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Caesarean Section Surgical Site Infection Surveillance

2017 Annual Report:

Appendix F:

Hywel Dda UHB

Includes data from 01/01/2017 – 31/12/2017

Version 1

Issued: 31/07/2018

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Contents

Tables.....	3
Figures	3
Summary	4
Data interpretation	5
Section 1: Data completeness.....	6
Compliance	6
Completion rates of surveillance forms.....	7
Section 2: SSI rate.....	8
Incidence of inpatient, post-discharge and overall SSI	8
Annual SSI rates	8
Incidence of SSI by infection type	11
Section 3: Demographics	12
Incidence of SSI by age	12
Incidence of SSI by BMI.....	13
Incidence of SSI by number of previous C sections.....	14
Section 4: Details of the surgical procedure	15
SSI risk score	15
Incidence of SSI by procedure type	16
Incidence of SSI by antibiotic prophylaxis	17
Incidence of SSI by skin closure type.....	18
Section 5: Post-procedure details and onset of infection.....	19
Length of stay in hospital	19
Length of midwifery care.....	20
Time to onset of infection.....	21
References	21

Tables

Table 1 – Coverage of the C section SSI surveillance compared to the expected number of forms.....	6
Table 2 – Completion rates of the SSI field (along with its associated type and infection date fields).....	7
Table 3 – Incidence of inpatient and post-discharge SSIs.	8
Table 4 – Overall, elective and emergency SSI rates for the last five years. (Unknowns excluded).....	9
Table 5 – Types of SSI in C section procedures by proportion.	11
Table 6 – SSI rates broken down by type.	11
Table 7 – Incidence of SSI by age group	12
Table 8 – Incidence of SSI by BMI category.....	13
Table 9 – Incidence of SSI by the number of previous C sections.	14
Table 10 – Incidence of SSI by procedure type.	16
Table 11 – Incidence of SSI by timing of prophylactic antibiotics.....	17
Table 12 – Incidence of SSI by type of skin closure.	18
Table 13 – Incidence of SSI by type of skin closure in mothers with BMI \geq 30.	18
Table 14 – Incidence of SSI by length of hospital stay.	19
Table 15 – Incidence of SSI by length of midwifery care post-procedure.	20

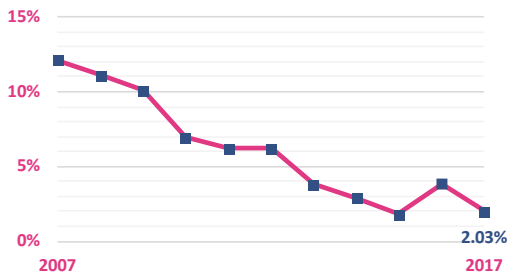
Figures

Figure 1 – Trend rate for compliance 2007-2017	6
Figure 2 – Overall, elective and emergency SSI rates for 2007-2017	8
Figure 3 – Cumulative SSI number for the year, and their relative change compared to the previous year.....	10
Figure 4 – Graph showing the incidence of SSI by age group.....	12
Figure 5 – Graph showing the incidence of SSI by BMI category.....	13
Figure 6 – Graph showing incidence of SSI by the number of previous C sections.....	14
Figure 7 – Graph showing spread of risk score across all procedures (as percentage of all procedures reported). The score has a theoretical range of -7 to 33 for C section procedures in Wales.	15
Figure 8 – Graph showing incidence of SSI by type of procedure.....	16
Figure 9 – Graph showing incidence of SSI by timing of prophylactic antibiotics.	17
Figure 10 – Graph showing incidence of SSI by type of skin closure used.	18
Figure 11 – Graph showing the incidence of SSI by skin closure in mothers with BMI \geq 30.	18
Figure 12 – Graph showing incidence of SSI by length of hospital stay.....	19
Figure 13 – Graph showing incidence of SSI by length of midwifery care post-procedure.	20
Figure 14 – Graph showing cumulative SSIs up to 14 days post-procedure. Blank infection dates excluded.....	21

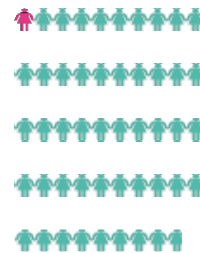
Summary

NOTE: The information in this annual report may differ from that found in the quarterly report due to delays in data arriving at Public Health Wales and amendments being made following the publication of the quarterly reports.

SSI rate

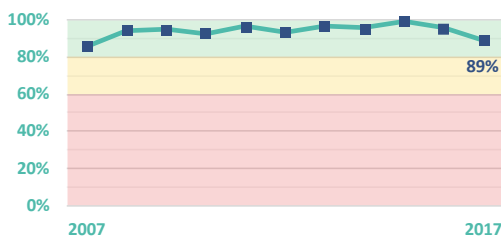


1 in 49 mothers had an SSI attributable to their C section procedure

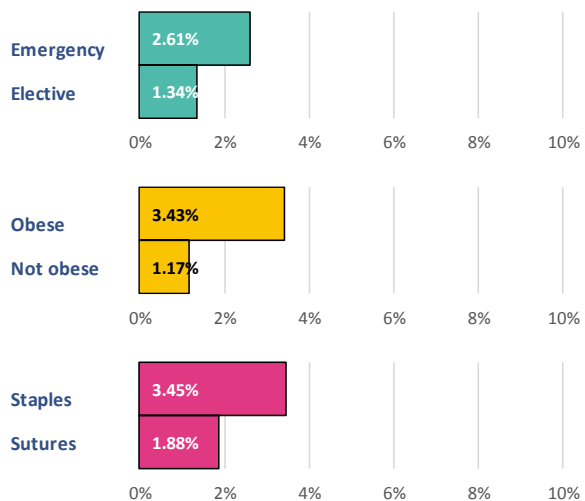


83% reduction in SSI rate since 2007, which equates to **379** infections prevented (based on 2007 rates)

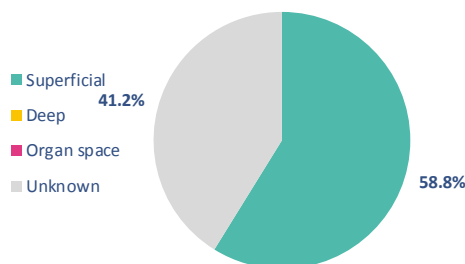
Compliance



Risk factors



Infection type



935 procedures were performed in 2017 and forms were completed for 93% of these procedures (n=874). Of these forms, 96% were valid forms that could be used for analysis (n=836).

