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SUMMARY

- There number of hip procedures and knee procedures reported increased by 12% and 20% respectively between 2007 and 2008.
- Surveillance coverage was 70% for 2008, which was a small increase compared to 2007, but substantially lower than the 95% required by the Welsh Assembly Government. Surveillance coverage ranged from 39% to 96% in the former trusts participating.
- Up to date coded data was unavailable for some sites from HSW at the time of analysis, indicated by some coverage rates of greater than 100%. It is likely therefore that the coverage rates provided are an over-estimation.
- The inpatient SSI rate was 1.2% for hips and 1.3% for knees. 43% of infections were identified during the inpatient stay.
- The overall SSI rate was 2.4% for hips and 3.2% for knees. The 2008 infection rate for hips was slightly higher than in 2007; the knee infection rate remained the same. Infection rates ranged from 1.7% to 7.0% in the former trusts participating.
- The overall infection rate when length of patient follow up was taken into account was 0.7/1000 patient days followed, ranging from 0.1 to 1.5/1000 patient days followed in the former trusts participating.
- Infection rates for Wales were high compared to rates reported for other UK countries, even when length of follow up was taken into account.
- More than 80% of infections reported were superficial infections.

INTRODUCTION

In November 2002 the NHS Management Board in Wales agreed to adopt measures to reduce healthcare associated infections. The first step was to make orthopaedic surgical site infection surveillance mandatory in all sites in Wales performing joint replacement. A Welsh Health Circular (WHC (2003) 43) was issued to Chief Executives informing them of this.

Surgical site infections (SSI) are a substantial cause of mortality and morbidity among hospitalised patients. Studies on orthopaedic surgical site infections have shown them to result in considerable increases in lengths of stay, high re-hospitalisation rates, increased healthcare costs and significant reductions in health-related quality of life^{1,2}. Surveillance of orthopaedic SSI and participation in national surveillance schemes have previously been shown to contribute to significant reductions in SSI rates, by allowing units to recognise whether they have a problem and monitoring the affects of interventions introduced^{3,4}.

This surveillance incorporates data collected by clinical teams and uses internationally agreed definitions⁵, allowing Welsh data to be compared with and be incorporated into other international databases, such as the HELICS⁶ European SSI database. The purpose of the surveillance is to assist sites in monitoring their infection rates so that risk can be assessed and communicated and variations from the expected mean recognised and investigated.

This is the 6th national report on surgical site infections (SSI) following orthopaedic procedures in Wales, since the surveillance was made mandatory in September 2003. The data presented here is a summary of information reported by the 7 former Trusts performing orthopaedic surgery in Wales in the calendar year 2008.

A validation study of the 2008 orthopaedic SSI data has also been carried out. The results of this report should be read and interpreted in conjunction with the findings of the validation report, when they are available.

RESULTS

A total of 6856 questionnaires were reported in Wales with procedure dates in 2008. The procedure types for All Wales are detailed below:

	Elective primary hip arthroplasty	Elective primary knee arthroplasty	Emergency hip fracture surgery	Revision hip arthroplasty	Revision knee arthroplasty	Not Specified	Total
Wales	2612	3742	278	69	27	128	6856

This rest of this report is restricted to the 2 mandatory surveillance procedures: elective primary hip arthroplasty and elective primary knee arthroplasty

1. Questionnaire Return

A total of 6354 questionnaires were received for the 2 mandatory procedures with procedure dates in Wales in 2008. 3% (203) of these questionnaires were not included in the analysis because the question on whether the patient had a SSI had not been completed on either the inpatient or the post-discharge form. A valid post-discharge update was received for 65% of the questionnaires where it was expected. A breakdown of the questionnaire return for All Wales is provided in Table 1.

