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ANNUAL REPORT: 2014

Caesarean-Section Surgical Site Infection Surveillance

(Includes data from 01/01/2014 - 31/12/2014)

ALL WALES

VERSION 1

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SUMMARY

- 7650 surveillance forms were returned to WHAIP in 2014, 7402 (97%) were valid for data analysis
- Compliance with the surveillance scheme was 92.2%, a decrease from 2013 (where compliance was 95.0%)
- There were 367 infections reported to WHAIP for 2014
- Superficial infections were the most common and accounted for 78% of infections
- 99% of post discharge forms were received by WHAIP
- No significant differences in SSI rate were noted between age groups, but the risk of an SSI increases in obese patients compared to overweight and healthy patients
- Antibiotic prophylaxis was given to 99% of patients
- There is an increase in SSI rate when staples used for skin closure
- The mean length of midwifery care was 22 days, this increased if the mother had an infection
- The mean onset of infection was 10 days after the procedure. Most SSIs were captured on day 7 (n=35) and day 10 (n=35). The follow up period of 21 days, 14 days and 10 days accounts for 95%, 79% and 59% of SSIs captured respectively
- The SSI rate in Wales is lower than that of Northern Ireland (8.2%), and (although not directly comparable due to differing post-discharge surveillance processes) the Wales SSI rate is higher than in Scotland (1.4%)

INTRODUCTION

The Welsh Healthcare Associated Infection Programme (WHAIP) is part of the Public Health Wales Health Protection division. WHAIP were instructed by the Welsh Government to develop and support the implementation of surveillance following Caesarean section procedures undertaken in NHS hospitals in Wales, which was a mandatory process from January 2006.

Surgical Site Infection (SSI) is an important area for surveillance and remains a complication of surgery where human and financial costs are high^{1,2}. Additionally, most infections are preventable³. An SSI is the second most common infection following a c-section, within a group of patients who are generally considered to be young, fit and well females⁴.

Serious patient consequences can result from SSIs, including pain, suffering, and on some occasions they require additional surgical interventions⁴. It is important to recognise that SSIs can range from a relatively trivial wound discharge with no other complications, to a life-threatening condition. Other clinical outcomes of SSI include poor scars that are cosmetically unacceptable, persistent pain and itching, restriction of movement, particularly when over joints, and a significant impact on emotional wellbeing.

The report includes data captured both during the hospital stay and post-discharge within the community. The surveillance incorporates data collected by clinical teams and midwives and uses internationally agreed definitions⁵, allowing Welsh data to be compared with and be incorporated into other international databases, such as the ECDC European SSI database. A clear understanding of how to diagnose an SSI is crucial to accurate data collection. WHAIP have developed a training package which addresses the diagnosis and care of wounds.

SECTION 1: Results

Surveillance form returns

Table 1.1 Number of inpatient, post-discharge and valid forms returned for the surveillance in 2014.

No. of in-patient forms returned	No. of expected post-discharge forms	No. of post-discharge forms returned (% forms returned)	No. of valid forms used for data analysis*	% of valid forms for data analysis*
7650	7650	7545 (99)	7402	97 (7402/7650)

The SSI rate provided throughout this report is based on an overall infection rate (infections captured pre-discharge or post-discharge), unless otherwise stated. To obtain the overall SSI rate, only valid forms could be utilised in data analysis.

*Valid forms include procedure records with an SSI complete on the main form or where infection data could be updated by the completion of a post-discharge form. If the SSI field is left blank, the patient record is not valid as we cannot assume that the patient did not have an SSI.

$$\% \text{ of valid forms} = \frac{\text{Number of valid forms analysed}}{\text{Number of main forms received}} \times 100$$

Of the 7650 forms returned for 2014, 99% (7545/7650) had a corresponding post-discharge form. Some forms had an incomplete SSI field, especially on the main form thus reducing the number of valid forms overall for inclusion in data analysis to 97%. The percentage of valid forms in 2014 was less than in 2013 (99%) and also in 2012 (99%).

Completion rates of surveillance forms

Details on the completion of the SSI field on the main and post-discharge form for all Wales (2014) is shown in table 1.2. Table 1.3 displays other data items on the main and post-discharge form that have a completion of $\leq 85\%$.

The procedure date has not been included as a data item in table 1.2 and 1.3 since all data extractions are based on a record having a procedure date.

All data items were completed above 85% apart from BMI, which was 81% complete.

Table 1.2 % completion of the SSI field on the c-section surveillance form (main and post-discharge) for Wales (2014).

Data Item	No. completed	No. expected	% Complete
Inpatient SSI (Yes/No):	7523	7650	98.3
If Yes, SSI type	30	36	83.3
If Yes, Infection date	36	36	100
Post-discharge SSI* (Yes/No):	7515	7545	99.6
If Yes, Infection date	325	331	98.2
If Yes, SSI type	310	331	93.7
Overall SSI**	7402	7650	96.8

Number expected is based on the number of post-discharge forms received.