There were 17 SSIs reported in 2017, which equates to an SSI rate of 2.0%. 0 of these were complicated infections (deep or organ space), approximately 0% of all infections.

55% of procedures performed in 2017 were emergencies. The SSI rate in emergency procedures was not significantly higher than elective procedures.

Data interpretation

Surgical site infection (SSI) rates in this report are calculated as the number of infections (inpatient and post-discharge) as a proportion of valid procedures. This is reported as a rate per 100 procedures.

$$SSI\ rate = \frac{\textit{number of SSI}}{\textit{number of valid procedures}} \times 100\%$$

A valid procedure is one where an SSI is recorded, or one where there is confirmation of no SSI on both inpatient and post-discharge forms. "Number of procedures" refers only to valid procedures, unless otherwise specified.

In keeping with the regular reports, all SSI rates reported in this document are those that occurred up to 14 days post-procedure. Due to the different discharge policies and treatment plans in place at all health boards, we are confident in the consistency of rates up to 14 days, but we are unable to guarantee consistency between hospitals after this point.

Section 1: Data completeness

Compliance

Compliance dropped this year, however, the health board remains comfortably within the high compliance range. Of all the procedures that were performed at the health board, forms were received for 93% of them, with 89% having valid forms.

Table 1 – Coverage of the C section SSI surveillance compared to the expected number of forms.

	2015	2016	2017
Expected number of forms*	1005	1004	935
Surveillance forms returned	999	962	874
Valid surveillance forms	999	960	836
Forms returned	99%	96%	93%
Valid forms returned	99%	96%	89%

*Total number of procedures performed at hospital, irrespective of whether or not a form was received.

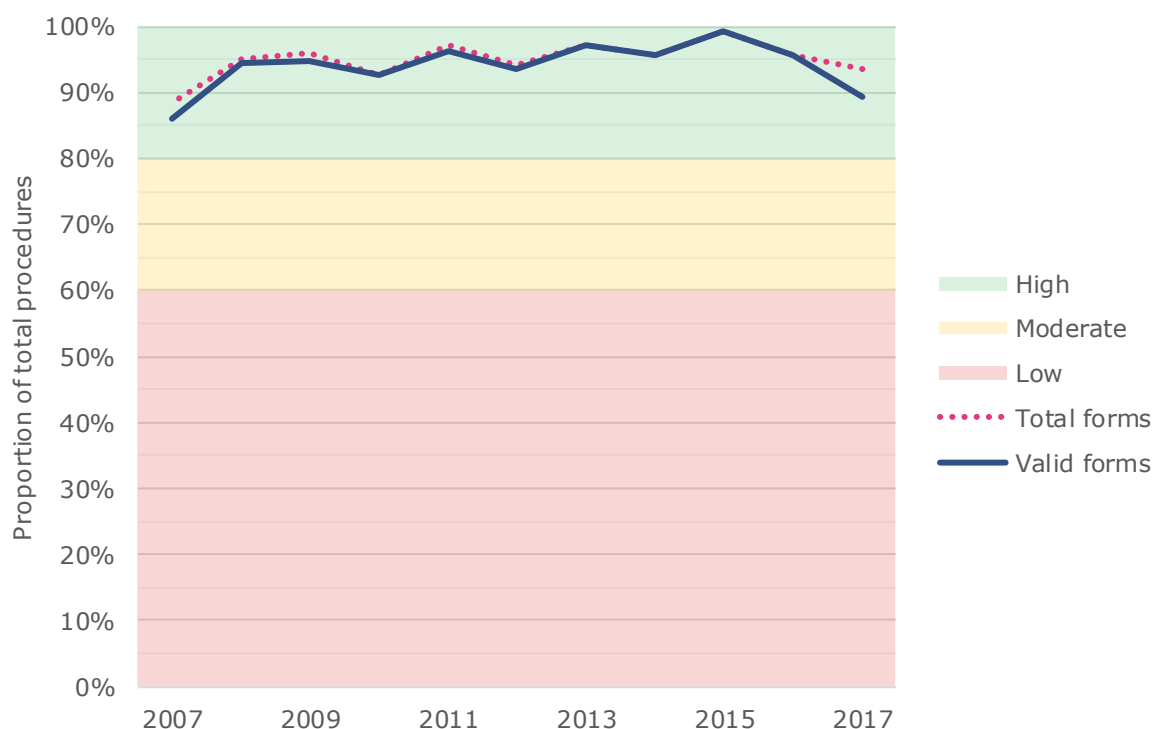


Figure 1 – Trend rate for compliance 2007-2017

Completion rates of surveillance forms

The vast majority of inpatient forms received at Public Health Wales have a completed SSI status field (where either yes or no are selected), with 871 of forms having a completed SSI field (of 874 forms, 99.7%). Following on from these inpatient forms, 96.7% of post-discharge forms were received (845/874) with the remaining 3.3% either not sent in at all, or being sent in blank. Of the post discharge forms that were sent in, 98.9% had a completed SSI field.

The additional information on post-discharge SSIs (type and date) is provided in most cases, with only a small number of forms missing this information. The additional information is provided less often in the case of inpatient SSIs, however, the numbers involved are too small to extrapolate any real meaning from them.

Table 2 – Completion rates of the SSI field (along with its associated type and infection date fields).

Data Item	Expected	Completed	Proportion
Inpatient SSI (Yes/No)	874	871	99.7%
If yes, SSI type	1	0	0.0%
If yes, infection date	1	0	0.0%
Post-discharge SSI* (Yes/No)	845	836	98.9%
If yes, SSI type	18	12	66.7%
If yes, infection date	18	16	88.9%

Section 2: SSI rate

Incidence of inpatient, post-discharge and overall SSI

The following table provides the SSI rates separated out as an inpatient and a post-discharge rate. A total of one inpatient SSI was recorded, giving an inpatient SSI rate of 0.12%. The vast majority of SSIs (94%) occurred following hospital discharge, giving a rate of 1.91%.