Table 1. Questionnaire return for Orthopaedic SSI Surveillance in All Wales in 2008

	No of inpatient forms received	No (%) of valid inpatient forms received ^A	No (%) of overall valid forms ^B	Proportion of forms with expected valid PD update ^C
Wales	6354	6085 (96%)	6151 (97%)	65% (4084/6262)

- A. Where inpatient SSI field has been answered yes or no**
- B. Where SSI field has been completed on either the inpatient or post-discharge form (percentage of total inpatient forms received).**
- C. Post discharge forms received where the PDSSI field has been answered yes or no/ inpatient forms received where a post discharge form is expected (ie no inpatient ssi and outcome is not death) *100**

2. Completion Rates

The completion rates for All Wales for the data items in the orthopaedic SSI questionnaire are detailed in Table 2 below. 6354 questionnaires were extracted with a procedure date in 2008 and the procedure type field completed as one of the 2 mandatory procedure types.

Table 2. Percentage completion of data items on the orthopaedic SSI questionnaires in Wales in 2008

Field Name	Expected Fields Completed	Fields Completed	% Completion
Sex	6354	6349	99.9%
Age	6354	6307	99.3%
Admission Date	6354	5760	90.7%
Procedure Date	Not applicable – all records have been extracted from database on the basis of procedure dates in 2008.		
Procedure	Not applicable – all records have been extracted from database on the basis of procedure being “elective primary hip arthroplasty” or “elective primary knee arthroplasty”.		
Consultant Code	6354	5911	93.0%
ASA Score	6354	5640	88.8%
Incision time	6354	6128	96.4%
Closure time	6354	5958	93.8%
Surgeon Grade	6354	5859	92.2%
Thromboprophylaxis	6354	4741	74.6%
Inpatient SSI	6354	6085	95.8%
Inpatient SSI Type	75	61	81.3%
Inpatient SSI Date	75	42	56.0%
Outcome	6354	5640	88.8%
Date of Death/Discharge	6354	6269	98.7%
Post-Discharge SSI	6262	4084	65.2%
Post-Discharge SSI Type	101	90	89.1%
Post-Discharge SSI Date	101	68	67.3%
Post-Discharge Assessment Date	6262	4029	64.3%

3. Surveillance Coverage

The number of valid questionnaires received from the surveillance was compared with data reported to Health Solutions Wales on the number of procedures carried out by the different Trusts in Wales. Overall questionnaires were received for approximately 70% of the mandatory orthopaedic surveillance procedures in Wales.

Table 3. Coverage of Orthopaedic SSI Surveillance compared to procedures reported to the PEDW database at HSW in All Wales in 2008

	Procedure Type	Procedures reported to HSW ^A	Valid questionnaires received ^B	% Coverage
Wales	Elective primary hip arthroplasty	3818	2523	66%
	Elective primary knee arthroplasty	4960	3628	73%
	All mandatory procedures	8778	6151	70%

- A. Procedure codes requested from HSW: elective primary hip arthroplasty (W37.1, W38.1, W39.1, W58.1 (hip joint), W93.1, W94.1, W95.1), elective primary knee arthroplasty (W40.1, W41.1, W42.1, W52.1, W53.1, W54.1, W58.1 (knee joint)). Subject to completeness of clinical coding at date of download from HSW.**
- B. Only questionnaires where SSI field has been completed have been included.**

Key Summary Points

- In Wales, surveillance coverage for 2008 was 70%. This was a small improvement on coverage for 2007 (69%).
- Some sites had surveillance coverage of greater than 100%, indicating that at the time of analysis their coding data was not up to date at HSW. The 70% coverage may therefore be an over-estimation of the true coverage value.
- The 95% surveillance coverage required by the Welsh Assembly Government was not achieved.

4. General Demographics

For inclusion in the analysis the following criteria must have been met:

- Procedure must be elective primary hip arthroplasty/elective primary knee arthroplasty
- Record must have a procedure date within 2008
- SSI field must have been completed on the inpatient and / or post-discharge form

6151 records were included in the analysis for Wales.

