National Survey of Variations in Practice in the Prevention of Surgical Site Infections in Adult Cardiac Surgery, United Kingdom & Republic of Ireland

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National Survey of Variations in Practice in the Prevention of Surgical Site Infections in Adult Cardiac Surgery, United Kingdom & Republic of Ireland

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SUMMARY

Introduction

Currently no national standards exist for the prevention of surgical site infection (SSI) in cardiac surgery. SSI rates range from 1% to 8% between centres. The aim of this study was to explore and characterise variation in approaches to SSI prevention in United Kingdom (UK) and Republic of Ireland (ROI).

Methods

Cardiac surgery centres were surveyed using electronic web-based questionnaires to identify variation in SSI prevention at the level of both institution and consultant teams. Surveys were developed and undertaken through collaboration between the Cardiothoracic Interdisciplinary Research Network (CIRN), Public Health England (PHE) and the National Cardiac Benchmarking Collaborative (NCBC) to encompass routine pre-, intra- and postoperative practice.

Results

Nineteen of 38 centres who were approached provided data and included responses from 139 consultant teams. There was no missing data from those centres that responded. The results demonstrated substantial variation in over 40 aspects of SSI prevention. These included variation in SSI surveillance, reporting of SSI infection rates to external bodies, utilisation of SSI risk prediction tools, and the use of interventions such as sternal support devices and gentamicin impregnated sponges.

Conclusion

Measured variation in SSI prevention in cardiac centres across the UK and ROI is evidence of clinical uncertainty as to best practice, and has identified areas for quality improvement as well as knowledge gaps to be addressed by future research.

INTRODUCTION

Surgical site infection (SSI) is the most significant healthcare-associated infection affecting surgical patients.[1] In England, the incidence of SSI at 30-days is 8.6% for coronary artery bypass grafting (CABG) and 2.2% for non-CABG operations.[2] SSIs following cardiac surgery can add an additional 2 weeks' stay to a patient's in-hospital care, increase their likely readmission to hospital six-fold, and require extended outpatient follow-up and reoperation.[3, 4] These events have significant resource implications and the costs of treating post-cardiac surgery SSI in the United Kingdom (UK) are estimated to be £15 million per annum.[3]

SSIs are often preventable. It has been estimated that there is a 39% to 55% potential for a significant reduction in rates of SSI through multifaceted interventions.[5] However, the certainty of the evidence to support these interventions is low, as acknowledged by both the 2019 National Institute for Health and Care Excellence (NICE) guidance for SSI prevention, [6] and the Global Guidelines for the Reduction of Surgical Site Infection published by the World Health Organisation.[7] Evidence gaps lead to clinical uncertainty and variations in care. Currently, there are no national standards of care specific to the prevention of cardiac SSIs in UK cardiac centres. We sought to determine if existing uncertainty is reflected by variation in SSI prevention practice occurs across UK and Republic of Ireland (ROI) cardiac surgery centres. These data will provide a benchmark for quality improvement strategies to reduce SSI rates, as well as evidence of equipoise to justify future research.

METHODS

This study was devised and delivered by the Cardiothoracic Interdisciplinary Research Network (CIRN), a research collaborative established by healthcare professionals including surgeons and nurses within the field of cardiothoracic surgery. [8] It provides the key infrastructure for the design and delivery of high-quality patient focused clinical research in people undergoing cardiothoracic surgery. According to the NHS Health Research Authority,

this study is not considered research as defined by the UK Policy Framework for Health and Social Care Research. Therefore, ethical committee approval was not required.

Sample & Setting

The surveys were issued to all 38 cardiac surgery centres in the UK (n = 35) and ROI (n = 3).