The length of hospital stay is shorter now than it was at the start of the surveillance period as more of an emphasis is being placed on community midwifery care. As a result, fewer inpatient SSIs are being identified than previously, and these are instead being picked up in the community.

Table 3 – Incidence of inpatient and post-discharge SSIs.

	No. of procedures	SSI	SSI rate (95% CI)
Inpatient	836	1	0.12% (0.00-0.35)
Post-discharge	836	16	1.91% (0.99-2.84)
Overall	836	17	2.03% (1.08-2.99)

Annual SSI rates

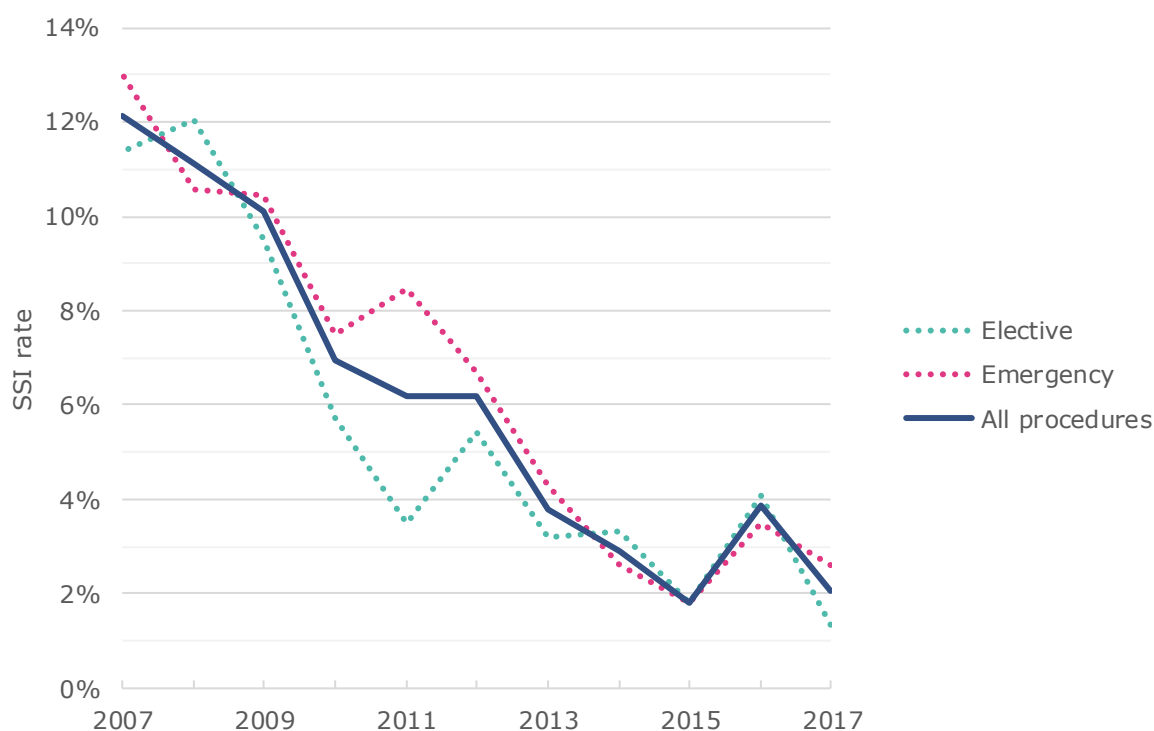


Figure 2 – Overall, elective and emergency SSI rates for 2007-2017

Table 4 – Overall, elective and emergency SSI rates for the last five years. (Unknowns excluded).

Operation type	Year	No. of procedures	SSI	SSI rate (95% CI)
All C-section procedures	2017	836	17	2.03% (1.08-2.99)
	2016	960	37	3.85% (2.64-5.07)
	2015	999	18	1.80% (0.98-2.63)
	2014	933	27	2.89% (1.82-3.97)
	2013	922	35	3.80% (2.56-5.03)
Elective	2017	374	5	1.34% (0.17-2.50)
	2016	441	18	4.08% (2.23-5.93)
	2015	448	8	1.79% (0.56-3.01)
	2014	394	13	3.30% (1.54-5.06)
	2013	406	13	3.20% (1.49-4.91)
Emergency	2017	460	12	2.61% (1.15-4.07)
	2016	518	18	3.47% (1.90-5.05)
	2015	551	10	1.81% (0.70-2.93)
	2014	538	14	2.60% (1.26-3.95)
	2013	515	22	4.27% (2.53-6.02)

The SSI rate at the health board decreased this year and this follows the general downward trend in rates that has occurred since the start of surveillance in 2007. The SSI rate back in 2007 was 12.13% and, when using this rate as a baseline, there has been a reduction of 83% in the years following. This represents an estimated 379 mothers who have been saved from an infection.

