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Caesarean Section Surgical Site Infection Surveillance

2017 Annual Report:

Appendix E:

Cwm Taf UHB

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

Version 1

Issued: 31/07/2018

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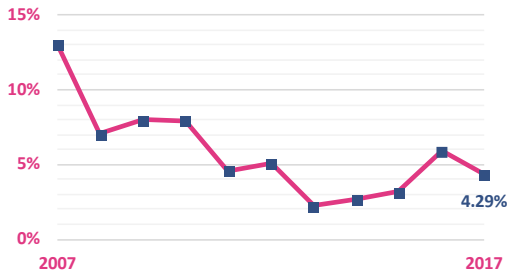
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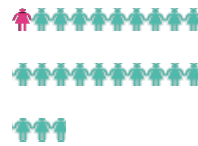
Summary

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

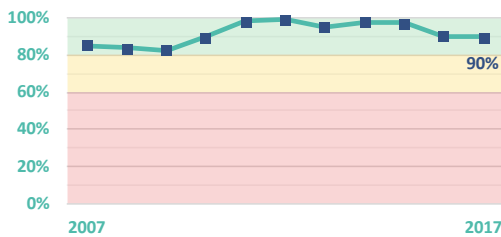


1 in 23 mothers had an SSI attributable to their C section procedure

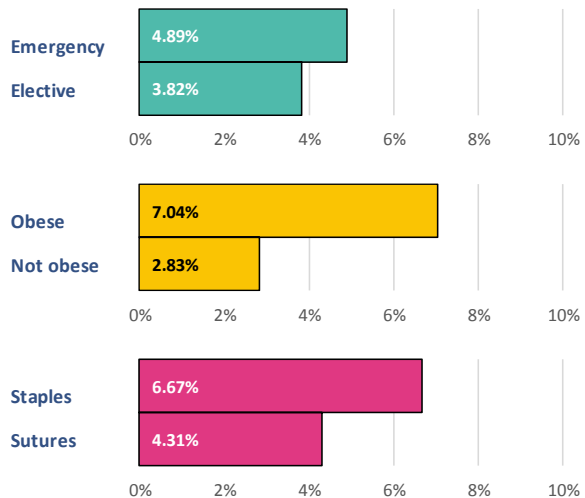


67% reduction in SSI rate since 2007, which equates to **384** infections prevented (based on 2007 rates)

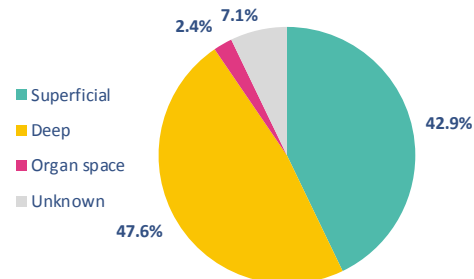
Compliance



Risk factors



Infection type



1089 procedures were performed in 2017 and forms were completed for 92% of these procedures (n=1007). Of these forms, 97% were valid forms that could be used for analysis (n=978).

There were 42 SSIs reported in 2017, which equates to an SSI rate of 4.3%. 21 of these were complicated infections (deep or organ space), approximately 50% of all infections.

50% 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 at this health board dropped slightly this year, but still remains comfortably within the high compliance range.

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

	2015	2016	2017
Expected number of forms*	1069	1134	1089
Surveillance forms returned	1043	1083	1007
Valid surveillance forms	1040	1022	978
Forms returned	98%	96%	92%
Valid forms returned	97%	90%	90%