** Includes procedures with an SSI complete on the main form or updated by completion of the SSI field on a post-discharge form.

Table 1.3 Data items on the c-section SSI surveillance form with ≤85% completion for Wales in 2014.

Data Item	No. completed	No. expected	% Complete
BMI	6222	7650	81.3

Surveillance Compliance

Table 1.4 shows the compliance of Wales in the mandatory c-section surveillance for 2014. The table includes the number of surveillance forms returned to WHAIP for 2014 and the number of valid surveillance forms returned (as previously detailed in table 1.1). The compliance figure is derived from the number of valid surveillance forms returned to WHAIP divided by the number of c-sections reported to NWIS.

Table 1.4 Coverage of the c-section SSI Surveillance compared to procedures reported to the PEDW database at NWIS for Wales in 2014

	No. of surveillance forms returned to WHAIP	No. of valid surveillance forms returned to WHAIP*	No. of C sections reported to PEDW*	% Compliance (all Health Boards in Wales)
All Wales	7650	7402	8031	92.2

* valid surveillance forms – procedures with an SSI complete on the main form or where infection data could be updated post-discharge

The All Wales compliance with the c-section surveillance has decreased to 92% for 2014, compared with 95% for 2013.

Figure 1.1 displays the compliance trend for 2008-2014. Although compliance has decreased in 2014 compared with 2011-2013, all Wales compliance with the SSI surveillance scheme still remains excellent at above 90%.

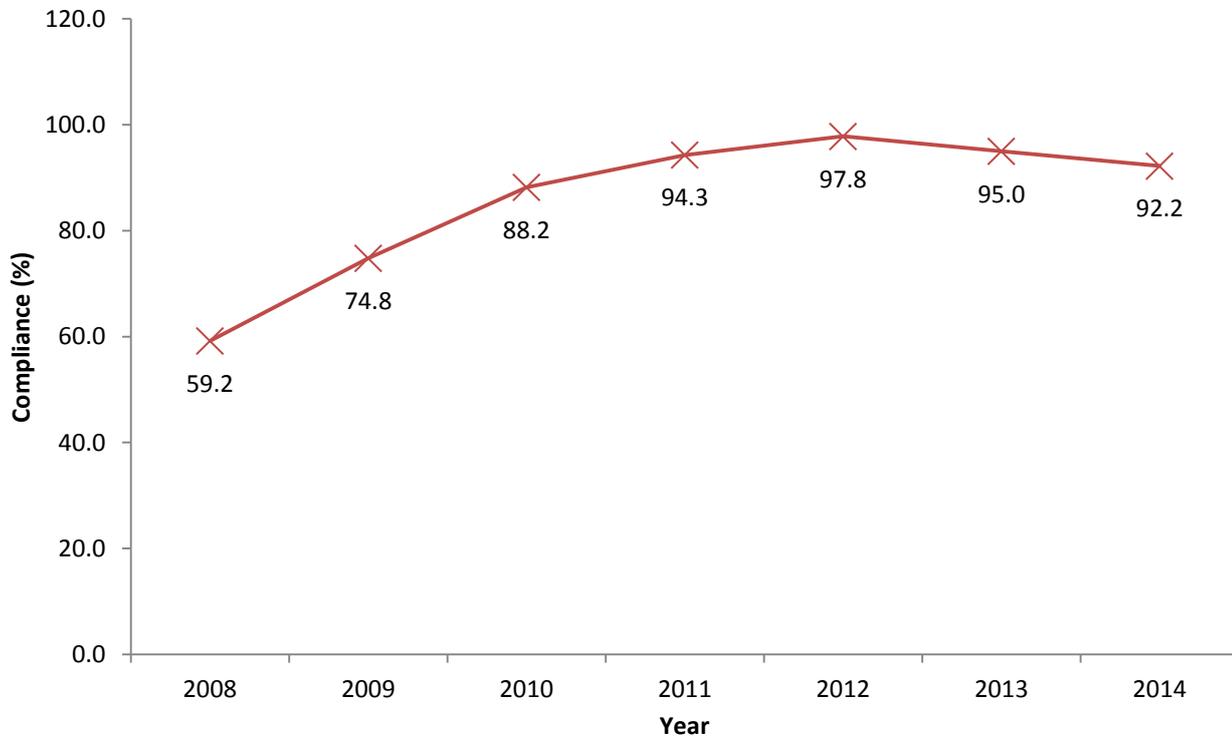


Figure 1.1 Trend rate for compliance in Wales 2008-2014

Summary:

97% of data received could be utilised for data analysis

Data items on the form were generally completed well however the BMI field remains blank in 19% of records

All Wales compliance has decreased over the last 3 years, but still remains above 90%

SECTION 2. All Wales SSI rate

Incidence of in-patient, post-discharge and overall SSI

Table 2.1 provides the inpatient SSI rate post C-section surgery. A total of 36 SSI were identified giving an inpatient rate of 0.48%. Table 2.2 provides the number and SSI for infections identified after discharge of the patient from hospital only. A post-discharge rate of 4.40% was noted with 331 SSI identified. Table 2.3 provides the overall SSI rate post C-section surgery and includes all SSI identified either pre or post-discharge from hospital. A total of 367 SSI were captured during the surveillance with an overall SSI rate of 4.96% for 2014. All rates are based on valid forms only.

