.

## Results

The baseline SSI audit was conducted from January to March 2017, where data on Non-CABG (n=161) and CABG (n=148) were collected. The baseline SSI rate was 17.6% (n=26) and 3.1% (n=5) for CABG and Non-CABG respectively. The BHIS and PICO<sup>®</sup> pathway was implemented and audited from January to March 2018, where data on Non-CABG (n=153) and CABG (n=148) procedures were collected. The overall SSI rate was 8.8% (n=13) and 5.2% (n=8) for CABG and Non-CABG respectively, during this quality improvement period. Figure 4 represented the SSI rate before and after the quality improvement introduction of BHIS score and sNPWT. There was a 50% reduction in the CABG procedure SSI rate after the implantation of the pathway.

Twenty-five PICO 10cm x 30cm devices were used during the quality improvement period. Patients, who did not receive a PICO device, received a standard dressing (Leukomed<sup>™</sup> T Plus, BSN Medical). The impact of cardiac SSIs, from a cost prospective is reported in table 2. The cost impact calculation clearly indicates that with the implementation of the BHIS risk scoring and PICO sNPWT, not only was there a 50% reduction in CABG procedure SSI, but the resultant saving was £83,271. The cost differences between the baseline audit and the quality improvement audit are illustrated in figure 5.

## Discussion

The implementation of the pathway resulted in a 50% decrease in CABG SSI, however there was an increase in the non-CABG related SSI. A deeper analysis of the audit data showed that not all patients were being risk scored and therefore compliance with the pathway could have affected the overall SSI rates. The approximate cost of utilising the PICO sNPWT device for the audit period was £3,213; when compared to the standard post op dressing is more expensive. However, the 50% reduction in cardiac SSI incidence resulted in an overall saving of approximately £83,271, when compared to the costs of SSI recorded during the baseline audit. This represents a 31% reduction in costs.

The higher cost of PICO sNPWT device is therefore not increasing Trust spend but in fact one of the contributing factors to reducing costs associated with cardiac SSI.

## Conclusion

This work has exhibited the positive impact on the clinical and health economic outcomes when patients are risk assessed with BHIS and receive prophylactic PICO sNPWT for CABG and non-CABG procedures. Further auditing work is required to ensure compliance to the pathway and to ensure all patients undergoing CABG and Non-CABG procedures are risk scored and receive the most appropriate incision management dressing.

## Acknowledgment

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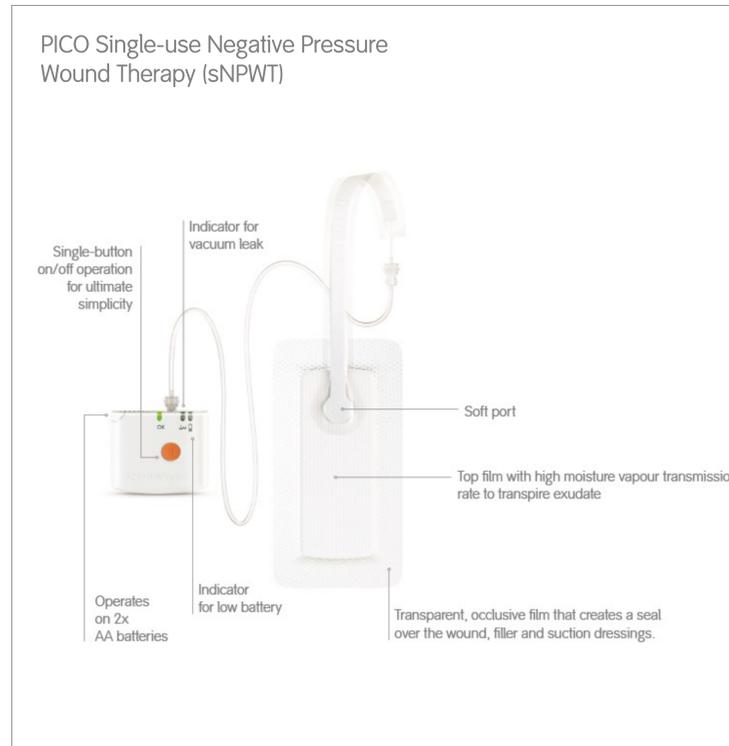


Figure 2 PICO Single-use Negative Pressure Wound Therapy (sNPWT)

Brompton and Harefield infection score (BHIS) SSI predictive score for CABG +/- additional procedures				
	Group	Score	% patients	SSI risk
Diabetic =1 OR HbA1c >7.5% = 3				
BMI ≥35 = 2				
Female = 2				
Emergency = 2				
LVEF <45% = 1				
	Low risk	0-1	66%	2.6%
	Medium risk	2-3	26%	6%
	High risk	≥4	8%	16%

Figure 1 Brompton and Harefield infection score<sup>5</sup>

Treatment/device	Monetary value
Cardiac SSI cost per patient	£8,638
PICO 10cm x 30cm device <sup>6</sup>	£128.50
Leukomed T Plus 10cm x 35cm dressing <sup>6</sup>	£3.13