This section gives information about the incidence of SSI, which is the proportion of SSI per 100 operations. Details are given on SSI incidence by procedure type, by patient age group and gender, by grade of surgeon performing the operation and by type of SSI.

4.1 Incidence of SSI

In Wales in 2008 there were 177 SSI recorded in the 6151 analysable procedures. One SSI was subsequently removed from the analysis because the infection date was the same as the procedure date and was not therefore related to the procedure reported. 43% (75) of the 176 SSI were identified during the inpatient stay and 57% (101) after the patient was discharged from hospital. The rates of infections identified during the inpatient stay and total infection rates by procedure type for Wales and All Wales are provided in sections 4.1.1 and 4.1.2.

4.1.1 Incidence of Inpatient SSI

75 SSI identified during the inpatient stay were recorded in 6085 analysable procedures, giving a crude inpatient SSI rate of 1.2% for Wales. The SSI rate by procedure type is provided in Table 4.

Table 4. Incidence of inpatient SSI by procedure type in All Wales in 2008

	Procedure Type	Procedures*	IP SSI	% IP SSI	95% CI
Wales	Elective primary hip arthroplasty	2496	29	1.2	0.8 – 1.7
	Elective primary knee arthroplasty	3589	46	1.3	0.9 – 1.7
	All mandatory procedures	6085	75	1.2	1.0 – 1.5

*66 procedures were excluded from the Wales data because the inpatient SSI field was not completed.

4.1.2 Incidence of SSI

The additional 101 SSI identified after the patient was discharged resulted in a crude total SSI rate of 2.9%. The total SSI rate by procedure type is provided in Table 5.

Table 5. Incidence of total SSI by procedure type in All Wales in 2008

	Procedure Type	Procedures*	SSI	% SSI	95% CI
Wales	Elective primary hip arthroplasty	2523	61	2.4	1.8 – 3.1
	Elective primary knee arthroplasty	3628	115	3.2	2.6 – 3.8
	All mandatory procedures	6151	176	2.9	2.5 – 3.3

Key Summary Points

- Infection rates were higher for knee procedures than hips both during the inpatient stay and overall, but not significantly so.
- Overall 57% of the SSI were identified post-discharge. 52% of SSI were identified post-discharge following the hip procedures compared to 60% of SSI following knee procedures.
- Infection rates for Wales are high compared to rates reported for hip and knee procedures in other UK countries for similar time periods. Scotland 2008⁷ % IPSSI total primary hip arthroplasty: 0.5%; knee arthroplasty: 0.2%. Northern Ireland 2007⁸ % IP SSI hip prosthesis: 0.2%; knee prosthesis: 0.7%. England 2008/09⁹: % IP SSI hip prosthesis: 0.5% (0.9% including readmissions); knee prosthesis 0.2% (0.6% including readmissions).

4.2 Incidence of SSI by Patient Age Group

Table 6. Incidence of total SSI by Patient Age Group by Procedure Type in All Wales in 2008

	Procedure Type	Age Group	Procedures*	SSI	% SSI	95% CI
Wales	Elective primary hip arthroplasty	<56	297	7	2.4	0.9 – 4.9
		56-65	583	10	1.7	0.8 – 3.2
		66-75	939	24	2.6	1.6 – 3.8
		76+	688	20	2.9	1.8 – 4.5
	Elective primary knee arthroplasty	<56	267	16	6.0	3.4 – 9.7
		56-65	994	29	2.9	2.0 – 4.2
		66-75	1409	34	2.4	1.7 – 3.4
		76+	927	35	3.8	2.6 – 5.3
	All mandatory procedures	<56	564	23	4.1	2.6 – 6.1
		56-65	1577	39	2.5	1.8 – 3.4
		66-75	2348	58	2.5	1.9 – 3.2
		76+	1615	55	3.4	2.6 – 4.4

*47 procedures have been excluded for Wales because patient age was not completed.

