



National Public Health
Service for Wales
Gwasanaeth Iechyd Cyhoeddus
Cenedlaethol Cymru

NPHS Communicable Disease
Surveillance Centre

Orthopaedic Surgical Site Infection Report

January – December 2006

This report includes surgical site infection (SSI) related to the four core procedures performed by orthopaedic surgeons in Wales.

Data are included for trusts / hospitals from January 2006 – December 2006

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Summary

- The report covers surveillance of hip & knee arthroplasties, hemiarthroplasties and internal fixations of trochanteric fractures of the femur (#NOF) carried out in 2006. This is the last annual report to include hemiarthroplasties, #NOFs and emergency hip and knee arthroplasty procedures. From 2007 onwards mandatory surveillance is restricted to elective hip and knee arthroplasties only.
- 3993 questionnaires were analysed for the report, which represented 45% of the mandatory surveillance procedures carried out in Wales in 2006.
- 85% of analysable questionnaires were for hip or knee arthroplasties.
- Overall 67 infections were detected within the hospital stay, giving a crude pre-discharge SSI rate of 1.7%. Another 32 infections were detected post discharge, giving a crude overall SSI rate of 2.5%. There were no significant differences between the rates of SSI in the different procedure types.
- SSI rates in 2006 are lower for all procedures than in any of the previous years of surveillance. Infection rates for knee arthroplasties were significantly lower in 2006 compared to 2005. This is the procedure where there has been the largest increase in numbers of reports.
- In general SSI rates in Wales in 2006 for hip and knee arthroplasties were higher than the data available for other countries.
- Infection rates were significantly higher in hip and knee revision procedures (hip: 12%; knee: 15%) than in primary hip and knee arthroplasties (hip: 2%; knee: 2%).
- Over 80% of infections were of the superficial type.
- The majority (67%) of patients were in the lowest risk category of infection (risk index=0). Patients with a risk index of 0 had a significantly lower infection rate (2.0% (1.4-2.7)) than those with a risk index > 0 (4.3% (3.1-5.7)).
- The majority (69%) of procedures were carried out by consultant surgeons. There were no significant differences between the rates of infection in procedures carried out by consultants and junior surgeon grades.
- Nearly 90% of patients were in hospital 1 day or less before they underwent one of the four mandatory orthopaedic surveillance procedures. There were no significant differences in the pre-operative lengths of stay between patients who developed an SSI and those that did not.
- Approximately 80% of hip and knee arthroplasty patients were discharged from hospital within 11 days of admission; total lengths of stay for hemiarthroplasty and #NOF patients were much longer. The median total length of stay for patients who developed a pre-discharge SSI was 8 days longer than for those that did not develop an SSI.

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 Trusts 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 is the fourth 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 12 Trusts in Wales in the calendar year 2006, although 1 trust has only contributed 6 procedures to the surveillance and another only 12.

The 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 Trusts in monitoring their infection rates so that risk can be assessed and communicated and variations from the expected mean recognised and investigated.

In November 2006, following discussions with the orthopaedic staff in the Welsh Trusts, it was decided to alter the surveillance to make it more relevant and less time consuming to Trust staff. From January 2007, the mandatory procedures were reduced to elective hip and knee prostheses. This is therefore the last orthopaedic SSI report that will include data on hemiarthroplasties, fractured necks of femurs and emergency hip and knee arthroplasties.

Results

Exclusions

Although some Trusts carried out surveillance on all orthopaedic procedures, this report is restricted to the surveillance of the 4 procedures that were mandatory in 2006:

- Arthroplasty of the hip
- Arthroplasty of the knee
- Hemiarthroplasty
- Internal fixation of trochanteric fractures of the femur (#NOF)

A total of 4279 questionnaires were received for the 4 mandatory procedures with procedure dates in 2006. 286 of these reports were not analysed because the question on whether the patient had an SSI had not been completed.

Table 1. Orthopaedic SSI questionnaires received and analysed in 2006

Procedure Category	No of questionnaires received	No of questionnaires analysed*
All mandatory procedures	4279	3993
Hip arthroplasty	1708	1608
Knee arthroplasty	1883	1790
Hemiarthroplasty	262	231
# NOF	426	364

Completion Rates

The completion rates for the data items in the orthopaedic SSI questionnaire are detailed in Table 2 below. Procedure type, SSI and procedure date have not been included, since the 3993 procedures identified for Wales for 2006 were extracted on the basis of being a mandatory procedure, having a procedure date in 2006 and having the SSI field completed.