The SSI rates calculated and provided in the remainder of this report are based on an overall rate unless otherwise stated. As the length of hospital stay after a caesarean section is generally between two and four days⁶, the majority of SSIs will be captured post-discharge in the community.

Table 2.1 Incidence of inpatient SSI in Wales for 2014

	No. of procedures analysed	No. of SSI *	Overall SSI rate (%) * (95% CI)
All Wales	7523	36	0.48 (0.34-0.66)

Table 2.2 Incidence of post-discharge SSI in Wales for 2014

	No. of procedures analysed	No. of SSI *	Overall SSI rate (%) * (95% CI)
All Wales	7515	331	4.40 (3.94-4.91)

Table 2.3 Incidence of overall SSI** in Wales for 2014

	No. of procedures analysed	No. of SSI *	Overall SSI rate (%) * (95% CI)
All Wales	7402	367	4.96 (4.46-5.49)

* Figures based on valid surveillance forms only. This only includes procedures with either an SSI field completed on the main form or where infection data could be updated post-discharge.

** Overall SSI rate (%) is based on the valid forms rule previously described and is not based on the inpatient SSI rate combined with the post-discharge SSI rate.

These rates can be compared to SSI rates in 2014 in Scotland (1.4%)^{7,8} and Northern Ireland rates for 2013/14 (8.2%)⁹. Scotland has a different post-discharge process to Wales and Northern Ireland as they follow up for 10 days after the procedure. As with Wales, the SSI follow up is 30 days post procedure for Northern Ireland.

Incidence of SSI over time

Data on C-section SSI surveillance have been collected since 2006. It is important to note that not all Health Boards were participating in the surveillance from this time and data is more reliable from 2010. Table 2.4 provides the overall SSI rate for 2010 – 2014 and broken down by elective and emergency procedures. Figure 2.1 provides the SSI trend over time (2010-2014) by quarter.