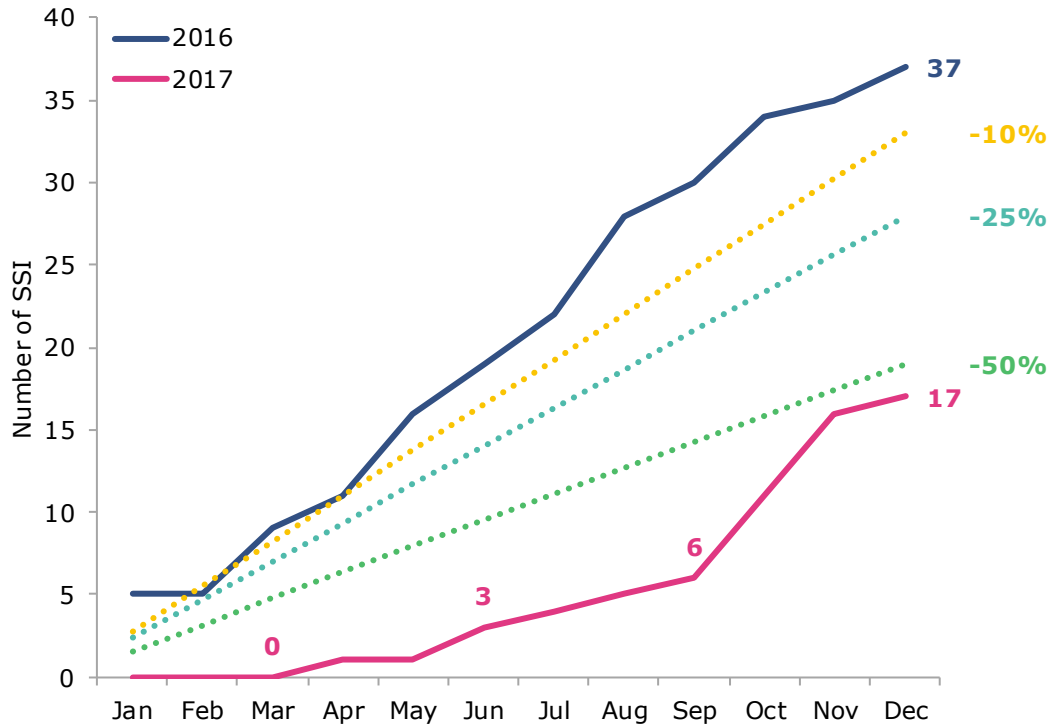


Figure 3 – Cumulative SSI number for the year, and their relative change compared to the previous year.

Throughout the health board, there were 17 SSIs reported in 2017. When compared to the previous year’s 37 SSIs, this is a reduction of 54% in raw SSI numbers (i.e. without factoring in the denominator) and means there were 20 fewer infections in 2017 than in 2016.

Incidence of SSI by infection type

The type of SSI recorded on the surveillance form can be categorised into either superficial, deep seated or organ space infections. These all have specific definitions and diagnostic criteria and remain standardised across Europe. The following tables show the split between different SSI types, and their corresponding rates.

Table 5 – Types of SSI in C section procedures by proportion.

SSI type	n	%
Superficial infection	10	58.8%
Deep infection	0	0.0%
Organ space infection	0	0.0%
Unknown	7	41.2%

Table 6 – SSI rates broken down by type.

SSI type	No. of procedures	SSI	SSI rate (95% CI)
Superficial infection	836	10	1.20% (0.46-1.93)
Deep infection	836	0	0.00% (0.00-0.00)
Organ space infection	836	0	0.00% (0.00-0.00)
Unknown	836	7	0.84% (0.22-1.46)

All SSIs reported at this health board were superficial, with no deep or organ space infections.

Section 3: Demographics

This section provides information about the mother which is not affected by the procedure itself and is known beforehand; namely age, BMI and the number of prior C section procedures.

Incidence of SSI by age

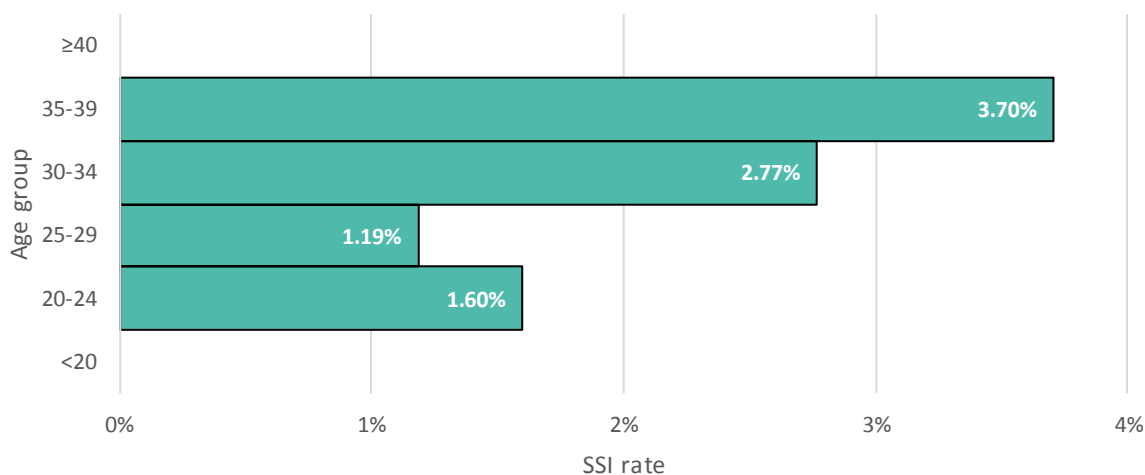


Figure 4 – Graph showing the incidence of SSI by age group.

Table 7 – Incidence of SSI by age group

Age group	No. of procedures	SSI	SSI rate (95% CI)
<20	21	0	0.00% (0.00-16.11)
20-24	125	2	1.60% (0.19-5.66)
25-29	253	3	1.19% (0.25-3.43)
30-34	253	7	2.77% (1.12-5.62)
35-39	135	5	3.70% (1.21-8.43)
≥40	48	0	0.00% (0.00-7.40)
Unknown	1	0	0.00% (0.00-97.50)

In contrast to the rest of Wales, this health board shows a weakly positive relationship with age and SSI rates, where increases in age lead to increases in SSI rates (with lower ages having higher SSI rates at the Wales level). The mean age of the entire cohort was 30.0 (median 30), but this increased to 31.5 (median 32) when an SSI occurred. This was not a significant trend (P=0.274).