Table 2. Percentage completion of data items on the orthopaedic SSI questionnaires for 2006

Data Item	Expected	Present	% Completed
Admission date	3993	3697	92.6
Age	3993	3893	97.5
Anaesthesia Type ¹	3993	3801	95.2
Antibiotic prophylaxis	3993	3776	94.6
Antibiotic route ²	3728	3708	99.5
Antibiotics continued	3728	2557	68.6
Antibiotic loaded cement	3993	3614	90.5
ASA	3993	3762	94.2
Clinician type	3993	3792	95.0
Closure Time	3993	3659	91.6
Consultant code	3993	3708	92.9
Consultant present	1150	1052	91.5
Criteria for diagnosing infection ³	99	78	78.8
Date of Death/Discharge	3993	3905	97.8
Diagnosis ⁴	3993	3891	97.4
Incision Time	3993	3763	94.2
Infection date	99	71	71.7
Operation type (emergency/elective)	3993	3842	96.2
Outcome	3993	3607	90.3
Procedure Code	3993	3651	91.4
Readmission	3993	3532	88.5

Relationship of SSI to death	4	3	75.0
Sex	3993	3990	99.9
Specific site of O/S infection	4	4	100
SSI type	99	89	89.9
Thromboprophylaxis	3993	3677	92.1
Wound Class	3993	3466	86.8

1. 192 records had no response in general, local or regional anaesthesia fields.
2. 20 records had no response in any of the 3 antibiotic route fields.
3. 21 records had no response in any of the criteria fields.
4. 102 records had no response in any of the 4 diagnosis fields.

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.

Table 3. Coverage of Orthopaedic SSI Surveillance compared to procedures reported to the PEDW database at HSW by Trust in Wales in 2006

Trust	No of procedures reported to HSW ¹	No of valid questionnaires received ²	% Coverage
Wales	8810	3993	45.3

1. Procedure codes reported to HSW: hip prosthesis (W37, W38, W39, W58, W93, W94, W95), knee prosthesis (W40, W41, W42), hemiarthroplasty (W46, W47, W48) and internal fixation of trochanteric fractures of the femur (W191).
2. Only questionnaires where SSI field has been completed have been included.

1. General Demographics

This section gives information about the gender, age groups, procedures, SSIs and the type of SSI.

1.1 Incidence of SSI by Patient Age Group

Table 4. Orthopaedic Surgical Site Infections by Patient Age Group in Wales in 2006

Age Group	No. of Procedures*	No. of SSI	% SSI
<56	305	13	4.3
56-65	850	24	2.8
66-75	1439	31	2.2
76+	1299	30	2.3

*100 procedures have been excluded because patient age was not completed

Key Summary Points

- The majority (70%) of procedures were carried out on patients aged over 65.
- Although the infection rate was higher in the younger age groups, there were no significant differences between the infection rates in different age groups.

1.2 Incidence of SSI by Patient Gender

Table 5. Orthopaedic Surgical Site Infections by Patient Gender in Wales in 2006

Procedure Category	Females		Males	
	No of procedures*	% SSI	No of procedures*	% SSI
All Procedures	2367	2.2	1623	3.0
Hip arthroplasty	908	2.2	700	3.0
Knee arthroplasty	1015	2.2	772	3.0
Hemiarthroplasty	168	2.4	63	4.8
#NOF	276	1.8	88	1.1

*3 procedures have been excluded because patient gender was not completed.

Key Summary Points

- The majority of procedures are carried out on female patients, overall (59%) and within each procedure type.
- Infection rates are higher in males overall and for every procedure type except open reduction of fracture, but not significantly so.

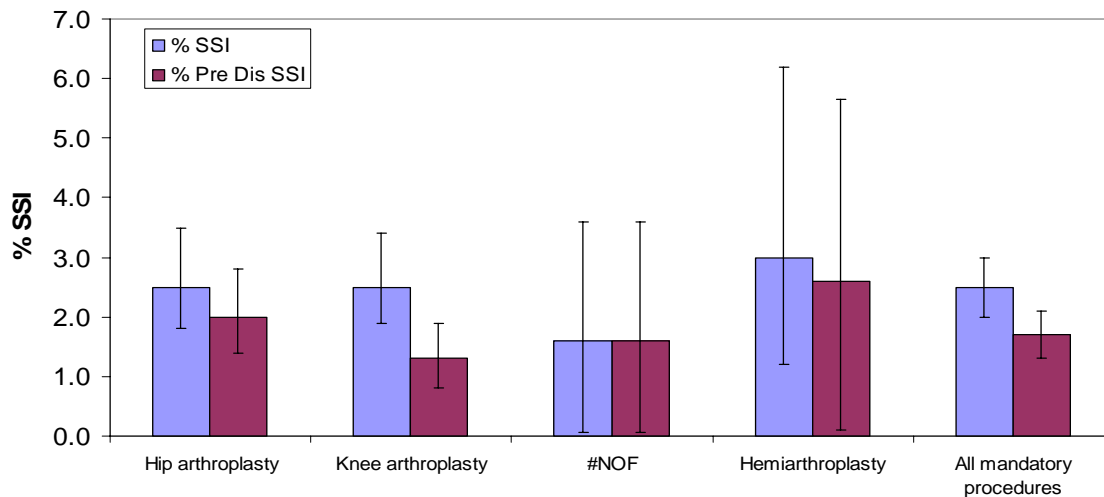
1.3 Incidence of SSI by Category of Surgical Procedure

There were 99 surgical site infections recorded in the 3993 analysable procedures. The crude SSI rate was 2.5%, which includes infections that occurred pre- and post-discharge from hospital. 32% of the infections were detected post-discharge. The crude pre-discharge SSI rate was 1.7%.