Survey Design

Surveys were developed by a Cardiothoracic Interdisciplinary Research Network (CIRN) steering committee. To identify variables of interest, the work drew primarily on four national resources: the National Institute for Health and Care Excellence (NICE) SSI guidance, the Department of Health (DH) High Impact Intervention care bundle to prevent SSI [9], a Cochrane review of measures to reduce SSI following cardiac surgery [10], and a 2017 NCBC survey of organisational SSI surveillance strategies. Each source was methodically reviewed and individual interventions relevant to cardiac surgery were extracted. In addition, current regulatory standards upheld by the Care Quality Commission (CQC) such as Regulation 20: Duty of candour [11] were included where appropriate. The CQC is an independent inspector and regulator of health and social services in England aimed with ensuring fundamental standards of quality and safety are met. Regulation 20: Duty of candour ensures that providers are open and transparent with people who use the service in relation to the care and treatment they receive. After a full list of interventions and standards was compiled, corresponding survey response options were discussed by the CIRN steering committee and amended through regular teleconferences to ensure a standardised closed-question approach with corresponding measures.

In February 2019, the surveys were reviewed by stakeholders at the NCBC annual conference. Following feedback from senior representatives of 22 cardiac centres including 35 cardiac surgeons, anaesthetists, nurses and managers the questionnaires were finalised. Two surveys were developed. The **Trust Survey** compromised 13 questions aimed to capture organisational and policy level data across National Health Service (NHS) or public institutions; commonly referred to as Hospital Trusts in the UK. This term has been used across centres in Scotland and ROI for ease. No private institutions were included. The Team **Survey** aimed to capture routine clinical practice centred around consultant surgeon teams and compromised 72 questions. Both surveys were translated into a bespoke online tool.

The online version (Microsoft Forms, Office 365®) of the surveys were further reviewed and tested by the collaborative team members prior to roll out. The complete list of questions for the two surveys are listed in **Appendices B.1 and B.2.**

Pilot Study

To identify any technical, analytical or comprehension problems both surveys were piloted in May 2019 by 59 surgeons in 9 centres. There was 100% completion within 1-month. Following some minor grammatical changes to the wording all remaining cardiac hospitals in the UK and ROI were invited via the SCTS, CIRN and NCBC to take part.

Survey Distribution & Data Collection

The two surveys were launched in the UK and ROI in May 2019. Links to the online surveys were distributed via email to named recipients. Each centre was provided its own unique code know only to steering committee leads and each consultant was assigned their own unique identifier known only to local leads to ensure both anonymity of centre and consultant. Each participating centre had a lead identified through the CIRN, who had overall responsibility for data collation through consultation with the appropriate teams at their centre – including infection control, SSI surveillance and surgical teams. They were either a junior doctor and/or a nurse or allied health professional (AHP). A single **Trust Survey** was completed for each centre. **Team Surveys** were completed once for each adult cardiac consultant per centre. Reminders were sent via email and text message. For a period of one-month (July 2019) data were entered onto the online survey. A senior member (defined as the Clinical Lead, NCBC representative, Line Manager, or a Senior Consultant) was required to review and authorise each centres data prior to submission via the online survey. The online survey permitted final dataset submission only when all questions had been answered, thereby ensuring completeness.

Data Storage & Governance

All responses were collected and stored on a secure cloud-based server. Patient level data including identifiable information was not collected. This study was conducted in accordance with International Conference for Harmonisation of Good Clinical Practice (ICHGCP) guidelines and the Declaration of Helsinki (World Medical Association 2000) Research Governance Framework for Health and Social Care.

Data analysis

Simple descriptive analyses were performed. Data are presented as a percentage of respondents in a table and in graphical form when deemed appropriate.

RESULTS

Responses

The surveys were distributed to 38 hospitals in UK and ROI. Of these 19 agreed to participate (50% response rate for hospital level data). Surveys were completed by 139 consultant teams working at these hospitals from a potential sample size of 257 (54%). All surveys were completed in full, with no missing data. SSI rates reported at Trust level between January and December 2018 ranged from 1% to 9.9% (median 3.4, IQR 2).