Incidence of SSI by BMI

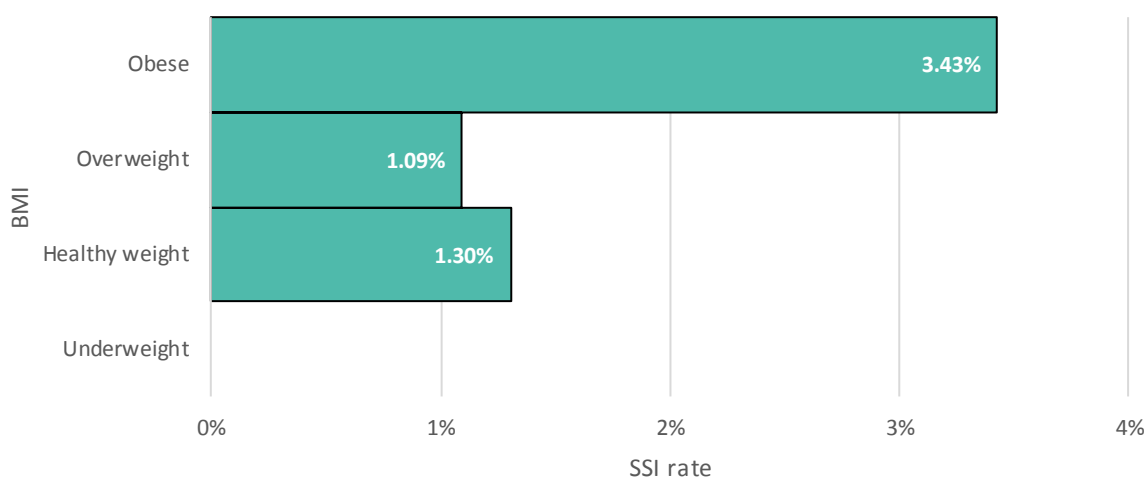


Figure 5 – Graph showing the incidence of SSI by BMI category.

Table 8 – Incidence of SSI by BMI category.

BMI	No. of procedures	SSI	SSI rate (95% CI)
Underweight	<18.5	11	0.00% (0.00-28.49)
Healthy weight	18.5-24.9	3	1.30% (0.27-3.76)
Overweight	25.0-29.9	3	1.09% (0.23-3.17)
Obese	≥30.0	11	3.43% (1.72-6.05)
Unknown		0	0.00% (0.00-0.00)

The only group in this health board to show any significant increases in SSI rate are obese patients, where the SSI rate was 294% higher than all other groups (P=0.024). The mean BMI for all procedures was 29.4 (median of 28), and this went up to 32.8 (median 31) when only those with an SSI were included.

Incidence of SSI by number of previous C sections

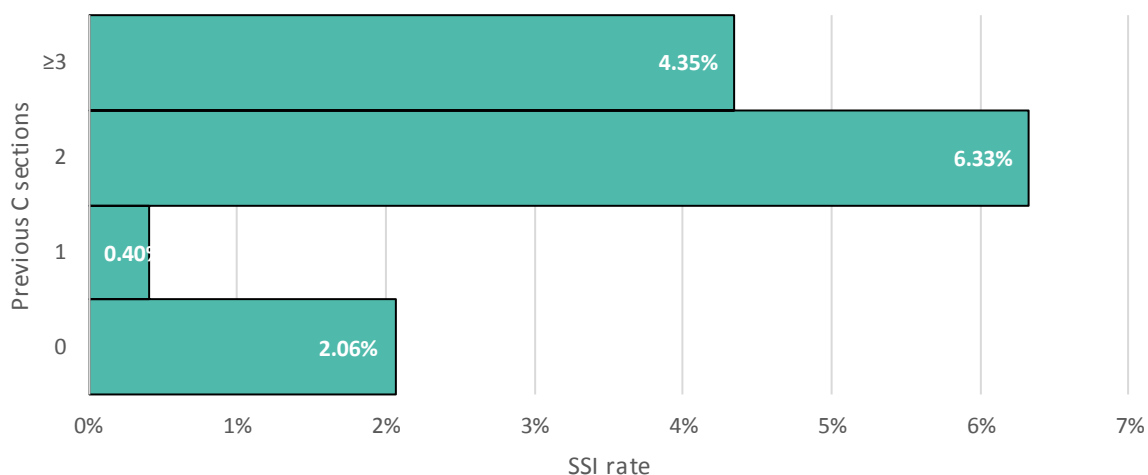


Figure 6 – Graph showing incidence of SSI by the number of previous C sections.

Table 9 – Incidence of SSI by the number of previous C sections.

Previous C sections	No. of procedures	SSI	SSI rate (95% CI)
0	485	10	2.06% (0.99-3.76)
1	249	1	0.40% (0.01-2.22)
2	79	5	6.33% (2.09-14.16)
≥3	23	1	4.35% (0.11-21.95)
Unknown	0	0	0.00% (0.00-0.00)

When comparing the number of C sections a mother has undergone prior to the current procedure, there appears to be a greater risk of developing an SSI when the mother has previously had two or more C sections. However, this group is very small compared to the entire sample and, with such a wide confidence interval, this could be due to chance.

Section 4: Details of the surgical procedure

The following section provides information on the variables relating to the procedure itself (including procedure type, prophylaxis and skin closure).