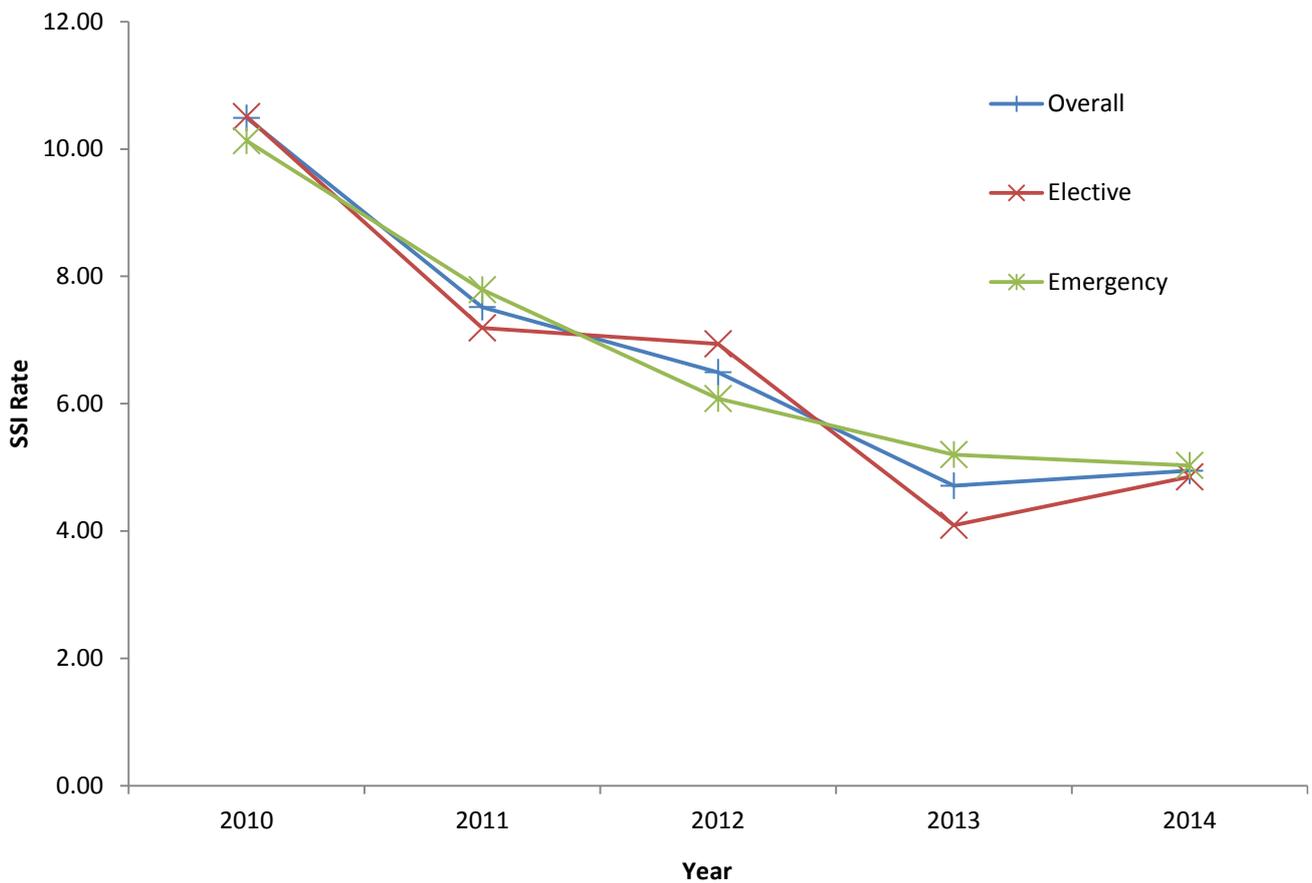


Figure 2.1 Overall, elective and emergency SSI rate in Wales for 2010-2014

Table 2.4 Overall SSI rate in Wales for 2006 - 2014

Operation type	Year	No. Procedures	No. SSI	% SSI (95% CI)
All C-section procedures	2014	7402	367	4.96 (4.46-5.49)
	2013	7962	375	4.71 (4.25-5.21)
	2012	8193	532	6.49 (5.95-7.07)
	2011	7756	583	7.52 (6.92-8.15)
	2010	7456	782	10.49 (9.77-11.25)
Elective	2014	3112	151	4.85 (4.11-5.69)
	2013	3349	137	4.09 (3.43-4.84)
	2012	3316	230	6.94 (6.07-7.89)
	2011	3170	228	7.19 (6.29-8.19)
	2010	3055	321	10.51 (9.39-11.72)
Emergency	2014	4197	212	5.05 (4.39-5.78)
	2013	4479	233	5.20 (4.56-5.91)
	2012	4687	285	6.08 (5.40-6.83)
	2011	4431	345	7.79 (6.99-8.65)
	2010	4136	419	10.13 (9.18-11.15)

The SSI rate is slightly higher for emergency c-sections than for elective c-sections but this difference is not significant.

Incidence of SSI by infection type

The type of SSI recorded on the surveillance form can be categorised into either superficial, deep or organ/space infections, utilising specific definitions. Table 2.5 details the percentage of infections by type of SSI. The SSI are categorised into superficial infections and deep seated infections (which are deep or organ/space infections). Table 2.6 and 2.7 provides the overall SSI rate and post-discharge SSI rate, respectively, broken down by SSI type in 2014.

Table 2.5 Type of SSI, specifically superficial and deep seated infections for C-section procedures carried out in Wales for 2014

SSI type	%
Superficial infections	77.9
Deep seated infections	14.7
Unknown	7.4

Table 2.6 Overall SSI rate (%) broken down by SSI type for Wales in 2014

SSI type	No. SSI	% SSI (95% CI)
Superficial infections	286	3.86 (3.43-4.34)
Deep seated infections	54	0.73 (0.55-0.95)
Unknown	27	0.36 (0.24-0.53)

Table 2.7 Post-discharge SSI rate (%) broken down by SSI type, specifically superficial and deep seated infections for Wales in 2014

SSI type	No. SSI	% SSI (95% CI)
Superficial infections	259	3.45 (3.04-3.89)
Deep seated infections	51	0.68 (0.49-0.88)
Unknown	21	0.28 (0.17-0.43)

Summary:

All Wales SSI rate following c-section in 2014 was 5.0% compared to 6.5% and 4.7% in 2012 and 2013 respectively.

Most common infection type is superficial (77.9% of infections)

Overall SSI rate in 2014 in Wales, broken down by SSI type: 3.9% superficial infections and 0.7% deep seated infections.

Post discharge SSI rate in 2014 in Wales, broken down by SSI type: 3.5% superficial infections and 0.7% deep seated infections.

Both elective and emergency SSI rates decreased by >5% when comparing data from 2010 to 2015.

SECTION 3. General demographics

This section gives information about the age groups and BMI of patients and the number of SSIs associated with each category.