Hospital Trust Survey

Trust level responses to questions on perioperative SSI prevention practices are listed in **Table** I. Centres reported which aspects of the DH/National UK High Impact Intervention bundle (2010/2011) [10] were routinely performed; of these screening for methicillin resistant *S. aureus* (MRSA) colonisation and hair removal with electric clippers were performed by all 19 centres (Table I). Preoperative showering and glucose control for diabetic patients was routinely performed in 18 centres (95%). All but one centre (95%) provided written information to patients on SSI prevention preoperatively and sixteen (84%) provided information postoperatively as well. Four centres (21%) provided SSI video education. Data on Trust SSI surveillance reporting is reported in **Table I and** II. Eighteen centres participated in external SSI monitoring. Twelve (63%) participated in national surveillance schemes run by Public Health England (PHE), Public Health Wales or Health Protection Scotland, eleven (58%) reported deep sternal SSI rates to National Institute for Cardiovascular Outcomes Research (NICOR), and eight (42%) participated in the Getting It Right First Time (GIRFT) SSI audit. SSI case definitions used to these external bodies varied. All centres reported SSI occurring within the primary admission and 18 (95%) centres included those requiring readmission. Eight (42%) included SSI diagnosed in the community

(outpatient/GP), and eleven (58%) recorded superficial infections up to 30 days and deep incisional organ/space up to 1-year postoperatively. A confirmed diagnosis of mediastinitis was met with Regulation 20(2): Duty of candour (DoC) [11] in 7 (37%) centres.

Team Survey

Care Bundles

SSI care bundles were used routinely by 105 (76%) consultant teams, of which 92 (66%) reported care bundle implementation for all patients (Table III). Thirty (22%) consultant teams targeted SSI care bundle(s) to patients deemed at medium or high-risk of SSI and 17 (12%) targeted high-risk patients only. No standardised method was used to identify patients at greater risk of SSIs. Eighty-eight (63%) consultant teams reported using no scoring tool to determine SSI risk. Remaining teams used locally validated tools; 21 (15%) centres used the Brompton and Harefield Infection Score (BHIS), 15 (11%) used the Barts-Surgical Infection Score (B-SIRS), and 9 (6.5%) used the Surgical Site Infections (SSI) or National Nosocomial Infection Surveillance System (NNIS) risk index.

Preoperative Diabetes Management

HbA1c levels were routinely measured by 114 (82%) consultant teams in people with known diabetes **(Appendix C, Table IV).** Twenty-one (11%) reported testing no patients. In those screened, who had an abnormal result, optimisation of their diabetes treatment pre-surgery was reported by 100 (81%) teams. The use of perioperative sliding scale insulin varied. All patients with diabetes receiving sliding scale insulin for 68 (49%) consultant teams, only patients with diabetes and abnormal blood glucose for 41 teams (30%), only patients with diabetes on insulin for 18 teams (13%), and only those with elevated blood glucose regardless of whether they had diabetes or not for 6 teams (4.3%).

Skin Decolonisation Prior to Surgery

All 139 consultants recommend washing prior to surgery, with 100 (72%) consultant teams recommending washing the night before surgery and 106 (76%) on the day of surgery (Table I V). One-hundred and thirty-nine (100%) teams routinely removed hair using electric clippers the day before surgery (44, 32%), the morning of surgery (67, 48%), in the anaesthetic room (19, 14%) or on the operating table (9, 7%). Hair was not routinely removed by two consultants. Hair was most commonly removed by ward staff for 90 (65%)

consultants although 19 (14%) consultant teams delegated this to patients themselves or carers.

Products used for pre-surgery skin decolonisation included washing with chlorhexidine gluconate liquid (67, 48%) and Octenisan (46, 33%). Mupirocin (2%) nasal decontamination was used by 94 (68%) teams although an alternative bactericidal medication was used by 41 (29%) teams. In 62 (45%) teams, skin decolonisation with antimicrobial solution was restricted to those with a current, previous, or unknown, history of MRSA skin colonisation. Skin decolonisation with (chlorhexidine gluconate 4% or alternative) was targeted to high-risk patients by 15 (11%) consultant teams. Mouthwash (chlorhexidine gluconate 0.2%) was used in 29 (21%) consultant teams in patients with current, historical or an unknown history of MRSA, high-risk individuals only in 13 (9%) teams and 10 (7%) teams used no form mouthwash decolonisation. Patients who are transferred from another hospital for "urgent" inpatient surgery often have a higher risk of SSI. In our survey only 35 (25%) of teams gave instructions to referring hospitals regarding decolonisation prior to transfer. This highlights a potential variation in care between those "urgent" patients requiring inpatient transfer and elective patients.