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

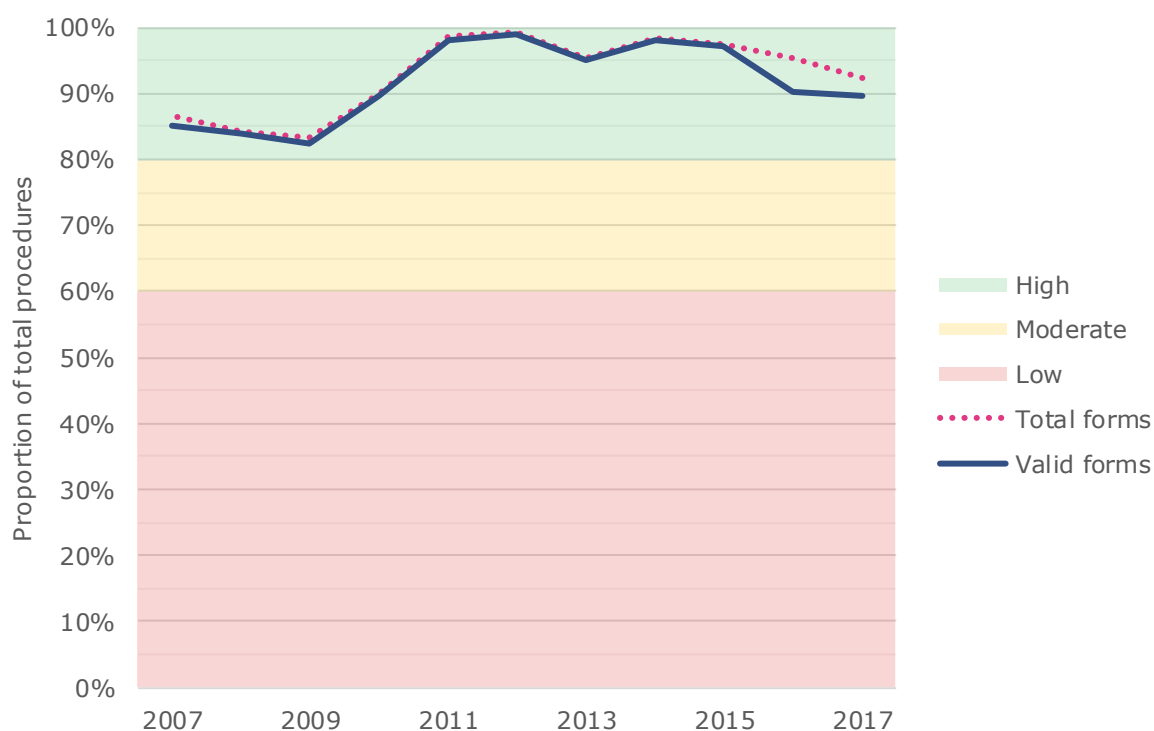


Figure 1 – Trend rate for compliance 2007-2017

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 1005 forms having a completed SSI field (of 1007 forms, 99.8%). Following on from these inpatient forms, 97.4% of post-discharge forms were received (981/1007). Of the post discharge forms that were sent in, over 99% 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)	1007	1005	99.8%
If yes, SSI type	5	5	100.0%
If yes, infection date	5	5	100.0%
Post-discharge SSI* (Yes/No)	981	978	99.7%
If yes, SSI type	68	63	92.6%
If yes, infection date	68	68	100.0%

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 four inpatient SSIs were formed, giving an inpatient SSI rate of 0.41%. The vast majority of SSIs (90%) occurred following hospital discharge, giving a rate of 3.89%.

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	978	4	0.41% (0.01-0.81)
Post-discharge	978	38	3.89% (2.67-5.10)
Overall	978	42	4.29% (3.02-5.57)