Figure 3.1 provides a pyramid plot showing the age and SSI rates and table 3.1 provides the number of SSI by the specified age groups. SSI by BMI is displayed in table 3.2

Incidence of SSI by age category

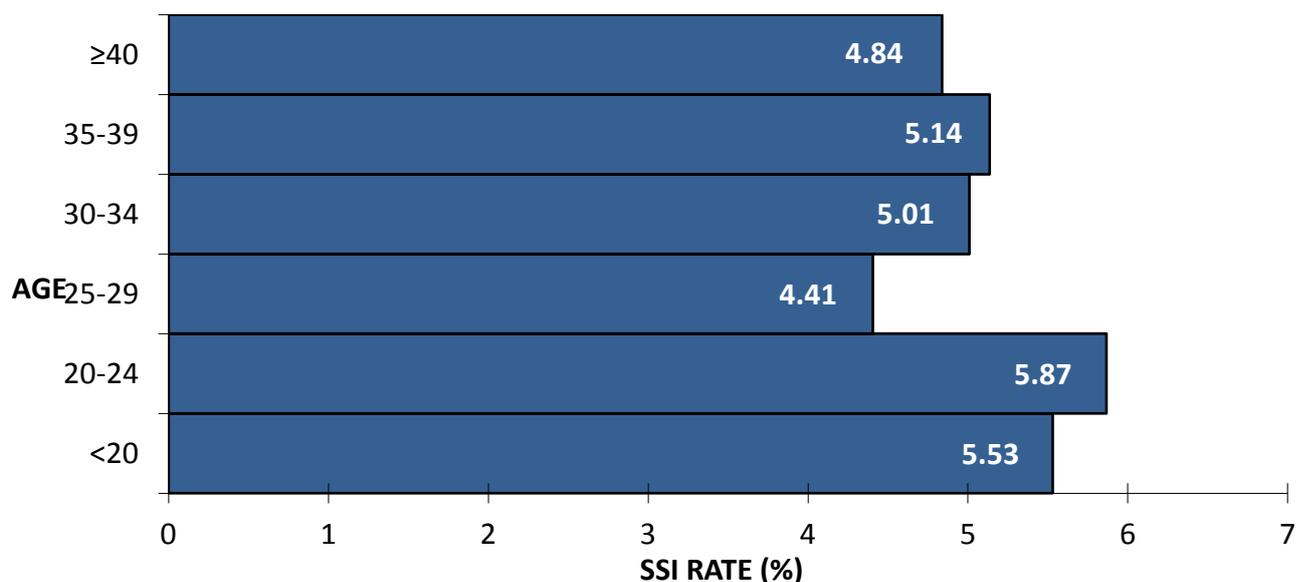


Figure 3.1 Pyramid plot showing age and corresponding SSI rate (%)

Table 3.1 C-section SSI with age in Wales in 2014 (specific age bands based on those utilised by The National Sentinel Caesarean section Audit report)¹⁰

Age group	No. of valid procedures*	No. of SSI	% SSI (95% CI)
<20	217	12	5.53 (2.86-9.66)
20-24	1142	67	5.87 (4.55-7.45)
25-29	2020	89	4.41 (3.54-5.42)
30-34	2257	113	5.01 (4.13-6.02)
35-39	1207	62	5.14 (3.94-6.59)
≥40	372	18	4.84 (2.87-7.65)

*187 procedures have been excluded because the age question was not completed

There was no significant difference in SSI rate found between the age categories.

Incidence of SSI by BMI category

Table 3.2 C-section SSI with BMI in Wales in 2014 (using World Health Organisation BMI categories)¹¹

BMI	No. of procedures*	No. of SSI	% SSI
Underweight <18.5	78	4	5.13 (1.40-13.13)
Healthy weight 18.5 – 24.9	1879	70	3.73 (2.90-4.71)
Overweight 25 – 29.9	1907	83	4.35 (3.47-5.40)
Obese ≥30	2162	183	8.56 (7.37-9.88)

*1376 procedures have been excluded because the BMI question was not completed

There is a significant increase in the infection rate between healthy weight patients and obese patients for 2014 ($p < 0.001$).

Summary:

There was no significant difference in the SSI rate by age in 2014

There was a significant increase in the SSI rate for obese patients compared with the healthy weight patients in 2014

SECTION 4. Details of the surgical procedure

The following section provides SSI rates associated with specific operation variables such as the type of operation (elective, emergency), use of and timing of antibiotic prophylaxis and skin closure type.

Incidence of SSI following elective and emergency procedures

Table 4.1 C-section SSI in elective and emergency surgical procedures in Wales in 2014

Operation Type	No. Procedures*	No. SSI	% SSI (95% CI)
Elective Procedure	3112	151	4.85 (4.11-5.69)
Emergency Procedure	4197	212	5.05 (4.39-5.78)

*93 procedures have been excluded because the operation type was not completed

The SSI rate in the elective category has increased from 2013 (4.09%) and the SSI rate in the emergency category has decreased compared to 2013 (5.20%).

In 2014, there was no significant difference in the SSI rate between elective and emergency procedures ($p=0.7$).