Antibiotic Prophylaxis

The results for antimicrobial prophylaxis are reported in **Table V**. Ninety-five (68%) consultant teams used a combination of at least two antimicrobials for SSI prophylaxis in CABG. The most frequently utilised antimicrobials in patients undergoing CABG with no allergies or known infection were flucloxacillin (88, 63%), gentamicin (79, 57%) and cefuroxime (39, 28%). The duration of antibiotic prophylaxis treatment ranged from 12 hours (15, 1%) through to 24 (92, 66%) and 48 hours (22, 16%) post anaesthetic induction. In patients undergoing valve surgery 118 (85%) teams utilised two antibiotics and 21 (15%) a single antimicrobial. Antimicrobial prophylaxis in patients undergoing valve surgery included gentamicin (101, 73%), flucloxacillin (88, 63%) and cefuroxime (42, 30%) most commonly. This was continued up to 24 hours postoperatively in 90 (65%) consultant teams, 21 teams (15%) continued up to 48 hours, and 3 (2%) teams continuing until the central line is removed.

Theatre Specialisation

Dedicated cardiac surgery theatres were available to 93 (67%) consultant teams whilst 31 (22%) were shared with thoracic surgery and another 15 (11%) shared with other surgical specialties. No centres had a dedicated theatre for infected cases and 36 (26%) used laminar flow ventilation systems.

Scrubbing Practices

Chlorhexidine gluconate (75, 54%) or betadine (46, 33%) was used for surgeon hand washing/ skin decolonisation prior to surgery, with 24 (17%) surgeons reporting no preference (Appendix C, Table VII). Single gloving was reported by 102 (73%) consultant teams, double gloving by 19 (14%) teams, and 18 (13%) double-gloving only in selected cases. In 26 (19%) teams glove changes occurred at specific operative times such as prior to handling of any prosthesis.

Skin Preparation & Draping

One hundred and nineteen (85%) consultant teams used chlorhexidine gluconate for skin preparation (Appendix C, Table VIII). Chlorhexidine gluconate 2% was delivered via applicator (78, 56%) or bottle 26 (19%). Povidone iodine preparations were used by 15 (11%) consultant teams. One hundred and twenty-four teams (89%) reported using other skin preparations.

Eighty-four (60%) used at least two applications of skin preparation either as a pre-preparation in the anaesthetic room prior to transfer into the theatre suite or as double preparation in theatre prior to draping. This was left to air dry for > 2 minutes by 103 (74%) teams. Disposable drapes with additional adhesive drapes for the sternum were used by 126 (91%) and 133 (96%) teams respectively. Ioban, an iodophor impregnated additional adhesive drape was used routinely by 106 (76%), Opsite by 27 (19%), or no additional adhesive by 6 (4%) consultant teams. One hundred and twenty-one (87%) teams incised the skin with a scalpel blade and then used diathermy for subcutaneous tissues. Scalpel blade to bone was used by 10 (7.2%) whereas 8 (6%) reported using diathermy for the entire incision, including skin. Bone marrow haemostasis was routinely achieved with bone wax by 109 (78%) consultant teams with 18 (13%) using only diathermy. Eleven (8%) consultants did not use any specific technique for bone marrow haemostasis.