Annual SSI rates

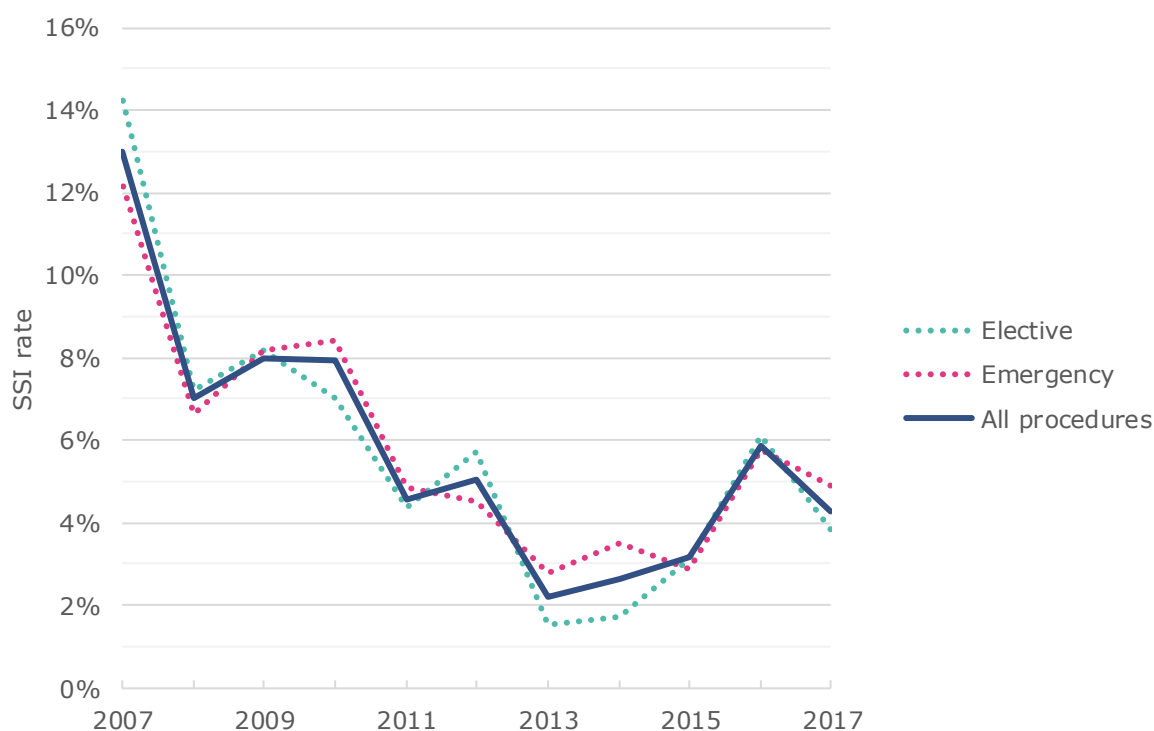


Figure 2 – Overall, elective and emergency SSI rates for 2007-2017

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	978	42	4.29% (3.02-5.57)
	2016	1022	60	5.87% (4.43-7.31)
	2015	1040	33	3.17% (2.11-4.24)
	2014	1174	31	2.64% (1.72-3.56)
	2013	1180	26	2.20% (1.37-3.04)
Elective	2017	471	18	3.82% (2.09-5.55)
	2016	493	30	6.09% (3.97-8.20)
	2015	446	14	3.14% (1.52-4.76)
	2014	469	8	1.71% (0.53-2.88)
	2013	463	7	1.51% (0.40-2.62)
Emergency	2017	470	23	4.89% (2.94-6.84)
	2016	485	28	5.77% (3.70-7.85)
	2015	559	16	2.86% (1.48-4.24)
	2014	654	23	3.52% (2.11-4.93)
	2013	652	18	2.76% (1.50-4.02)

The SSI rate at the health board decreased until 2013, but increased again from 2013 to 2016. There was a reduction in SSI rate in 2017 but, given the spike in numbers in 2016, this could be a return to more normal pre-2016 SSI rates.

The SSI rate is substantially lower than the 13.01% when surveillance started in 2007. When using this 2007 rate as a baseline, there has been a reduction of 67% in the years following. This represents an estimated 384 mothers who have been saved from an infection.

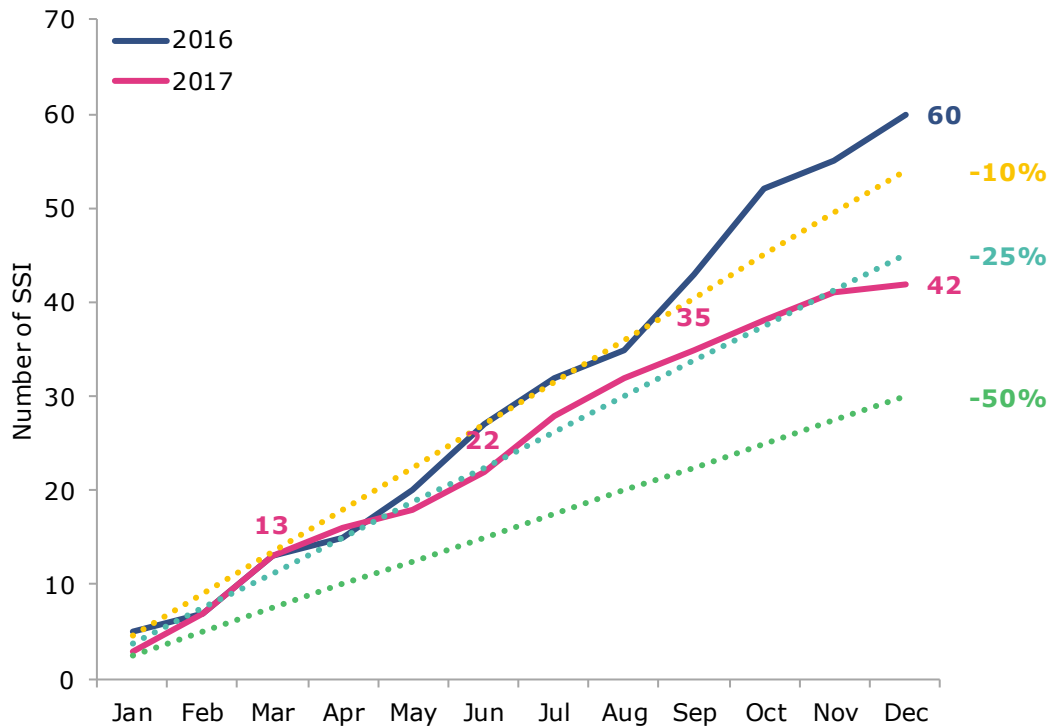


Figure 3 – Cumulative SSI number for the year, and their relative change compared to the previous year.

Throughout the health board, there were 42 SSIs reported in 2017. When compared to the previous year’s 60 SSIs, this is a reduction of 30% in raw SSI numbers (i.e. without factoring in the denominator) and means there were 18 fewer infections in 2017 than in 2016.

Incidence of SSI by infection type

The type of SSI formed 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	18	42.9%
Deep infection	20	47.6%
Organ space infection	1	2.4%
Unknown	3	7.1%

Table 6 – SSI rates broken down by type.

SSI type	No. of procedures	SSI	SSI rate (95% CI)
Superficial infection	978	18	1.84% (1.00-2.68)
Deep infection	978	20	2.04% (1.16-2.93)
Organ space infection	978	1	0.10% (0.00-0.30)
Unknown	978	3	0.31% (0.00-0.65)

The split between different types of infection is substantially different than expected, with deep infections being more common than superficial infections. While this may be due to an increased incidence of infections which reach the muscle layer, it is not possible to confirm this and they may simply be due to the way infections have been reported from the health board – especially since all 20 deep and organ space infections were reported by the same hospital (Prince Charles).