Incidence of SSI by timing of antibiotic prophylaxis

Table 4.2(a) Percentage (%) of C-section procedures by timing of antibiotic prophylaxis in Wales in 2014

Timing of antibiotic prophylactic	No. Procedures*	%
Prior to incision	6317	90.8
After incision	640	9.2

*388 procedures have been excluded because the prophylactic antibiotic question was not completed

Table 4.2(b) C-section SSI with antibiotic prophylaxis in Wales in 2014

Was prophylactic antibiotic given?	No. Procedures*	No. SSI	% SSI (95% CI)
Yes prior to incision	6317	322	5.10 (4.56-5.69)
Yes after incision	640	26	4.06 (2.65-5.95)
No	57	3	5.26 (1.09-15.38)

*388 procedures have been excluded because the prophylactic antibiotic question was not completed

640 procedures received antibiotic prophylaxis after incision, contrary to NICE recommendations, where it is recommended prior to incision³. No significant differences were seen in the SSI rate between the timing of prophylaxis ($p=0.10$), and whether or not prophylaxis was administered ($p=0.9$).

Incidence of SSI by skin closure type

Table 4.3 Percentage (%) of c-section procedures with type of skin closure used in Wales in 2014

Type of skin closure	No. Procedures*	%
Dissolvable suture	3584	49.7
Removable suture	3120	43.3
Staples	503	7.0

*195 procedures have been excluded because the type of skin closure utilised was not completed

In 2013, 44% of procedures used dissolvable sutures, 49% used removable sutures and 7% used staples. There was one procedure which used glue.

Table 4.4 C-section SSI with type of skin closure used in Wales in 2014

Type of skin closure	No. Procedures*	No. SSI	% SSI (95% CI)
Dissolvable suture	3584	129	3.60 (3.01-4.28)
Removable suture	3120	177	5.67 (4.87-6.57)
Staples	503	55	10.93 (8.24-14.23)

*195 procedures have been excluded because the type of skin closure utilised was not completed

There was a significant difference between the mean SSI rates of staples and dissolvable/removable sutures ($p < 0.01$) and also between removable and dissolvable sutures ($p < 0.01$). The use of removable sutures increased the risk of having an infection compared to dissolvable sutures. The use of staples increased the risk of having an infection compared to a removable or dissolvable suture, but further detail around risk factors is required before further analysis can be completed.

Summary:

No difference in SSI rates were noted for elective versus emergency procedures, however there is a need to determine if SSI rates differ when other variables are combined with these type of procedures, e.g., skin closure type, BMI etc.

Antibiotic prophylaxis was given to 99% of patients.

91% of patients received their antibiotic prior to incision, 9% after to incision.

Use of removable sutures increased the rate of SSI compared with dissolvable sutures as a skin closure type. Use of staples increases the risk of SSI (when compared to removable and dissolvable sutures) however more data are required for further statistical analysis.

SECTION 5. Post-discharge details and onset of infection

The following section provides a summary on post discharge care and infection details.

Length of stay in hospital

Table 5.1 C-section SSI by hospital stay length (days)

Length of hospital stay (days)	No. Procedures*	No. SSI	% SSI (95% CI)
0 – 5	6341	303	4.78 (4.26-5.35)
6 – 9	316	22	6.96 (4.36-10.54)
> 10	94	11	11.70 (5.84-20.94)

*651 procedures had hospital discharge dates missing and have therefore been excluded

The mean length of stay in hospital was 3 days and the median length of stay was 2 days.

There was a significant increase in the risk of infection between hospital stays of 0-5 days and >10 days ($p < 0.01$). There was no significant change in the risk of infection between 0-5 days and 6-9 days ($p = 0.07$).

Length of midwifery care

Table 5.2 C-section SSI by length of midwifery care (days)

Length of midwifery care (days)	No. Procedures*	No. SSI	% SSI (95% CI)
≤10	309	8	2.59 (1.12-5.10)
11-14	1164	28	2.41 (1.60-3.48)
15-21	2066	98	4.74 (3.85-5.78)
22-28	2130	132	6.20 (5.19-7.35)
≥29	1018	72	7.07 (5.53-8.91)

*715 procedures had midwifery discharge dates missing and have therefore been excluded from this table

The mean length of midwifery care post discharge was 22 days and the median length midwifery care was 20 days. If the mother had an SSI, the average length of midwifery care increased from 22 days to 25 days (median values were 20 days and 22 days, respectively).