Conduit Harvesting Techniques & Wound Closure

Conduit harvesting was performed via open surgical technique by 84 (61%) teams, endoscopic harvesting by 45 (32%), or a bridging technique by 9 (7%) teams **(Appendix C, Table IX).** Radial artery harvest was performed via an open (121, 87%) or 'no touch' (52, 37%) techniques. Subcutaneous drains were routinely used following harvest of the radial artery and saphenous vein graft in 26 (19%) and 30 (22%) of consultant teams respectively. Compression bandages were applied to saphenous vein harvest sites for 24 hours by 94 (68%) teams and 48 hours by 43 (31%) teams. For radial artery harvest, the durations were 61% (85) for 24 hours and 9% (13) for 48 hours. Transparent woven island dressings (such as Opsite Post-op and Mepore) were applied immediately following completion of surgery by 76 (55%) teams. A wound visible dressing (for instance Opsite Post-op Visible) was used by 38 (27%) teams and a topical adhesive such as Dermabond was used by 9 (6%) teams.

Sternal Wound Closure Technique

Sternal wound closure used single wires according to weight (62, 45%), double wire technique or equivalent (37, 27%), or a standard number of wires regardless of weight (48, 35%) **(Appendix C, Table X).** In obese patients, sternal closure was achieved using a double wire technique with either two single wires or Mayo wires by 89 (64%) teams, standard single wires were used by 20 (14%), single wires according to weight by 18 (13%) and a combination of techniques by 12 (9%) teams which included three with ZipFix and two with Flexigrip. For the closure of the pre-sternal tissues, uncoated Vicryl was used for both closure of the muscle layer (104, 75%) and subcutaneous layer (113, 78%) and Monocryl for skin layer (108, 78%).

Local antibiotics were used for sternal closure by 32 (23%) teams. This included 18 (13%) gentamicin impregnated sponges, 9 (7%) antibiotic powder and 5 (4%) antibiotic solutions. Thirty-five (25%) used a Posthorax vest (11, 8%) or Cough lok (24, 17%) in high-risk or selected patients. Cardiac bras (such as BHIS bra) were routinely used in female patients by 15 (11%) consultant teams or in high-risk, selected individuals by 5 (4%) consultant teams; patient's own or sports bra style was advised by 48 consultant teams (35%). No additional sternal support methods were used by 26 (19%) consultant teams.

DISCUSSION

Main findings

A survey of SSI prevention strategies in cardiac surgery centres in the UK and ROI demonstrated significant variation in care. Heterogeneity was noted in preoperative risk stratification, **perioperative** interventions, postoperative SSI surveillance, and reporting methods.

There was low variability between centres for some preoperative SSI prevention interventions; all 19 centres that responded to the survey reported MRSA screening and hair removal with single-use electrical clippers, 17 centres (95%) reported preoperative showering and glucose control for diabetic patients in line with the High Impact Intervention – Care Bundle to prevent SSI published by the UK Department of Health and NICE [9].

Overall this survey has demonstrated that there is no nationally agreed protocols or standards of care specific to SSI prevention in cardiac surgery, and that practice as well as SSI rates (1% to 9.9% (median 3.4, IQR 2)) varies widely between different centres and surgeons.

Clinical Importance

This work reinforces the findings of Tanner et al [12] that surveillance definitions and data collection methods vary between centres. [13] The gold standard PHE SSI surveillance was only adhered to in a minority of cases, with greater participation in **people undergoing** CABG. [14] It is therefore paramount that a comprehensive and agreed standard of wound surveillance is developed within each country and ideally internationally. This presents an opportunity to encourage participation across all cardiac surgical procedures in national surveillance (including post-discharge) [15] alongside strategies to engage patients themselves in SSI prevention such as 'Photo at Discharge' [16] and videos for SSI prevention for patients and carers recently endorsed by NICE. To ensure precision in both a future **epidemiological study aiming to develop an** SSI risk prediction tool and a clinical and cost effectiveness trial of targeted SSI prevention in individuals undergoing adult cardiac surgery, it is essential that post-discharge PHE SSI surveillance is implemented using standardised metrics across all centres.