Table 6. Orthopaedic Surgical Site Infections by Category of Surgical Procedure in Wales in 2006

Procedure Category	No. procedures	No. SSI (All)	% SSI (95% CI)	No. Pre Dis. SSI	% Pre Dis. SSI
All mandatory procedures	3993	99	2.5 (2.0 – 3.0)	67	1.7 (1.3 – 2.1)
Hip arthroplasty	1608	41	2.5 (1.8 – 3.5)	32	2.0 (1.4 – 2.8)
Knee arthroplasty	1790	45	2.5 (1.8 – 3.4)	23	1.3 (0.8 – 1.9)
Hemiarthroplasty	231	7	3.0 (1.2 – 6.2)	6	2.6 (0.9 – 5.7)
#NOF	364	6	1.6 (0.6 – 3.6)	6	1.6 (0.6 – 3.6)

Figure 1. % SSI and % Pre-Discharge SSI by Procedure Category in Wales in 2006



Key Summary Points

- There were no significant differences between the rates of SSI in different procedure types.
- Approximately a third of the SSIs were identified post-discharge.
- Numbers of reports of hemiarthroplasty and #NOF procedures were small so data for these procedure types should be treated with caution.

1.3.1 Incidence of SSI by Category of Surgical Procedure and OPCS Code

91% of the 3993 analysable questionnaires had provided a procedure code. A description for each OPCS IV⁷ code is provided in the Appendix.

Table 7. Orthopaedic Surgical Site Infections by Category of Surgical Procedure and OPCS Code in Wales in 2006

Procedure category	No. records with codes	No. records with appropriate codes for the procedure type	No. without codes
Hemiarthroplasty	184	163	47
Hip arthroplasty	1507	1444	101
Knee arthroplasty	1691	1626	99
#NOF	269	175	95

Figure 2. No. of hemiarthroplasties, SSIs and % SSI by OPCS code in Wales in 2006

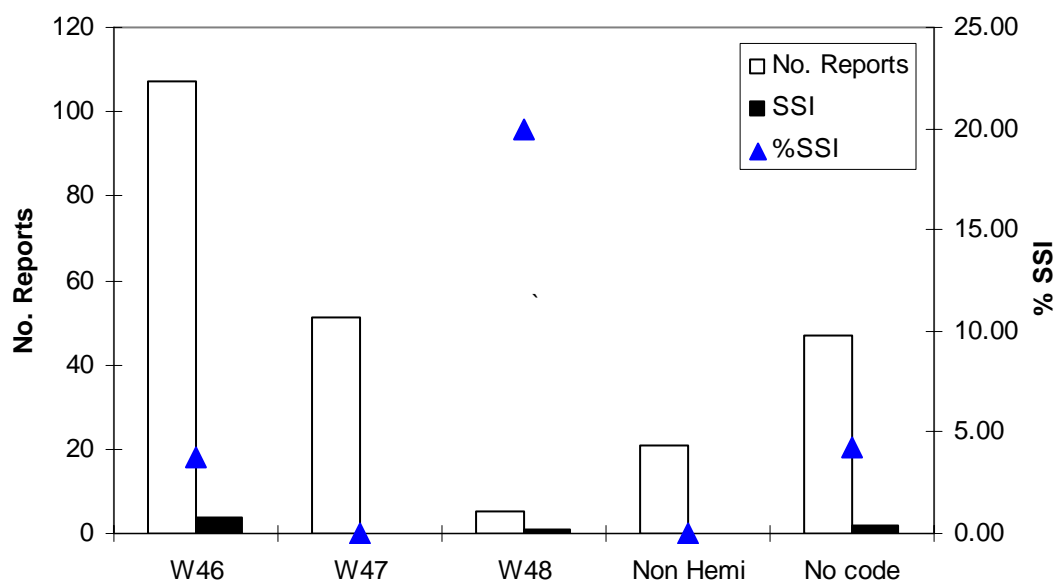


Figure 3. Reports of SSI following hip arthroplasty by OPCS code in Wales in 2006