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

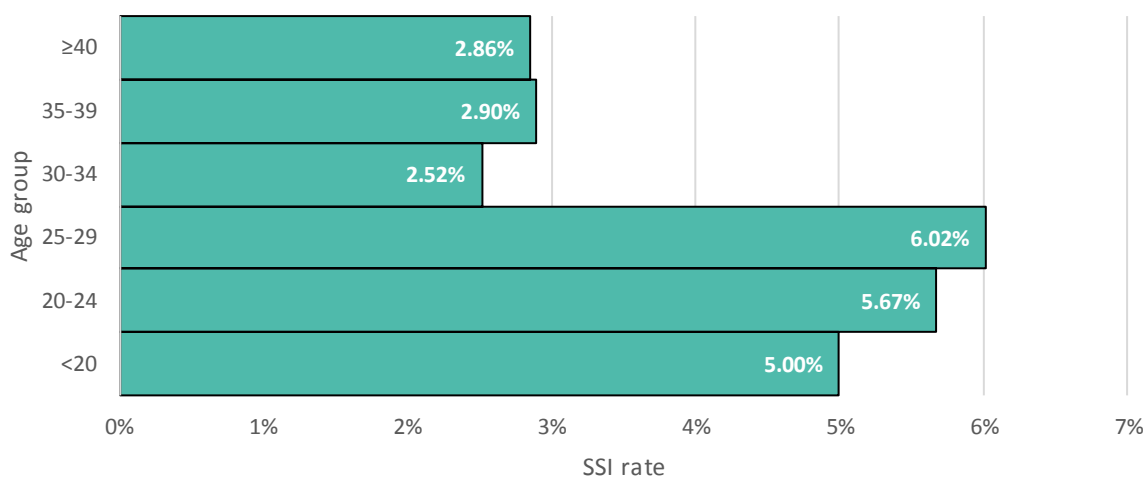


Figure 4 – Graph showing the incidence of SSI by age group.

Table 7 – Incidence of SSI by age group

Age group	No. of procedures	SSI	SSI rate (95% CI)
<20	20	1	5.00% (0.13-24.87)
20-24	141	8	5.67% (2.48-10.87)
25-29	266	16	6.02% (3.48-9.58)
30-34	278	7	2.52% (1.02-5.12)
35-39	138	4	2.90% (0.80-7.26)
≥40	35	1	2.86% (0.07-14.92)
Unknown	100	5	5.00% (1.64-11.28)

In 2017, there was a substantially higher SSI rate in women under the age of 30. Age appears to be a significant factor in the probability of having an SSI ($P=0.030$). The entire sample group had a mean age of 29.7 (median 30), and this was slightly lower at 27.7 when only including those who had an SSI (median 26).

Incidence of SSI by BMI

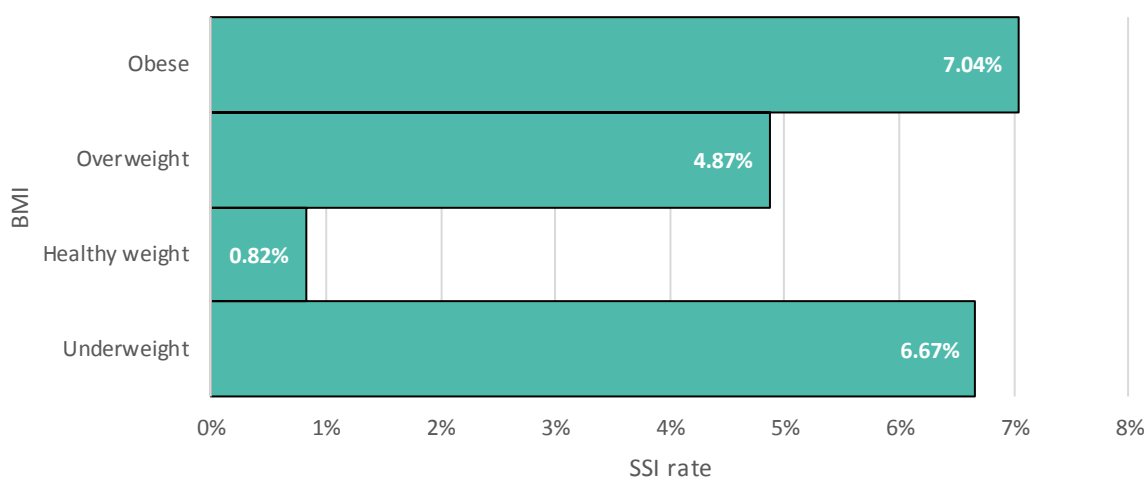


Figure 5 – Graph showing the incidence of SSI by BMI category.

Table 8 – Incidence of SSI by BMI category.