At present centres which preoperatively stratify people for SSI risk use a wide variety of risk prediction tools which have only been validated in local cardiac surgery populations; no nationally, validated tool exists. The approach of using routinely collected national SSI data would allow the development of a standardised tool applicable to the population of UK and ROI patients undergoing adult cardiac surgery thereby allowing preoperative identification of high-risk patients that may benefit from additional targeted interventions. Indeed, recent NICE guidance [6] has qualified recommendations on nasal and skin decolonisation, gentamycin-collagen implants and triclosan-coated sutures in cardiac surgery. The certainty of evidence to support these interventions is low which may explain the poor uptake found in our survey. Although increasing compliance to these interventions may reduce SSI, there is a risk of increasing antimicrobial resistance which is an emerging risk to global health and is the subject of a five-year action plan (2019- 2024) in the UK [10]. Therefore a balance between a maximum reduction in SSI and minimal antimicrobial resistance is needed. A clinical trial comparing decolonisation and gentamycin-collagen implants in all cardiac surgery patients versus a selected "high risk" group would address this area of uncertainty.

Limitations

The main strengths of this review include the iterative review of content by multiple groups to ensure that the surveys were comprehensive and efficient, the pilot survey to check accuracy and precision of the information collected, and the senior sign-off of the data that coupled with the 100% completion rate will have increased the accuracy of the data. The main limitation of the study is the self-determined nature of Trust and team involvement. This introduces the potential for non-response error that may impact on the generalisability of the findings. In mitigation, it may be surmised that the centres that declined to take part will have lower adherence to evidence based practice than responders. In which case their omission will not have produced elevated estimates of variation in practice. In addition, the intentional omission of any an analysis of association between variation in practice and centre specific SSI rates will have avoided the identification of spurious associations based on incomplete data. This was intentional, only randomised trials can demonstrate causal relationships between interventions and outcomes. The cross-sectional design of the survey only reflects practice only at the time in which it was completed. The 2019 NICE guidance on SSI prevention, published two months prior to the survey, may have longer-term effects on

SSI care bundle implementation that will not have been measured. However, it is worth noting that the NICE guidance made only one specific recommendation for cardiac surgery patients, consideration of gentamicin collagen implants and this survey identified many more aspects of SSI prevention where there was important variability [6].

Conclusion

A cross-sectional survey of cardiac surgery centres in the UK and Ireland identified significant variation in the implementation of SSI prevention care bundles, both at institutional level and at the level of the individual consultant. There was also significant variation in SSI rates. Given the knowledge gaps identified in previous work, including contemporary treatment guidelines, we conclude that these results are evidence of clinical uncertainty. Together these findings support the need for implementation of quality improvement initiatives to standardise care as well as research that will address existing knowledge gaps.

Appendices

A Authorship Contributions

B.1 Trust/Health Board Questionnaire

B.2 Team Questionnaire

C Supplementary Tables

Acknowledgements

This was a collaborative project between the Cardiothoracic Interdisciplinary Research Network (CIRN), Public Health England (PHE) and the National Cardiac Benchmarking Collaborative (NCBC). There were over 149 individuals who contributed to the delivery of this project. Individuals names and contributions are presented in Appendix A. The delivery

of this project would not have been possible without the collaborative work of all these individuals.

Conflict of Interest: RM & SG; directors of Miles-Green Associates which runs and manages NCBC. MR; BHIS Bra (registered inventor), creator 'photo at discharge' scheme. No other conflicts declared by authors.