SSI risk score

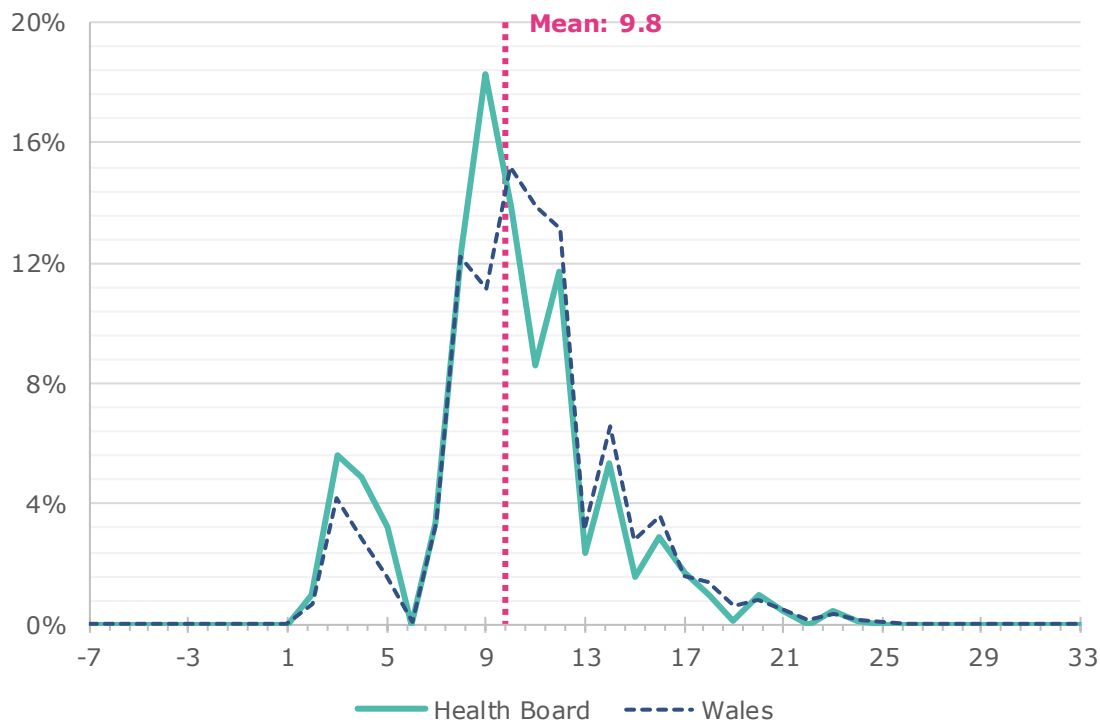


Figure 7 – Graph showing spread of risk score across all procedures (as percentage of all procedures reported). The score has a theoretical range of -7 to 33 for C section procedures in Wales.

The SSI risk score [1] is based on a number of different factors; including procedure type, wound type, ASA class, BMI and procedure duration¹. This yields a score that categorises mothers by their risk of developing an SSI (with higher scores equating to higher risk).

In 2017, the mean risk score for all mothers undergoing C section at the health board was 9.8 (median 10). When counting only those who have developed an SSI, the mean risk score increases to 10.4 (median 10), which means that mothers who developed an SSI had a higher aggregate risk score than those who did not, but not significantly higher ($P=0.520$). The risk profile of the health board was lower than the Wales mean (10.6, median 10).

¹ There are additional metrics used in the calculation of this score which we are unable to use since they are not reported as part of our surveillance. These are the number of concurrent procedures, type of anaesthetic, smoking status, presence of metastatic cancer or peripheral vascular disease, and use of steroids.

Incidence of SSI by procedure type

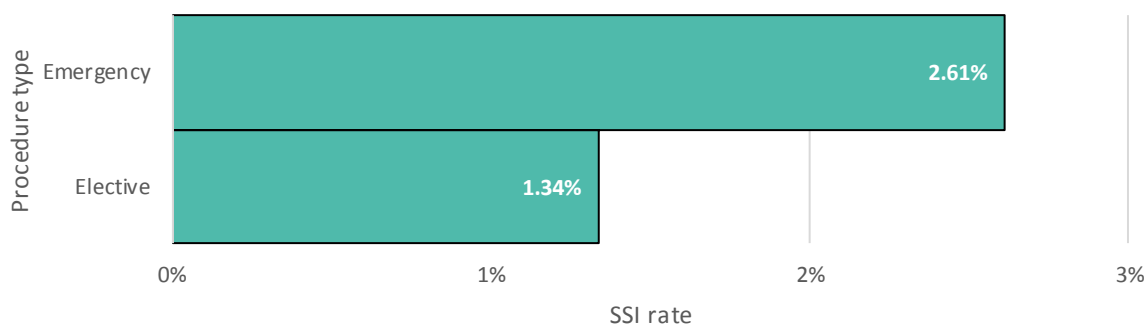


Figure 8 – Graph showing incidence of SSI by type of procedure.

Table 10 – Incidence of SSI by procedure type.

Age group	No. of procedures	SSI	SSI rate (95% CI)
Elective	374	5	1.34% (0.44-3.09)
Emergency	460	12	2.61% (1.36-4.51)
Unknown	2	0	0.00% (0.00-84.19)

In 2017, the SSI rate in emergency procedures was higher than in elective procedures, but not significantly so (95% increase, $P=0.197$). The split of procedures is weighted more towards emergency procedures, with 55.2% of procedures being classed as emergencies (CS1, CS2 and CS3) and the remaining 44.8% being classed as elective (CS4).

Incidence of SSI by antibiotic prophylaxis

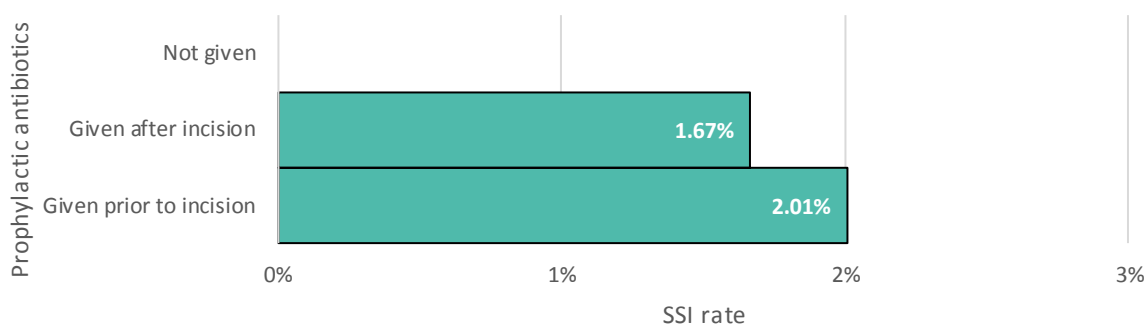


Figure 9 – Graph showing incidence of SSI by timing of prophylactic antibiotics.

Table 11 – Incidence of SSI by timing of prophylactic antibiotics.

Prophylactic antibiotics	No. of procedures	SSI	SSI rate (95% CI)
Given prior to incision	747	15	2.01% (1.13-3.29)
Given after incision	60	1	1.67% (0.04-8.94)
Not given	1	0	0.00% (0.00-97.50)
Unknown	28	1	3.57% (0.09-18.35)

99.9% of mothers were given prophylactic antibiotics and, of these, 92.6% were given prior to surgical incision. There is a slightly higher SSI rate when antibiotics are administered after incision, but this was not significant (20% increase, $P=0.855$).

Despite this increase not being statistically significant, we continue to recommend that antibiotics are administered prior to incision where possible, in accordance with NICE guidelines [2]. It is also worth taking into consideration that the serum half-life of Cefuroxime is 80 minutes, and NICE recommend that a repeat dose is administered when the length of the procedure exceeds this time. (In the case of mothers on second line antibiotics, both Clindamycin and Gentamicin have a serum half-life of two hours).