Key Summary Points

- The majority (65%) of procedures were carried out on patients aged over 65.
- There were no significant differences in SSI rates between different age groups.

4.3 Incidence of SSI by Patient Gender

Table 7. Incidence of total SSI by Patient Gender in All Wales in 2008

	Procedure Type	Gender	Procedures*	SSI	% SSI	95% CI
Wales	Elective primary hip arthroplasty	Male	1023	23	2.2	1.4 – 3.4
		Female	1497	38	2.5	1.8 – 3.5
	Elective primary knee arthroplasty	Male	1565	54	3.5	2.6 – 4.5
		Female	2062	61	3.0	2.3 – 3.8
	All mandatory procedures	Male	2588	77	3.0	2.3 – 3.7
		Female	3559	99	2.8	2.3 – 3.4

*4 procedures have been excluded from the Welsh data because patient gender was not completed.

Key Summary Points

- The majority of procedures are carried out on female patients, overall (58%) and within each procedure type (59% of hips; 57% of knees).
- There are no significant differences in rates by gender, overall or within procedure types.

4.4 Incidence of SSI by Grade of Surgeon

The grade of the surgeon performing the surgery was recorded in 92% (5669/6151) of questionnaires. 85% (4794/5669) of procedures were carried out by a substantive consultant. Table 8 provides the SSI incidence by grade of surgeon.

Table 8. Incidence of total SSI by Grade of Surgeon in All Wales in 2008

	Procedure Type	Surgeon Grade	Procedures*	SSI	% SSI	95% CI
Wales	Elective primary hip arthroplasty	Substantive consultant	1946	41	2.1	1.5 – 2.9
		Other	360	14	3.9	2.1 – 6.5
	Elective primary knee arthroplasty	Substantive consultant	2848	95	3.3	2.7 – 4.1
		Other	515	11	2.1	1.1 – 3.8
	All mandatory procedures	Substantive consultant	4794	136	2.8	2.4 – 3.4
		Other	875	25	2.9	1.8 – 4.2

*482 procedures have been excluded from the Wales data because surgeon grade was not completed.

Key Summary Points

- The majority (85%) of procedures were carried out by substantive consultants.
- Infection rates are higher for surgeon grades other than substantive consultants, but not significantly so.

4.5 Incidence of SSI by Type of SSI

Three types of surgical site infection have been defined depending on whether the incisional site (superficial and deep infections) or other structures (organ/space infections) are involved. 151 of the 176 infections reported in Wales in 2008 had an infection type identified. Table 9 gives details of the proportions of the different SSI types recorded. No organ/space infections were reported in 2008. The incidence of SSI by SSI type is given in Table 10.

Table 9. Type of Surgical Site Infection by procedure category in All Wales in 2008

	Procedure Type	% Superficial (N)	% Deep (N)	% Not stated (N)
Wales	Elective primary hip arthroplasty	80% (49)	7% (4)	13% (8)
	Elective primary knee arthroplasty	82% (94)	3% (4)	15% (17)
	All mandatory procedures	81% (143)	5% (8)	14% (25)

Table 10. Incidence of total SSI by type of SSI in All Wales in 2008

	Procedure Type	Procedures*	SSI Type	SSI	% SSI	95% CI
Wales	Elective primary hip arthroplasty	2515	Superficial	49	1.9	1.4 – 2.6
			Deep	4	0.2	0.0 – 0.4
	Elective primary knee arthroplasty	3611	Superficial	94	2.6	2.1 – 3.2
			Deep	4	0.1	0.0 – 0.3
	All mandatory procedures	6126	Superficial	143	2.3	2.0 – 2.7
			Deep	8	0.1	0.1 – 0.3

*25 procedures have been excluded from the Wales data because the SSI type was not completed.