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Table I. Perioperative SSI prevention practices, UK & Ireland 2019 - Trust Survey	%	**Centres (n=19)**
What aspects of the current DH/National UK high impact intervention bundle (2010/2011) does your hospital implement for cardiac surgery patients?		
MRSA screening, and decolonisation as required	100%	19
Hair removal with electric clippers	100%	19
Preoperative showering	95%	18
Glucose control for diabetic patients (< 11 mmol/L)	95%	18
Prophylactic antibiotics within 60 minutes of skin incision	90%	17
Iodophor-impregnated incise drapes	74%	14
Regular hand hygiene audits	84%	16
Skin preparation with alcohol-based solution of chlorhexidine	63%	12
Interactive surgical dressing for 48 hours	58%	11
Supplemental oxygen to in the early postoperative phase	84%	16
Does your cardiac centre use a **policy(s) or guideline(s) for the prevention of cardiac surgical site infections?**		
Yes	53%	10
No	47%	9
Which external bodies do you report your surgical site infection data to?		
Public Health England/Public Health Wales/Health Protection Scotland	63%	12
Society of Cardiothoracic Surgery (SCTS)/National Institute for Cardiovascular Outcomes Research (NICOR)	58%	11
GIRFT SSI audit (Getting It Right First Time)	42%	8
None	5%	5
Please indicate the frequency that reports relating to surgical site infections are sent to consultants?		
Monthly	37%	7
Quarterly	32%	6
Not routinely provided	32%	6
Are deep sternal wound infections recorded on the local incident reporting system?		
Yes	47%	9
No	53%	10
Is SSI data collected by a **dedicated individual and/or team?**		
Yes	**68%**	13
No	32%	6
Do you have a **dedicated wound clinic available?**		
Yes	58%	11
No	42%	8
What information is provided to patients/carers for SSI prevention?		
Preoperative printed information – e.g. when and how to wash	95%	18
Postoperative printed information – e.g. signs of SSI and who to contact	84%	16
Video(s) on SSI prevention	21%	4
Dedicated group teaching sessions (preoperative)	16%	3
Dedicated group teaching sessions (postoperative)	42%	8
Photo at discharge	37%	7
Posters in ward showers and/or printed instructions	47%	9
Please note, some questions allowed multiple options to be selected so may not add up to 100%.		

Table II. SSI surveillance, UK & Ireland 2019 - Trust Survey	%	**Centres (n=19)**
How are you detecting SSIs that are included in your annual rate?		
Inpatient stay (primary admission)	100%	19
Readmission to (primary) hospital for SSI	95%	18
Outpatient/GP	42%	8
Superficial SSI recorded up 30 days postoperatively	58%	11
Deep and organ or space up to 1-year	58%	11
How do you identify surgical site infections following discharge from hospital?		
No system in place	58%	11
Post-discharge questionnaire (PDQ) given to patients	21%	4
GP practice reporting systems	21%	4
Follow-up telephone calls for non-responders (patients) to PDQ	11%	2
Follow-up telephone calls	32%	6
District General Reporting systems	11%	2
Does the CABG SSI rate include?		
Superficial incisional - sternal	90%	17
Superficial incisional – leg	84%	16
Superficial incisional - radial	74%	14
Deep incisional – sternal	100%	19
Deep incisional - leg	79%	15
Deep incisional - radial	79%	15
Organ/Space (e.g. mediastinitis/infective endocarditis)	84%	16
Does a **confirmed case of mediastinitis postoperatively trigger duty of candour requirements?**		
Yes	37%	7
No	63%	12
Please note, some questions allowed multiple options to be selected so may not add up to 100%.		

Table III. Care Bundles and Risk Scores, UK & Ireland 2019 - Team Survey	%	**Teams**

		(n=139)
Does this consultant's team use a locally developed care bundle(s) for the prevention and/or management of cardiac surgery SSIs?		
Yes	77%	105
No	23%	32
Does the team use only one SSI care bundle or more than one?		
None	23%	32
1	55%	77
2	1%	2
3 or more	20%	28
How long has this current care bundle(s) been in use in your team?		
No care bundle used	23%	32
6 months – 1 year	6%	8
1 – 2 years	36%	50
> 2 years	35%	49
Which of the following patients are your care bundle(s) used on?		
No care bundle used	23%	32
All patients	51%	71
Medium & high-risk patients	17%	23
High-risk patients only	9%	13
What scoring system do you use to assess patient risk of getting an SSI?		
No scoring system used	63%	**88**
BHIS	15%	21
Local **B-SIR**	11%	15
SSI Risk Index (NNIS Risk Index)	6%	9
Local Scoring System	4%	6
Please note, some questions allowed multiple options to be selected so may not add up to 100%.		