BMI	No. of procedures	SSI	SSI rate (95% CI)
Underweight	<18.5	1	6.67% (0.17-31.95)
Healthy weight	18.5-24.9	2	0.82% (0.10-2.94)
Overweight	25.0-29.9	11	4.87% (2.45-8.54)
Obese	≥30.0	24	7.04% (4.56-10.29)
Unknown		4	2.61% (0.72-6.56)

In 2017, there was a very clear association between BMI and the probability of having an SSI. The mean BMI for all procedures was 30.3 (median of 28), but this went up to 35.9 (median 33.5) when only those with an SSI were included (with this trend being very significant at the health board level at $P < 0.001$). When comparing BMI groups, the SSI rate in overweight mothers (including obese mothers) was significantly higher ($P < 0.001$), and this was also true when comparing obese mothers to all other BMI groups ($P < 0.005$). The sample group of underweight patients was too small to show any significant trends ($P = 0.701$).

Incidence of SSI by number of previous C sections

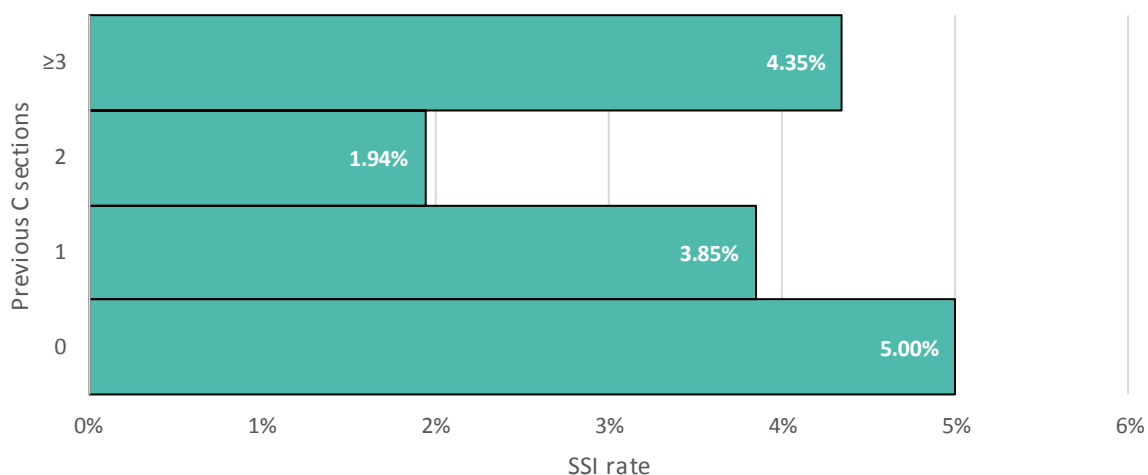


Figure 6 – Graph showing incidence of SSI by the number of previous C sections.

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

Previous C sections	No. of procedures	SSI	SSI rate (95% CI)
0	560	28	5.00% (3.35-7.15)
1	286	11	3.85% (1.94-6.78)
2	103	2	1.94% (0.24-6.84)
≥3	23	1	4.35% (0.11-21.95)
Unknown	6	0	0.00% (0.00-45.93)

When comparing the number of C sections a mother has undergone prior to the current procedure there are no clear trends and, while patients who have had two prior C sections have a lower SSI rate, the confidence interval is rather wide and overlaps with all other groups.