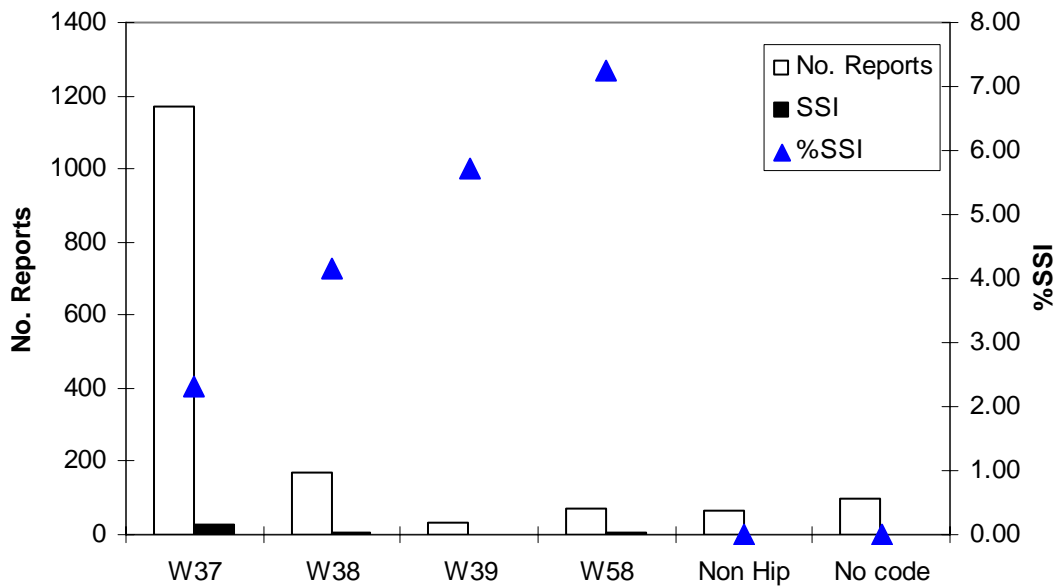


Figure 4. Reports of SSI following knee arthroplasty by OPCS code in Wales in 2006

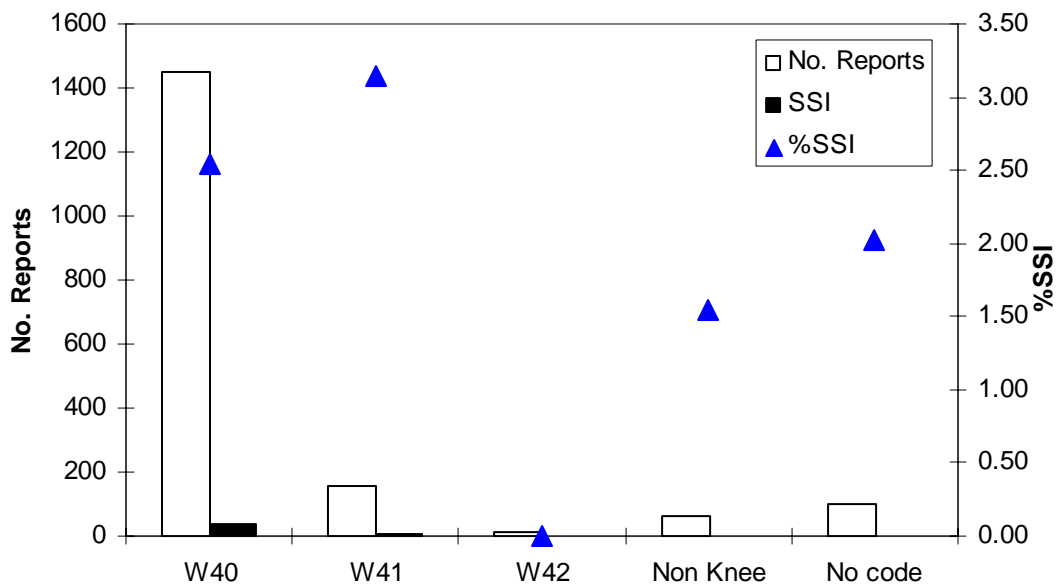
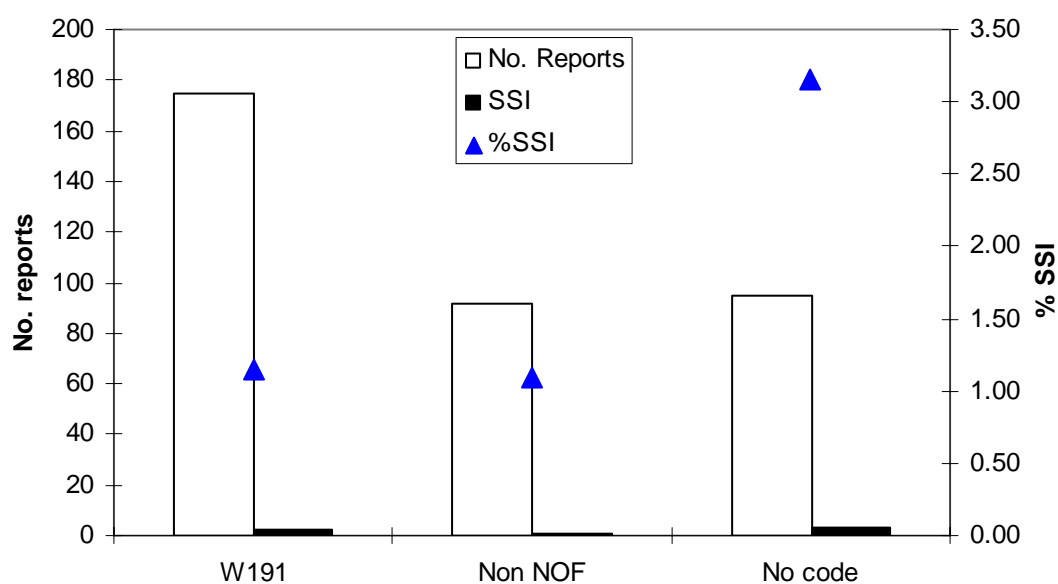