Key Summary Points

- More than 80% of SSI reported following orthopaedic procedures were of the superficial type.
- A higher proportion of infections were deep seated following hip prosthesis procedures than knee prosthesis procedures (8% vs 3%).
- There were no significant differences in the rates of superficial or deep infections between hip and knee procedures.
- Proportions of deep infections in Wales appear low when compared with other UK countries, particularly where readmission surveillance was in place ^{7,8,9}.

5. SSI Incidence Density

The infection rates based on the number of SSI per 100 procedures provided in section 4, do not take into account the length of time the patients are followed up. The CDC definitions for SSI state that a patient with an implant should be followed up for 1 year from the procedure date⁵. Inpatient length of stay varies between sites as does the degree of post-discharge follow up. This section therefore provides an incidence density rate, based on a denominator of 1000 days followed up.

Tables 11 and 12 detail the number of inpatient days the patients were followed up and the inpatient SSI incidence density rate by procedure type for Wales in 2008. Tables 13 and 14 detail the total days followed up (inpatient and post-discharge) and the total SSI incidence density by procedure type.

Table 11. Inpatient Days followed up by Procedure Type in All Wales in 2008

	Procedure Type	Procedures*	Total IP days followed	Mean IP days followed	Median IP days followed	Mode IP days followed
Wales	Elective primary hip arthroplasty	2509	17464	7	6	5
	Elective primary knee arthroplasty	3602	22777	6	5	4
	All mandatory procedures	6111	40241	7	5	5

*40 records have been excluded from the Wales data because the number of inpatient days followed up could not be calculated.

Table 12. Inpatient SSI rate/1000 days followed up by procedure type in All Wales in 2008

	Procedure Type	Procedures*	IP SSI	Total IP days followed	IPSSI/1000 days followed	95% CI
Wales	Elective primary hip arthroplasty	2485	29	17296	1.7	1.1 – 2.4
	Elective primary knee arthroplasty	3568	46	22551	2.0	1.5 – 2.7
	All mandatory procedures	6053	75	39847	1.9	1.5 – 2.4

*98 records have been excluded from the Wales data because the IPSSI field was not completed or the number of inpatient days followed up could not be calculated.

Table 13. Total Days followed up by Procedure Type in All Wales in 2008

	Procedure Type	Procedures*	Total days followed	Mean days followed	Median days followed	Mode days followed
Wales	Elective primary hip arthroplasty	2519	97457	39	41	5
	Elective primary knee arthroplasty	3621	138935	38	41	4
	All mandatory procedures	6140	236392	39	41	4

*11 records have been excluded from the Wales data because the number of days followed up could not be calculated.

Table 14. Total SSI rate/1000 days followed up by procedure type in All Wales in 2008

	Procedure Type	Procedures*	SSI	Total days followed	SSI/1000 days followed	95% CI
Wales	Elective primary hip arthroplasty	2519	61	97457	0.6	0.5 – 0.8
	Elective primary knee arthroplasty	3621	115	138935	0.8	0.7 – 1.0
	All mandatory procedures	6140	176	236392	0.7	0.6 – 0.9

*11 records have been excluded from the Wales data because the number of days followed up could not be calculated.

Key Summary Points

- The median length of inpatient follow up was 5 days and of total follow up was 41 days, reflecting approximately 6 weeks to the outpatient follow-up appointment for elective hip and knee arthroplasty procedures.
- The rate of inpatient SSI and total SSI was higher for elective primary knee arthroplasties than elective primary hip arthroplasties, when length of inpatient follow up was taken into account, but not significantly higher.
- Rates of infection in Wales still appeared to be high compared to those reported from other UK countries, even when length of follow up is taken into account ^{7,9}.

6. Incidence of SSI over time

Data on orthopaedic SSI surveillance have been collected since 2003. In 2007 the mandatory surveillance procedures were reduced to elective hip and knee prostheses only. Table 15 compares the numbers of reports by procedure category for 2003 to 2008 and the infection rates. These data, however, should be interpreted with caution, since data for hip and knee arthroplasties from 2008 are not strictly comparable with data collected in previous years.