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

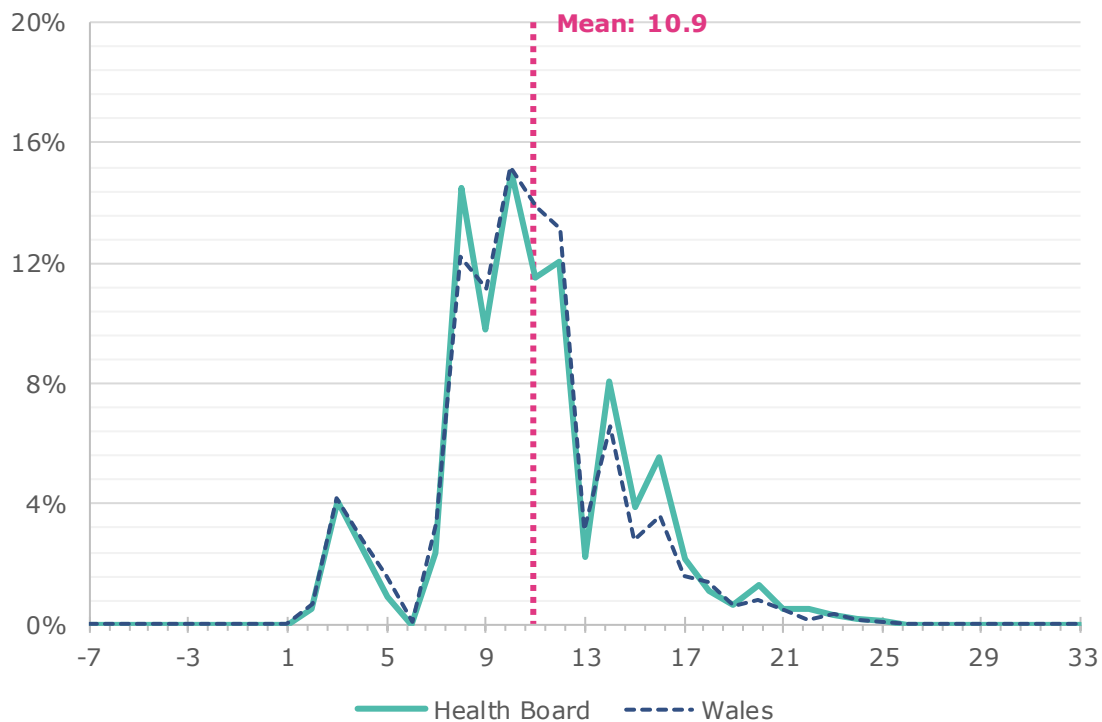


Figure 7 – Graph showing spread of risk score across all procedures (as percentage of all procedures reported). The score has a theoretical range of -7 to 33 for C section procedures in Wales.

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 10.9 (median 11). When counting only those who have developed an SSI, the mean risk score increases to 12.5 (median 12), which means that mothers who developed an SSI had a significantly higher aggregate risk score than those who did not ($P=0.006$). The risk profile of the health board was slightly higher 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

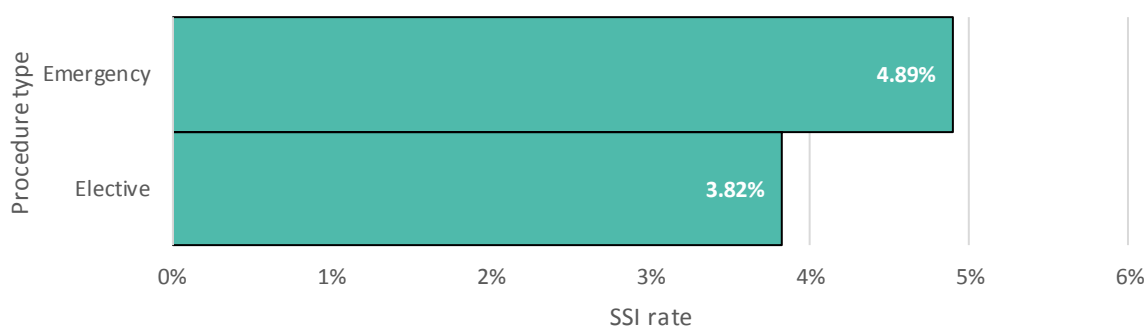


Figure 8 – Graph showing incidence of SSI by type of procedure.

Table 10 – Incidence of SSI by procedure type.

Age group	No. of procedures	SSI	SSI rate (95% CI)
Elective	471	18	3.82% (2.28-5.97)
Emergency	470	23	4.89% (3.13-7.25)
Unknown	37	1	2.70% (0.07-14.16)

In 2017, the SSI rate in emergency procedures was higher than in elective procedures, but not significantly so (28% increase, $P=0.421$). The split of procedures is very even, with 49.9% of procedures being classed as emergencies (CS1, CS2 and CS3) and the remaining 50.1% being classed as elective (CS4).

Incidence of SSI by antibiotic prophylaxis

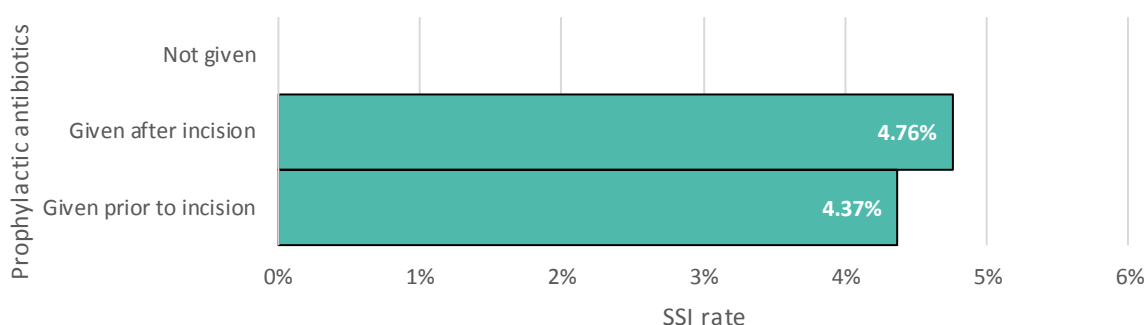


Figure 9 – Graph showing incidence of SSI by timing of prophylactic antibiotics.

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

Prophylactic antibiotics	No. of procedures	SSI	SSI rate (95% CI)
Given prior to incision	846	37	4.37% (3.10-5.98)
Given after incision	21	1	4.76% (0.12-23.82)
Not given	3	0	0.00% (0.00-70.76)
Unknown	108	4	3.70% (1.02-9.21)

99.7% of mothers were given prophylactic antibiotics and, of these, 97.6% were given prior to surgical incision. There is a slightly higher SSI rate when antibiotics are administered after incision, but this was not significant (9% increase, $P=0.932$).