Figure 5.1 shows the occurrence of infection and the number of days post surgery. 7 procedures are not included within this figure as 6 did not have infection dates and 1 was an infection, 30 days after the procedure and this captures data to 28 days post-procedure

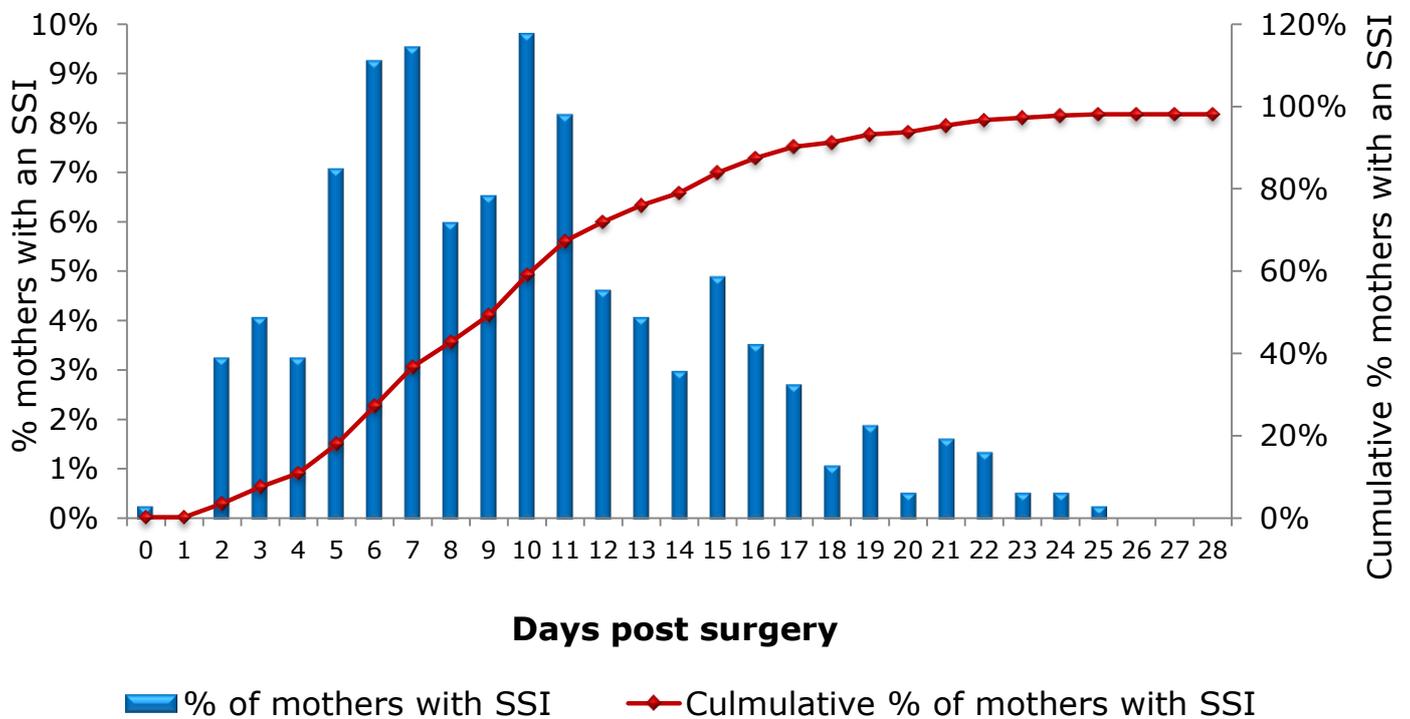


Figure 5.1 Post discharge surveillance and onset of infection

The mean onset of infection was 10 days after a c-section procedure and the median onset was 9 days after a c-section procedure.

Summary:

Mean length of midwifery care was 22 days; median length of midwifery care was 20 days

Average length of discharge from midwifery care increased by 3 days if the mother had an SSI

Greatest number of infections captured days 1-9 (n=181), highest number on day 10 (n=36)

Welsh data for 2014 suggests midwifery care should ideally be followed up until day 28 post-surgery (16 infections were captured days 21-28), however to fit with maternity case patterns post-discharge, a minimum of 14 days would be recommended.

Using the 2014 data, 21 days, 14 days and 10 days midwifery follow up allowed for 95%, 79% and 59% of SSIs to be captured, respectively

Discussion and conclusions

The surveillance is currently running at 92.2% compliance and, although this is a significant increase since the surveillance scheme began, there has been a decrease for the last few years where the compliance was 95.0% (2013), 97.8% (2012) and 94.3% (2011). The overall SSI rate has decreased by 5.5% compared with rates in 2010, but there was a slight increase from 4.9% in 2013 to 5.0% in 2014.

The Welsh c-section surgical site infection surveillance scheme provides surgical teams with an indication of the current Welsh infection rate and, details of possible risk factors associated with post surgical infection.

The surveillance in Wales for 2014 has identified obesity as a significant ($p < 0.01$) risk factor of increased infection post surgery. An increase in the SSI rate was noted when removable sutures were used compared to dissolvable sutures as the skin closure type. There is an added risk of infection if sutures have to be physically removed, asepsis techniques in this situation is essential. Traditionally, staples have been used for obese women, further increasing the risk of infection. Use of staples also increased the SSI rate but more data are required to confirm this. The method of skin closure has been shown to increase SSI rates in other studies^{12,13}. No significant difference was seen in the SSI rate with antibiotic prophylaxis, before or after the incision ($p = 0.25$) although this has showed a different pattern in other years in the Welsh data. All should be given prior to incision to meet NICE guidance.