Figure 5. Reports of SSI following internal fixation of trochanteric fractures of the femur by OPCS code in Wales in 2006



Key Summary Points

- In many cases the OPCS code on the questionnaire did not match the procedure category selected. For this report, where they do not match, we have assumed that the procedure category is correct.
- For the #NOF codes, many of the OPCS codes provided were for fractures of bones other than the neck of the femur.

1.4 Incidence of SSI following Revision Procedures

129 valid OPCS codes matching a procedure type for revision procedures were reported. The infection rates for hip (W37.3, W37.4, W38.3, W38.4, W39.3, W39.5, W58.2) and knee (W40.3, W40.4, W41.3, W41.4, W42.3, W42.5, W58.2) revision surgeries and primary hip (W37.1, W38.1, W39.1, W58.1) and knee surgery (W40.1, W41.1, W42.1, W58.1) are compared in Table 8.

Table 8. Surgical Site Infections following Hip and Knee Revision Surgery in Wales in 2006

Surgery Type	No. Procedures	No. SSI	% SSI (95% CI)
Hip Revision	69	8	11.6 (5.0 – 22.8)
Primary Hip	1334	32	2.4 (1.6 – 3.4)
Knee Revision	60	9	15.0 (6.9 – 28.5)
Primary Knee	1519	32	2.1 (1.4 – 3.0)

Key Summary Point

- The infection rates for both hip and knee revision procedures were significantly higher than for primary hip and knee surgeries.

1.5 Incidence of SSI following Elective and Emergency Procedures

Table 9. Orthopaedic Surgical Site Infections in Elective and Emergency Surgical Procedures in Wales in 2006

Operation Type	No. Procedures*	No. SSI	% SSI (95% CI)
Elective Procedures	3216	82	2.5 (2.0-3.2)
Emergency Procedures	626	17	2.7 (1.6-4.3)

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

Key Summary Points

- The proportion of emergency procedures in Wales was higher than in the Pan Celtic dataset (16.3% in Wales; 3.6% in PanCeltic⁸ data), but surveillance in some of the other PanCeltic countries does not cover emergency work.
- There was no significant difference between the rates of SSI in elective and emergency procedures in Wales, whereas in the Pan Celtic dataset the SSI rate for elective procedures was significantly lower.

1.6 Type of Surgical Site Infection

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. 89 of the 99 infections reported in Wales in 2006 had an infection type identified.

Table 10. Type of Surgical Site Infection by procedure category in Wales in 2006

Procedure Category	No. with type of SSI completed (total SSI)	Type of SSI		
		% Superficial	% Deep	% Organ/Space
All mandatory procedures	89 (99)	83.2	11.2	5.6
Hemiarthroplasty	6 (7)	83.3	16.7	0.0
Hip arthroplasty	35 (41)	88.6	5.7	5.7
Knee arthroplasty	42 (45)	78.5	16.7	4.8
#NOF	6 (6)	83.3	0.0	16.7

Key Summary Points

- Over 80% of the infections reported were of the superficial type.
- Five organ/space infections were reported in 2006, all were Joint or Bursa Infections.

2. Incidence of SSI by Patient Risk Index

Although the results are grouped by category of clinically similar procedures, they do not take into account factors that may influence the risk of infection. The American National Nosocomial Infections Surveillance (NNIS) system risk index⁹ is the most widely used method internationally of risk adjusting surgical patients. The risk index uses three risk factors to score each patient, namely the American Society of Anaesthesiologists (ASA) pre-operative assessment score, the wound classification and the duration of surgery. If a patient has an ASA score of 3 or more, a wound class of contaminated or dirty/infected or surgery duration of over 2 hours, they are assigned 1 point for each factor. This results in each patient receiving a score of 0 to 3. 792 procedures have been excluded from the risk index analysis because one or more of the risk index component fields have not been completed and the risk index therefore could not be calculated.