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

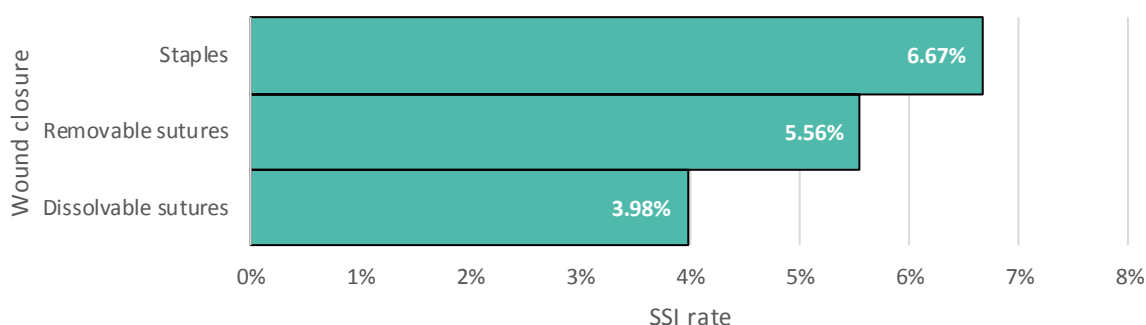


Figure 10 – Graph showing incidence of SSI by type of skin closure used.

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)	927	40	4.31% (3.01-5.62)
Dissolvable sutures	729	29	3.98% (2.68-5.66)
Removable sutures	198	11	5.56% (2.81-9.72)
Staples	30	2	6.67% (0.82-22.07)
Unknown	21	0	0.00% (0.00-16.11)

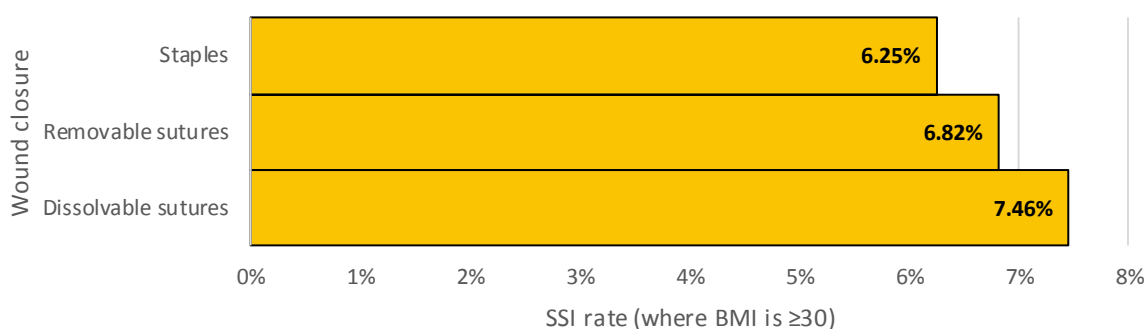


Figure 11 – Graph showing the incidence of SSI by skin closure in mothers with BMI ≥ 30.

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)	316	23	7.28% (4.41-10.14)
Dissolvable sutures	228	17	7.46% (4.40-11.67)
Removable sutures	88	6	6.82% (2.54-14.25)
Staples	16	1	6.25% (0.16-30.23)
Unknown	9	0	0.00% (0.00-33.63)

In 2017, the SSI rate was 55% higher when staples were used. In contrast to other health boards however, the SSI rate was 16% lower when staples were used in obese patients. Neither of these trends are significant ($P=0.537$ and $P=0.877$, 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

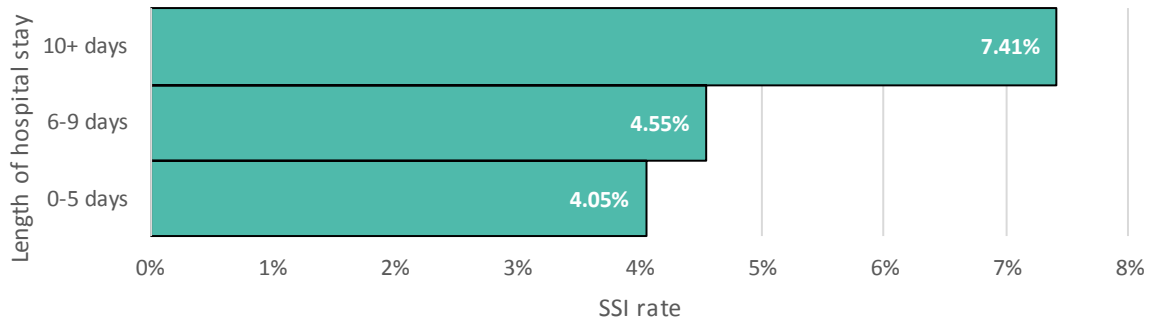


Figure 12 – Graph showing incidence of SSI by length of hospital stay.

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	790	32	4.05% (2.79-5.67)
6-9 days	44	2	4.55% (0.56-15.47)
10+ days	27	2	7.41% (0.91-24.29)
Unknown	117	6	5.13% (1.90-10.83)

For all patients undergoing a C section, the mean hospital stay following the procedure is 3.4 days (median of 2). When only mothers who have had an SSI are included, this was lower at a mean of 3.1 days (median 2). This trend was not significant ($P=0.928$).