There are differences between hospitals/Health Boards in the degree of post-discharge surveillance that is undertaken, and it has been well demonstrated in previous years that the length of post-discharge surveillance impacts on their infection rates. From the 2014 data the mean onset of infection was 10 days after a C-section procedure (median = 9 days) and the surveillance has demonstrated the importance of carrying out post-discharge surveillance for a minimum of 14 days. Only 59% of infections were captured after 10 days follow-up. This increased to 79% and 95% after 14 days and 21 days follow-up, respectively. It is difficult, however to determine if all SSIs were captured in the dataset due to the variance that hospitals/Health Boards have in their length of midwifery care. The importance of carrying out post-discharge surveillance has been highlighted in this report and is increasingly essential due to the continual decrease in the hospital stay following a C-section procedure. In 2014, the mean hospital stay was 3 days and the median was 2 days. Comparison of SSI rates in other countries within and outside of Europe is difficult as the majority do not have continuous post-discharge surveillance.

C-section SSI surveillance concentrates on capturing superficial infections, which constitute the majority of infections identified in the community. It is difficult to assess whether under-reporting of deep seated infections is occurring as we do not capture readmission data at present.

This all-Wales report should be used in conjunction with hospital/Health Board specific reports. Continuation of this scheme is required with correct diagnosis and reporting of infections, to ensure an accurate all Wales infection rate is calculated and for comparison of rates over time.

Overall, the infection rates should be interpreted with caution, as there has been some debate as to whether all hospitals/Health Boards in Wales are reporting SSIs using the same standards, with some over-reporting and others under-reporting. To address this, WHAIP have reviewed the SSI surveillance form so that it includes more information around the infection. This will allow for a greater depth of validation as more detail of the infection is provided. The WHAIP team have also carried out a number of validation checks on the hospital reported data, giving them an opportunity to feedback to the hospital about their reporting of SSIs. An all Wales training package (for wound care and management)¹ has also been developed to help educate the staff that are involved in the surveillance scheme, in particular addressing the diagnosis of infections. The overall aim of this is to standardise the reporting of SSIs after a c-section across Wales. It is hoped that these developments will address the reporting differences and increase the confidence that can be placed in the reliable reporting of c-section SSIs throughout Wales.

¹ For further information of the wound care and management training package, please visit the WHAIP intranet site:
(<http://howis.wales.nhs.uk/sites3/page.cfm?orgid=379&pid=49916>)

References

1. Plowman, R. 2000. The socioeconomic burden of hospital acquired infection. *Euro surveillance: bulletin Europeen sur les maladies transmissibles= European communicable disease bulletin*, 5, (4) 49-50
2. Jenks, P.J., Laurent, M., McQuarry, S., & Watkins, R. 2014. Clinical and economic burden of surgical site infection (SSI) and predicted financial consequences of elimination of SSI from an English hospital. *Journal of Hospital Infection*, 86, (1) 24-33
3. NICE. Surgical site infections: prevention and treatment. 2014. [Accessed 10-11-2015]. Ref Type: Online Source
4. Sykes, P.K., Brodribb, R.K., McLaws, M.L., & McGregor, A. 2005. When continuous surgical site infection surveillance is interrupted: the Royal Hobart Hospital experience. *American journal of infection control*, 33, (7) 422-427
5. Horan, T.C., Gaynes, R.P., Martone, W.J., Jarvis, W.R., & Emori, T.G. 1992. CDC definitions of nosocomial surgical site infections, 1992: a modification of CDC definitions of surgical wound infections. *Infection Control*, 13, (10) 606-608
6. NHSChoices. Caesarean section - Recovery. [Accessed 17-7-2015]. 22-10-2015. Ref Type: Online Source
7. Health Protection Scotland 2015a, *Healthcare Associated Infection Annual Report 2014*, Health Protection Scotland, Glasgow.
8. Health Protection Scotland 2015b, *Surveillance of Surgical Site Infection Annual Report 2014*, Health Protection Scotland, Glasgow.
9. Health and Social Care Board & Public Health Agency 2014, *Health and Social Care Board and Public Health Agency - Annual Quality Report (2013/14)*, HSCB/PHA, Belfast.
10. Thomas, J. & Paranjothy, S. Royal College of Obstetricians and Gynaecologists Clinical Effectiveness Support Unit. National Sentinel Caesarean Section Audit Report. 2001. London: RCOG press. Ref Type: Generic
11. WorldHealthOrganisation(WHO). BMI Classification. [Accessed 22-10-2015]. 22-10-2015. Ref Type: Online Source
12. Johnson, A., Young, D., & Reilly, J. 2006. Caesarean section surgical site infection surveillance. *Journal of Hospital Infection*, 64, (1) 30-35
13. Killian, C.A., Graffunder, E.M., Vinciguerra, T.J., & Venezia, R.A. 2001. Risk factors for surgical-site infections following cesarean section. *Infection Control*, 22, (10) 613-617