Table 15. Procedures, SSI and % SSI (95% CI) by procedure category in Wales, 2003 – 2008

Procedure Category	Year	Procedures	SSI	% SSI (95% CI)
Hips	2008	2523	61	2.4 (1.8 – 3.1)
	2007	2246	52	2.3 (1.7 – 3.0)
	2006	1608	41	2.5 (1.8 – 3.5)
	2005	1488	49	3.3 (2.4 – 4.4)
	2004	744	20	2.7 (1.6 – 4.2)
	2003	472	17	3.6 (2.1 – 5.8)
Knees	2008	3628	115	3.2 (2.6 – 3.8)
	2007	3022	97	3.2 (2.6 – 3.9)
	2006	1790	45	2.5 (1.8 – 3.4)
	2005	1440	69	4.8 (3.7 – 6.1)
	2004	624	28	4.5 (3.0 – 6.5)
	2003	370	11	3.0 (1.5 – 5.3)

Key Summary Points

- There was a 12% increase in the number of hip procedures reported and a 20% increase in the number of knee procedures reported between 2007 and 2008.
- There was a small increase in the infection rate for hip arthroplasties in 2008 compared to 2007, whereas the rate for knees remained the same. Rates of infection for 2008, however, are not strictly comparable with rates for previous years since the procedures included have changed.

7. Conclusions

The Welsh orthopaedic surgical site infection surveillance scheme provides surgical teams with risk-adjusted measures of performance over time for the two mandatory surveillance procedures.

The incidence of SSI per 100 operations for elective hip and knee prostheses combined was 2.9%. The rate by former Trust ranged between 1.7 and 7.0%. Comparisons between sites, however, should only be made with caution because there are still concerns about the reliability of the surveillance in some sites, in terms of completing and returning data for all the required procedures. Although overall surveillance coverage improved slightly in 2008 (70%) compared to 2007 (69%), the coverage by former Trust varied considerably, ranging from 39% to 96%. A number of individual hospitals within the former Trusts had coverage rates of greater than 100%. This indicates that the coding data available for these sites was not up to date at the time of analysis (7 months after the end of the year). The surveillance coverage of 70% is therefore likely to be an over-estimation of the proportion of questionnaires received. One Trust achieved the 95% compliance required by the Welsh Assembly Government, but it is likely that this was an over-estimation for this site.

There are also differences between sites in the degree of post-discharge surveillance undertaken, which has a major impact on infection rates. Overall a post-discharge follow-up questionnaire was received for 65% of reported procedures, but this varied considerably by site, ranging from 26% of procedures to 98%. Calculating infection rates which take into account the length of patient follow up does reduce the influence of this and the SSI incidence density rates by site reflect this, ranging from 0.1 to 1.5 infections per 10000 days followed up compared to the range of 1.7 and 7.0% using the crude infection rate.

This all-Wales report should be used in conjunction with surgeon specific reports, hospital specific reports, as well as alongside the Pan Celtic report and reports from SSI schemes in other countries. Although data from surveillance schemes in other countries are not directly comparable because of differences in methodologies, definitions and procedures covered, broad comparisons with data currently available for other UK countries suggest that the Welsh rates for both hip and knee arthroplasties are high. Comparisons of types of SSI suggest a much higher proportion of superficial infections in Wales. The post-discharge surveillance methodology used in Wales will contribute to this difference, since all patients in Wales should be actively followed up approximately 6 weeks post-surgery at their outpatient appointment, whereas other UK countries concentrate on readmission surveillance. However, preliminary results from the validation study carried out on the 2008 orthopaedic SSI data suggests some over-reporting of both inpatient and post-discharge SSI. This suggests that SSI rates for Wales are lower than reported here and identifies a training issue in definition interpretation.

8. References

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