Length of midwifery care

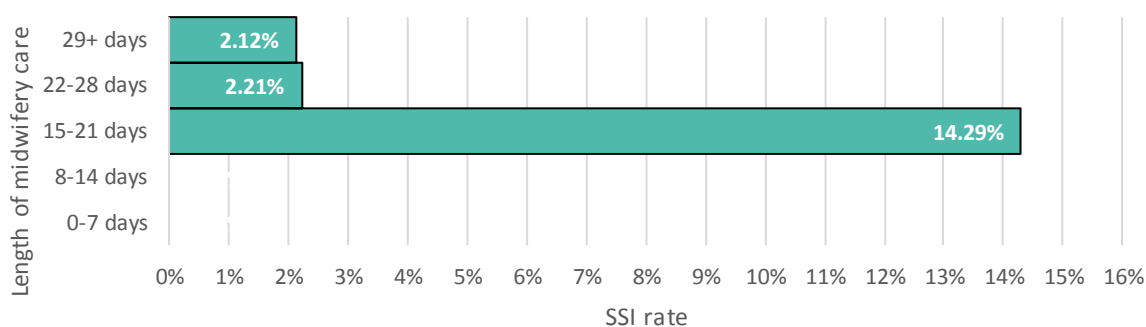


Figure 13 – Graph showing incidence of SSI by length of midwifery care post-procedure.

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	0	0	0.00% (0.00-0.00)
8-14 days	2	0	0.00% (0.00-84.19)
15-21 days	14	2	14.29% (1.78-42.81)
22-28 days	543	12	2.21% (1.15-3.83)
29+ days	236	5	2.12% (0.69-4.87)
Unknown	183	23	12.57% (8.14-18.26)

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 28.2 days under the care of a midwife (median of 28), 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 reduces to a mean of 27.7 days (median of 28). At the health board level, this trend was significant (P=0.719).

In both categories, the time a mother spent under the care of a midwife was substantially and consistently longer at this health board than in all other health boards.

Time to onset of infection

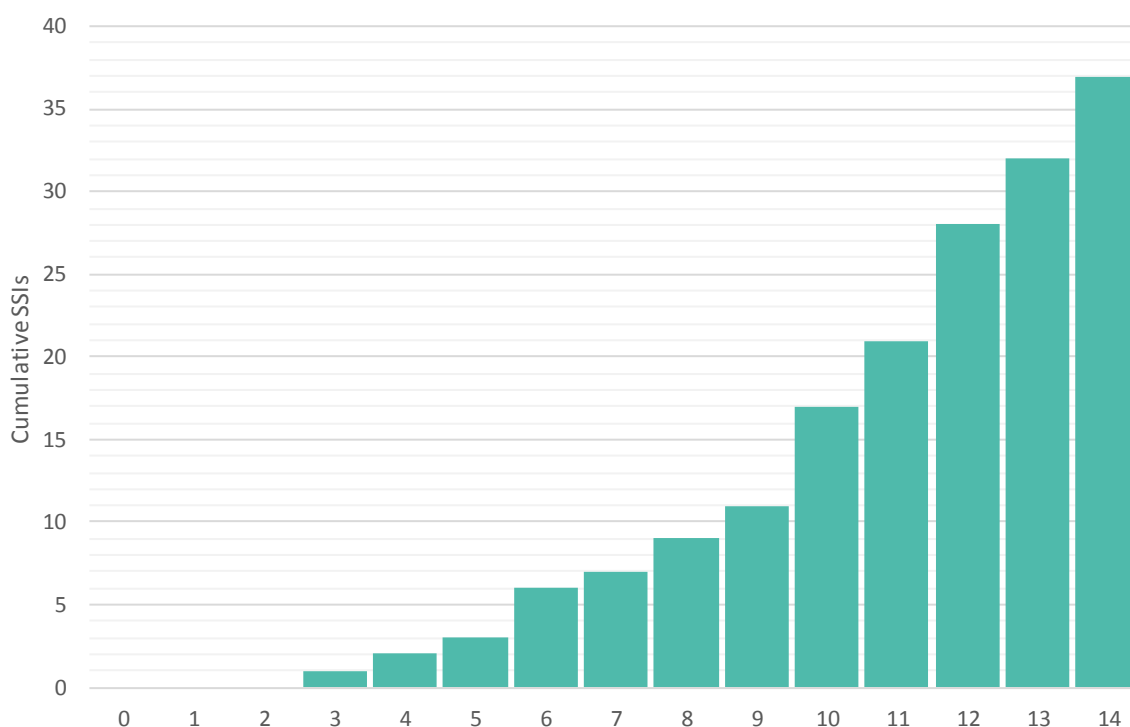


Figure 14 – Graph showing cumulative SSIs up to 14 days post-procedure. Blank infection dates excluded.

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 five (12%) infections where the date of onset was not formed. Within the first 14 days, the mean time to infection was 10.3 days, with a median of 11. The greatest number of infections were reported on day 12 (n=7).

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.
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