1st line	If allergic to penicillin
Cefuroxime 1.5g IV	Clindamycin 600mg IV/PO
+	+
Metronidazole 500mg IV	Gentamicin 1.5mg/kg IV

Incidence of SSI by skin closure type

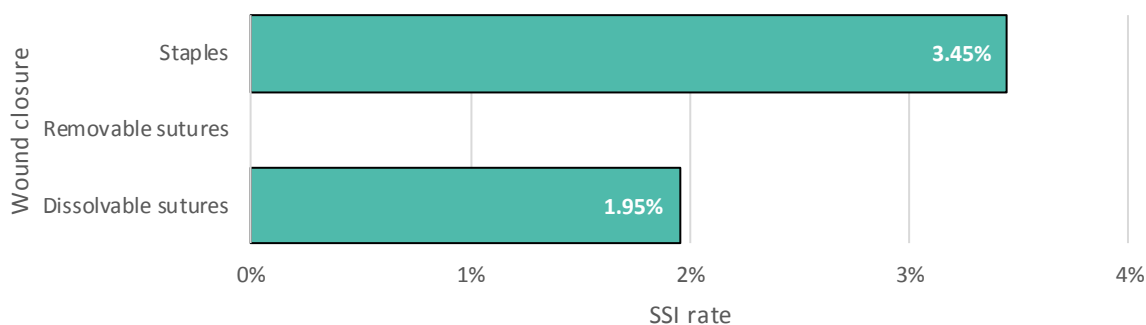


Figure 10 – Graph showing incidence of SSI by type of skin closure used.

Table 12 – Incidence of SSI by type of skin closure.

Type of wound closure	No. of procedures	SSI	SSI rate (95% CI)
Sutures (all types)	800	15	1.88% (0.94-2.81)
Dissolvable sutures	768	15	1.95% (1.10-3.20)
Removable sutures	32	0	0.00% (0.00-10.89)
Staples	29	1	3.45% (0.09-17.76)
Unknown	7	1	14.29% (0.36-57.87)

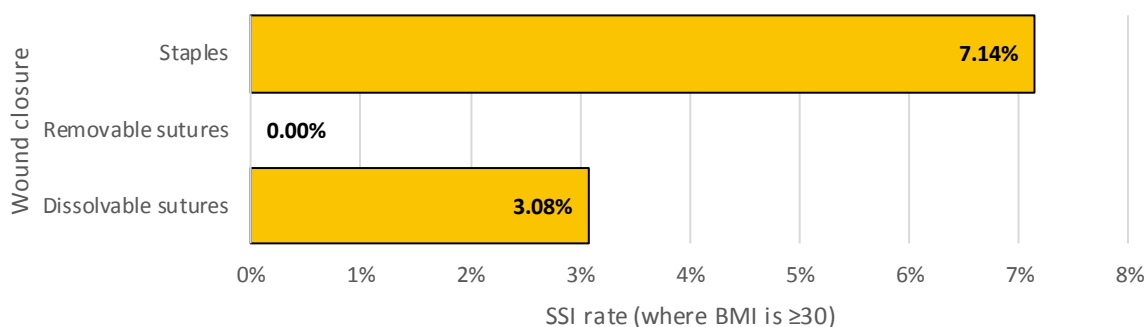


Figure 11 – Graph showing the incidence of SSI by skin closure in mothers with BMI ≥ 30.

Table 13 – Incidence of SSI by type of skin closure in mothers with BMI ≥ 30.

Type of wound closure	No. of procedures	SSI	SSI rate (95% CI)
Sutures (all types)	305	9	2.95% (1.05-4.85)
Dissolvable sutures	292	9	3.08% (1.42-5.77)
Removable sutures	13	0	0.00% (0.00-24.71)
Staples	14	1	7.14% (0.18-33.87)
Unknown	2	1	50.00% (1.26-98.74)

In 2017, the SSI rate when staples were used as a method of skin closure was 84% higher than when sutures were used, and 142% higher when only obese patients were included, but this was not significant. (P=0.546 and P=0.380, respectively).

Section 5: Post-procedure details and onset of infection

This section deals with the time period after the procedure has occurred and the time to onset of infection.

Length of stay in hospital

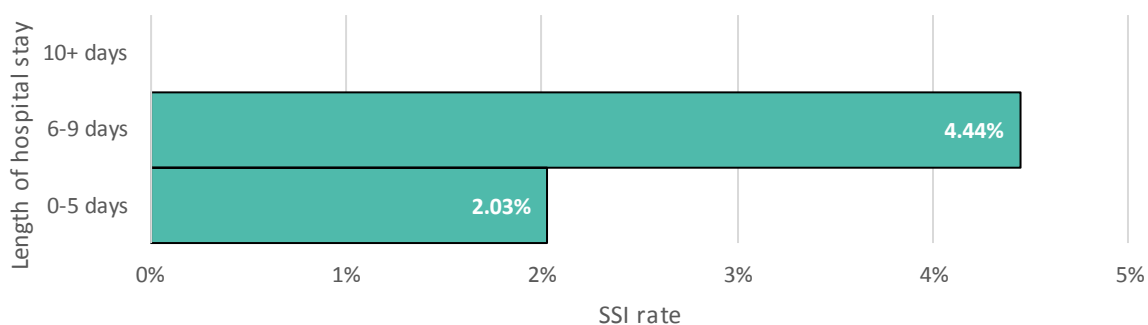


Figure 12 – Graph showing incidence of SSI by length of hospital stay.

Table 14 – Incidence of SSI by length of hospital stay.

Length of hospital stay	No. of procedures	SSI	SSI rate (95% CI)
0-5 days	689	14	2.03% (1.12-3.39)
6-9 days	45	2	4.44% (0.54-15.15)
10+ days	27	0	0.00% (0.00-12.77)
Unknown	75	1	1.33% (0.03-7.21)

For all patients undergoing a C section, the mean hospital stay following the procedure is 3.3 days (median of 2). When only mothers who have had an SSI are included, this was lower at a mean of 2.4 days (median 2). This trend was not significant ($P=0.601$).