Table 11 gives the proportion of records scoring 1 for each of the components of the risk index. Table 12 shows the numbers of records falling into each risk index category for all mandatory orthopaedic procedures. Figure 6 shows the percentage SSI by risk index for the different procedure categories. Because there were so few procedures with a risk index of 2 or 3, risk index 2 and 3 have been combined in the graphs.

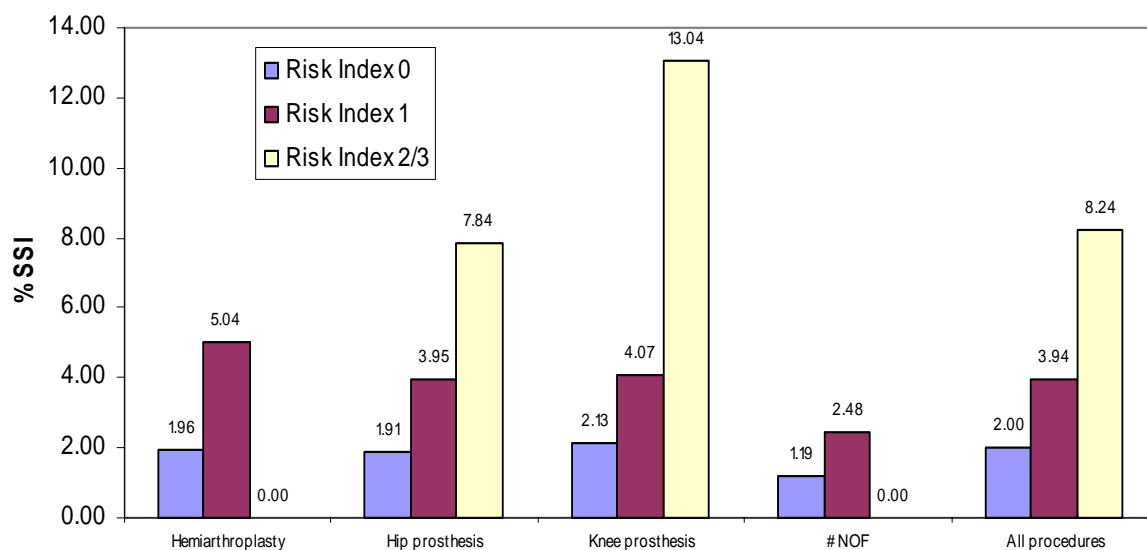
Table 11. Proportion of procedures scoring 1 for each of the components making up the NNIS system risk index in Wales in 2006

Risk Factor	Proportion of Procedures scoring 1
ASA of 3,4,5	26.9
Wound class Contaminated or Dirty/Infected	0.3
Duration of surgery over T value	9.5

Table 12. Surgical Site Infections by Patient Risk Index for all mandatory orthopaedic procedures in Wales in 2006

Patient Risk Index	Number of Procedures	Number of SSI	% SSI (95% CI)
0	2152	43	2.0 (1.4 – 2.7)
1	964	38	3.9 (2.8 – 5.4)
2/3	85	7	8.2 (3.3 – 17.0)

Figure 6. % SSI by procedure category by Risk Index in Wales in 2006



Key Summary Points

- The majority of patients were in the lowest risk category for infection: 67% of all records, 75% of knee arthroplasties, 67% of hip arthroplasties and 40% of #NOF, but under a third of patients (29%) undergoing hemiarthroplasty procedures had risk classifications of 0.
- The % SSI increased with increasing risk index for hip and knee arthroplasty procedures.
- Overall the infection rate was significantly lower for patients with risk index = 0 (2.0% (1.4-2.7)) than for those with a risk index greater than 0 (4.3% (3.1-5.7)).
- Numbers of patients in the higher risk index categories (2 and 3) are very small at the present time. Further data collection is required before meaningful analysis of these categories can take place.

3. Incidence of SSI by Grade of Surgeon

The grade of surgeon (clinician type) performing the operation was completed in 95% (3792/3993) of analysable questionnaires in Wales in 2006. Table 13 gives the numbers of procedures carried out by each surgeon grade and the numbers of SSIs. Table 14 gives this information by orthopaedic procedure category. All surgeon grades except SHO include locums. Figures 7 and 8 compare rates of SSI for consultants and junior surgeon grades by patient risk index and by procedure type. The Junior Surgeon Grades category is an aggregate of the results for staff grades, associate specialists, SPRs and SHOs. In Table 15, the affect of a surgeon's presence in the theatre is examined, when surgery is performed by a junior surgeon grade.