Table IV. Preoperative preparation for surgery by cardiac teams (n=139), UK & Ireland 2019 - Team Survey	%	**Teams (n=139)**
What is your recommended routine protocol for patients regarding the timing and frequency of pre-washing prior to surgery? (Exclude high risk patients and those with MRSA/MSSA)		
Day of surgery	76%	106
Night before surgery	72%	100
Three days of washing prior to surgery	13%	18
Five days of washing prior to surgery	1%	1
What product(s) do you ask patients to wash with on the day of surgery?		
Plain soap (bar or liquid)	4%	6
Octenisan	33%	46
Chlorhexidine gluconate liquid	71%	**98**
Chlorhexidine gluconate wipes	6%	8
No specific advice on which wash product to use	2%	3
What additional decolonisation measures do you use to reduce SSI risk? (Excluding standard MRSA/MSSA decolonisation measures)		
Nasal decontamination Mupirocin 2% - current/history/unknown MRSA status	27%	38
Nasal decontamination Other - current history/unknown/MRSA status	17%	24
Nasal decontamination Mupirocin 2% - all patients (no screening)	30%	42
Nasal decontamination Other - all patients (no screening)	12%	17
Nasal decontamination Mupirocin 2% - selected patients (i.e. high-risk SSI)	10%	14
Nasal decontamination Other - selected patients (i.e. high-risk SSI)	1%	2
Mouthwash - current/history/unknown MRSA status	21%	29
Mouthwash - selected patients (i.e. high-risk SSI)	9%	13
No decolonisation	7%	10
Do you routinely give instructions to referring hospitals regarding decolonisation of patients prior to transfer for surgery?		
Yes	25%	35
No	75%	104
How is body hair removed from the surgical sites prior to surgery?		
Electric clipper	100%	139
Hair is not routinely removed	0%	0
Who routinely removes patient hair?		
Patient/carer	14%	19
Ward staff	65%	90
Theatre nursing staff	10%	14
Surgical team	4%	6
Surgical Care Practitioner (SCP)	4%	6
No standard	3%	4
When is hair routinely removed?		
Day before surgery	32%	44
Morning of surgery	48%	67
In the anaesthetic room	14%	19
On the operating table	6%	9
How is body hair cleaned up following removal?		
Patient showers after removal	61%	85
Adhesive tape	12%	17
Sticky mitts	23%	32
Sheets and gown changed	4%	5
Please note, some questions allowed multiple options to be selected so may not add up to 100%.		

Table V. Prophylactic Antibiotics, UK & Ireland 2019 - Team Survey	%	Teams (n=139)
How many antibiotics are used for prophylaxis in patients undergoing CABG (Excluding patients with allergies or ongoing infections)		
Combination of two or more antibiotics	68%	95
Single antibiotics only	32%	44
What antibiotic prophylaxis is used for patients undergoing CABG? (excluding patients with allergies and no ongoing infections)		
Flucloxacillin	63%	**88**
Gentamicin	57%	79
Cefuroxime	28%	39
Vancomycin	7%	10
Teicoplanin	25%	35
Ciprofloxacin	2%	3
What is the routine duration of prophylactic antibiotics in these CABG patients? (excluding patients with post-operative infections)		
Up to 24 hours	66%	92
12 hours	11%	15
Up to 48 hours	16%	22
Three doses	1%	2
Single dose within 60 minutes of skin incision	6%	8
How many antibiotics are used for prophylaxis in patients undergoing valve surgery (excluding patients with allergies or ongoing infections)		
Combination of 2 or more antibiotics	85%	118
Single antibiotic only	15%	21
What antibiotic prophylaxis is used for patients undergoing valve surgery? (Excluding patients with allergies or 1ongoing infections)		
Flucloxacillin	63%	**88**
Gentamicin	73%	101
Cefuroxime	30%	42
Vancomycin	7%	10
Teicoplanin	25%	35
Ciprofloxacin	2%	3
What is the routine duration of prophylactic antibiotics in valve patients? (excluding patients with infections)		
Single dose < 60 minutes prior to skin incision	6%	8
Up to 12 hours	11%	15
Up to 24 hours	65%	90
Up to 48 hours	15%	21
Three doses	1%	2
Until central line is removed	2%	3
Please note, some questions allowed multiple options to be selected so may not add up to 100%.		

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