Length of midwifery care

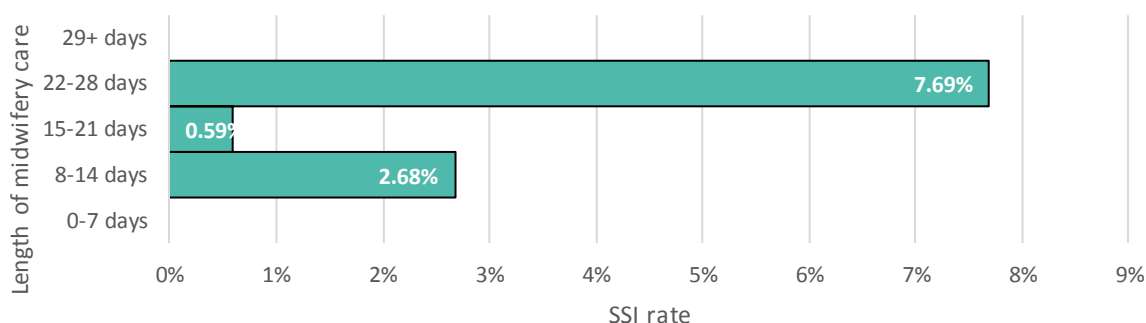


Figure 13 – Graph showing incidence of SSI by length of midwifery care post-procedure.

Table 15 – Incidence of SSI by length of midwifery care post-procedure.

Length of midwifery care	No. of procedures	SSI	SSI rate (95% CI)
0-7 days	14	0	0.00% (0.00-23.16)
8-14 days	523	14	2.68% (1.47-4.45)
15-21 days	170	1	0.59% (0.01-3.23)
22-28 days	13	1	7.69% (0.19-36.03)
29+ days	13	0	0.00% (0.00-24.71)
Unknown	103	1	0.97% (0.02-5.29)

NOTE: All SSIs in this report occurred in the first 14 days post-procedure. Even in mothers who spent 29 or more days in care, the SSI rate does not include any SSIs occurring day 15 or later.

Following the procedure, women spend a mean length of 13.5 days under the care of a midwife (median of 13), including both the time spent in the hospital and the time spent at home with regular visits from a community midwife. If there has been an SSI, this rises slightly to a mean of 13.8 days (median of 13), but this trend was not significant at the health board level (P=0.840).

Time to onset of infection

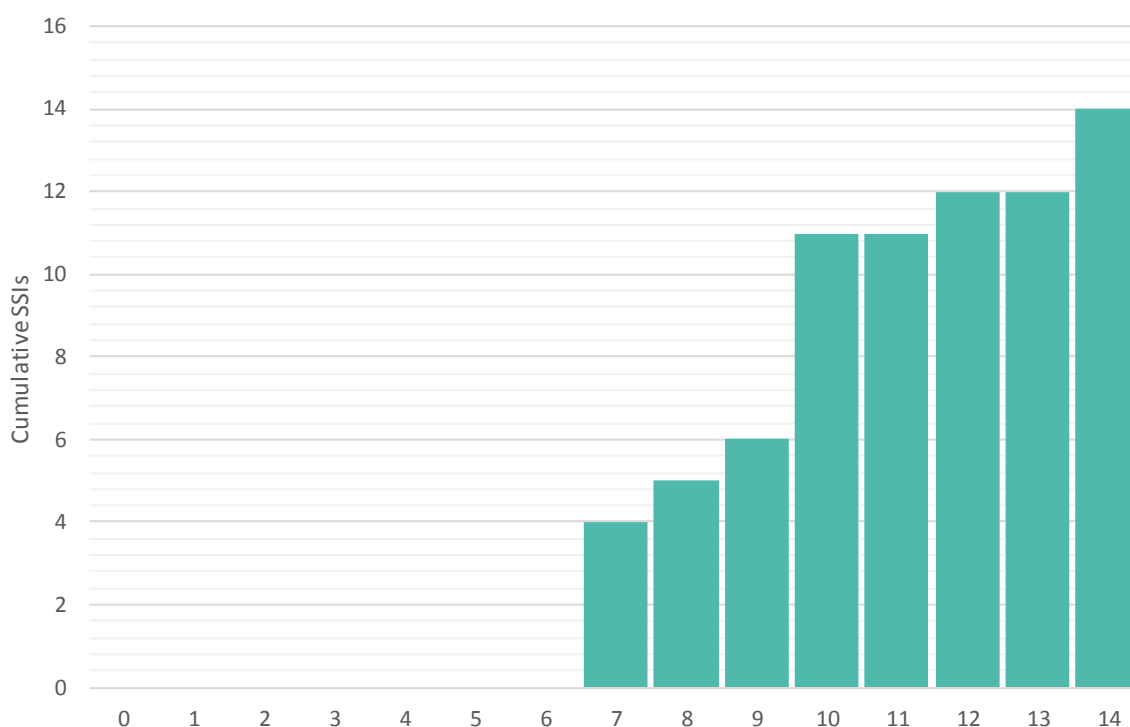


Figure 14 – Graph showing cumulative SSIs up to 14 days post-procedure. Blank infection dates excluded.

While SSIs can be reported on our forms up to 30 days post-procedure, we are only including those up to 14 days for consistency across Wales. Despite this, we do request that hospitals continue reporting up to 30 days as normal, as infections occurring on days 15-30 are still counted and reported to the European Centre for Disease Prevention and Control (ECDC).

Any SSIs reported without an infection date are counted as occurring on day 0 and are included in the SSI rates. There were 3 (18%) infections where the date of onset was not recorded. Within the first 14 days, the mean time to infection was 9.6 days, with a median of 10. The greatest number of infections were reported on day 10 (n=5).

References

1. van Walraven C, Musselman R. The Surgical Site Infection Risk Score (SSIRS): A Model to Predict the Risk of Surgical Site Infections. PLoS One. 2013; 8(6): p. e67167.
2. National Institute for Health and Care Excellence. Surgical site infections: prevention and treatment. [Online].; 2017 [cited 2018 June 1. Available from: <https://www.nice.org.uk/guidance/CG74/chapter/1-Guidance>.