Table 13. Surgical Site Infections by grade of surgeon performing mandatory orthopaedic procedures in Wales in 2006

Surgeon Grade	Number of procedures	Number of SSI	% SSI	95% CI
Consultant	2606	76	2.9	2.3 – 3.7
Staff Grade	453	12	2.6	1.4 – 4.6
Associate Specialist	239	2	0.8	0.1 – 3.0
SPR	431	8	1.9	0.8 – 3.7
SHO	27	0	0	0 – 13.7
Locum Ukn Grade	36	0	0	0 – 10.2
All Junior Surgeon Grades*	1150	22	1.9	1.2 – 2.9

*All Junior Surgeon grades = Staff grade + Assoc Specialist + SPR + SHO

Table 14. Surgical Site Infections by grade of surgeon by category of orthopaedic procedure in Wales in 2006

Surgeon Grade	No of Procedures (% SSI)			#NOF
	Hemiarthroplasty	Hip Prosthesis	Knee Prosthesis	
Consultant	38 (0)	1210 (3.1)	1292 (2.8)	66 (3.0)
Staff Grade	73 (4.1)	118 (1.7)	180 (2.8)	82 (2.4)
Associate Specialist	33 (3.0)	77 (0)	101 (1.0)	28 (0)
SPR	73 (4.1)	104 (1.0)	117 (1.7)	137 (1.5)
SHO	5 (0)	0	5 (0)	17 (0)
Locum Ukn Grade	0	16 (0)	19 (0)	1 (0)
All Junior Surgeon Grades*	184 (3.8)	299 (1.0)	403 (2.0)	264 (1.5)

*All Junior Surgeon grades = Staff grade + Assoc Specialist + SPR + SHO

Figure 7. Percentage SSI in orthopaedic procedures performed by consultants and junior surgeon grades by patient risk index in Wales in 2006

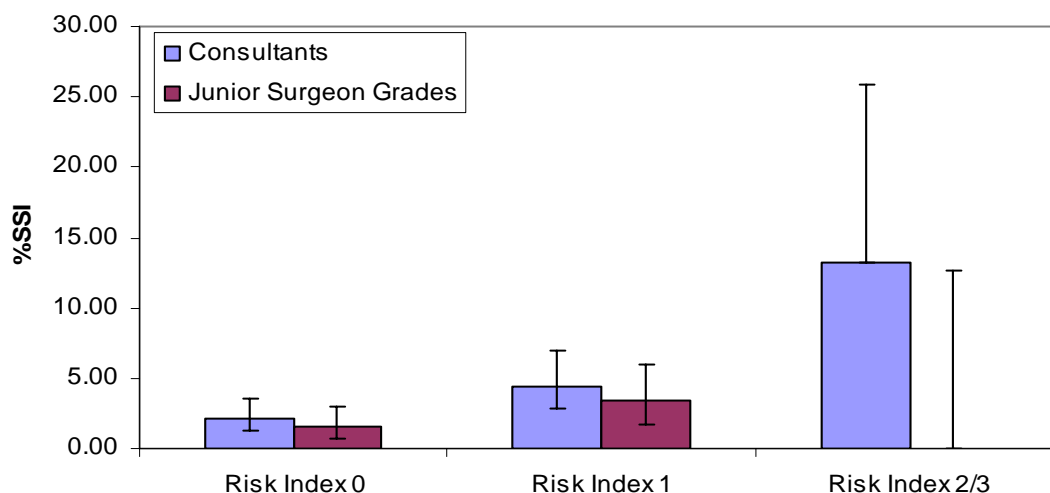


Figure 8. Percentage SSI in orthopaedic procedures performed by consultants and junior surgeon grades by procedure type in Wales in 2006

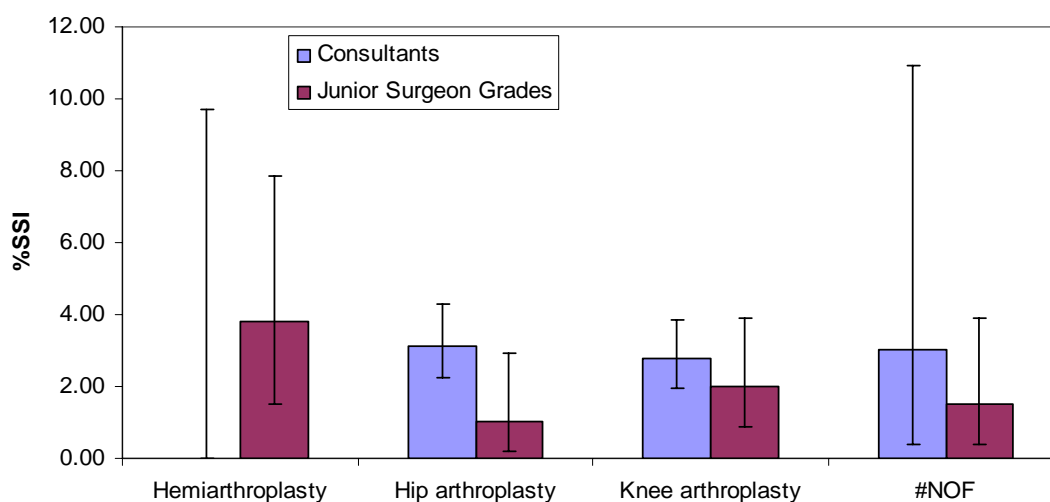


Table 15. Surgical Site Infections by consultant presence in Wales in 2006

	No. procedures	No. SSI	% SSI (95% CI)
Procedures not performed by consultant surgeons	1150	22	1.9 (1.2 – 2.9)
Procedures not performed by consultant but consultant present in theatre	578	10	1.7 (0.8 – 3.2)
Procedures not performed by consultant and consultant not present in theatre	474	10	2.1 (1.0 – 3.9)