Table 1 Monetary values used for budget impact calculations

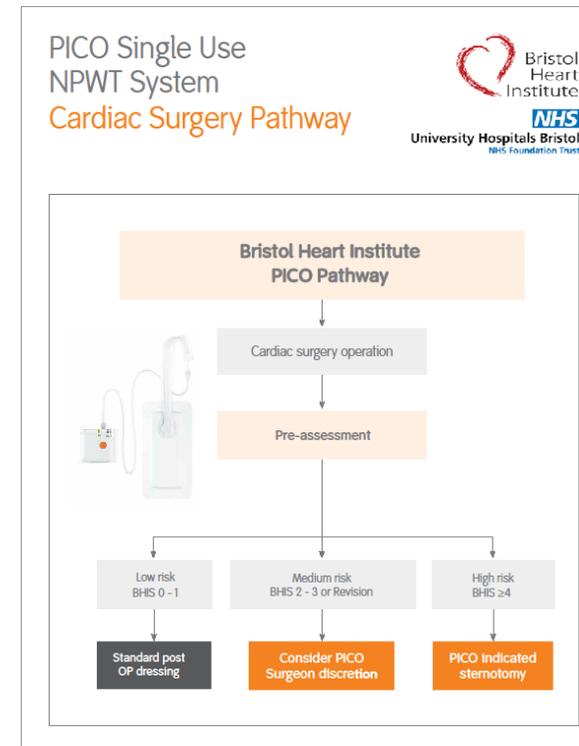


Figure 3 Cardiac incision pathway

Procedure	Baseline audit: Standard dressing (n=31)	Quality improvement Audit: BHIS score and PICO sNPWT (n=21)
CABG	£224,588	£112,294
Non-CABG	£43,190	£69,104
<b>Total SSI cost</b>	<b>£267,778</b>	<b>£181,398</b>
Incision management		
	Baseline audit: Standard dressing (n=309)	Quality improvement audit: BHIS score and PICO sNPWT (n=301)
Leukomed T Plus (10cm x 35cm)	£967	£864
PICO (10x30 cm)		£3,213
<b>Total incision management spend</b>	<b>£967</b>	<b>£4,076</b>
<b>Total cost of cardiac SSI including incision management cost</b>	<b>£268,745</b>	<b>£185,474</b>

Table 2 Cost of cardiac SSI with incision management spend

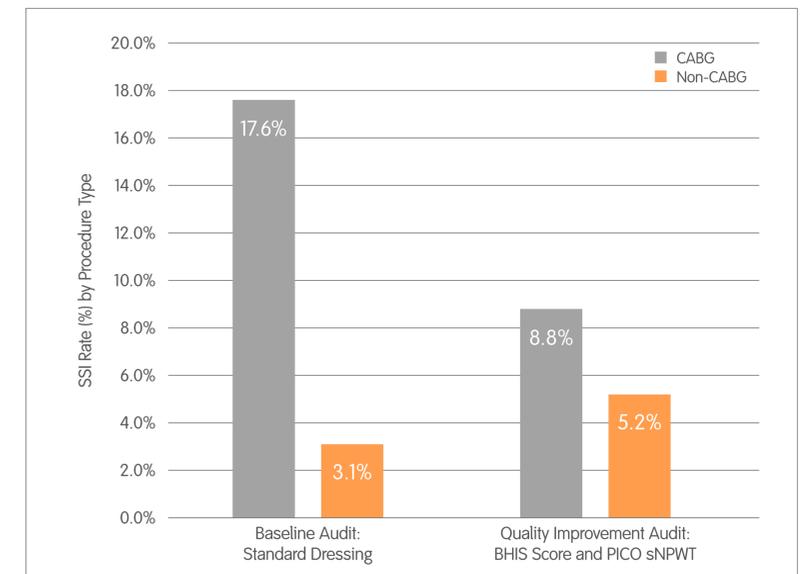


Figure 4 SSI rate by procedure for baseline audit and subsequent quality improvement audit

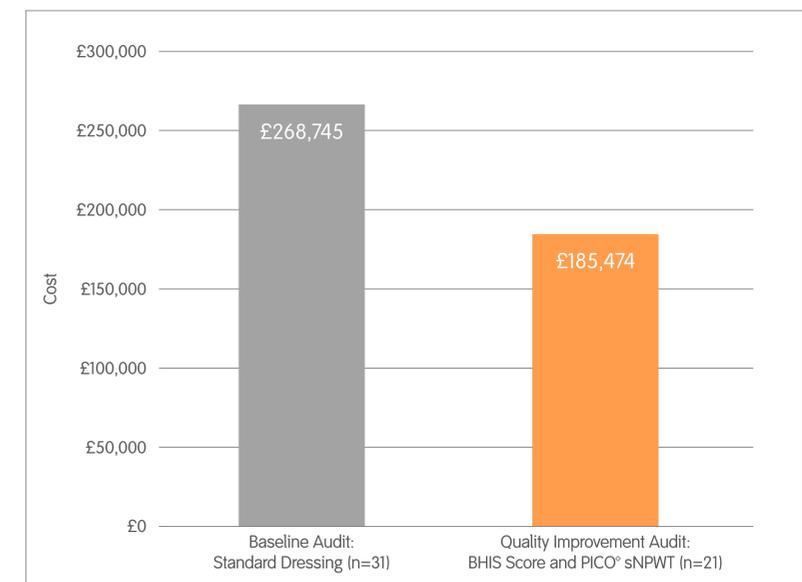


Figure 5 Total cost of cardiac SSI with incision management costs