NB 98 procedures performed by non-consultants did not record whether a consultant was present in theatre.

Key Summary Points

- 69% of procedures were carried out by Consultant surgeons.
- There were no significant differences between the rates of infection in procedures carried out by consultants and junior surgeon grades.
- There were no significant differences in the rates of infection when consultants were present in the theatre or not, in procedures carried out by non-consultant surgeons.

4. Duration of Procedure

The duration of surgery is used to calculate the patient risk index. Each surgical category has been assigned a T-value; procedures that take longer than the T-value for that procedure are assigned a point towards their risk index total. The T-values are calculated as the 75th percentile of duration of the surgical procedure, based on surgeon performance in the United States⁹. For all the mandatory orthopaedic procedures, the T-value is 2 hours. It would be expected that 25% of the procedures should lie above the T-value, but in Wales only 10% of procedures took longer than the T value. The durations of procedure categories in Wales are given in Table 16 and durations of procedures with specific OPCS codes are given in Table 17.

Table 16. Duration of Procedure Categories in Minutes and proportion over T value

Procedure Category	Number with Procedure start and end times	Mean	Median	Range	Proportion > T-value	75 th Percentile of Welsh data (minutes)
Hemiarthroplasty	198	59	55	10-162	3.0 %	70
Hip arthroplasty	1481	97	90	15-376	14.2 %	111
Knee arthroplasty	1687	86	85	8-330	6.8 %	98
#NOF	287	59	46	11-319	5.6 %	66

Table 17. Duration in minutes of most frequently reported OPCS codes for each procedure category and the proportion over T value

Procedure Category	Procedure Code	No. with Procedure start and end times	Mean	Median	Range	Proportion > T-value	75 th Percentile of Welsh data (minutes)
Hemiarthroplasty	W461	95	59	60	10-160	2.1	70
Hip arthroplasty	W371	1041	95	90	20-260	12.5	110
Knee arthroplasty	W401	1313	86	85	8-251	5.1	98
#NOF	W191	154	53	47	11-180	2.6	63

Key Summary Points

- As found in the Pan Celtic aggregate data⁸, Welsh surgeons performed operations in a shorter time than their US counterparts, therefore US derived T-values are not representative of surgery here.
- UK T-values need to be produced for procedures performed by UK surgeons, as this will have a substantial bearing on SSI rates stratified by risk.

5. Durations of Stay

The durations of stay data are derived from the questions on admission date, procedure date and date of death/discharge. Some of the results do not look very likely, but are a representation of what has been provided on the questionnaires.

5.1 Pre-operative length of stay

The pre-operative length of stay is the number of days from date of admission to hospital to the date of procedure. The pre-operative lengths of stay by procedure category are given in Table 18 and a comparison of the pre-operative lengths of stay for procedures that resulted in an SSI and those that did not are given in Table 19.

Table 18. Pre-operative length of stay for orthopaedic procedures by procedure category in Wales in 2006

Procedure	Pre-operative Length of Stay	No. Procedures* (%)	
All procedures	0-1 days	3292	(89)
	2-3 days	236	(6)
	4+ days	169	(5)
Hemiarthroplasty	0-1 days	114	(55)
	2-3 days	57	(28)
	4+ days	36	(17)
Hip arthroplasty	0-1 days	1421	(95)
	2-3 days	38	(2)
	4+ days	40	(3)
Knee arthroplasty	0-1 days	1582	(95)
	2-3 days	55	(3)
	4+ days	22	(1)
#NOF	0-1 days	175	(53)
	2-3 days	86	(26)
	4+ days	71	(21)

*296 procedures excluded because admission date not completed

Table 19. Pre-operative length of stay for patients with and without an SSI following orthopaedic procedures in Wales in 2006.

	<i>Admission to Procedure (days)</i>		
	Mean	Median	Range
<i>All patients</i>	1.4	1	0-136
Patients without SSI	1.4	1	0-136
Patients with SSI	1.9	1	0-24

Key Summary Points

- 89% of patients who underwent one of the 4 mandatory orthopaedic surveillance procedures were in hospital 1 day or less before they had their surgery.
- There were differences in the pre-operative lengths of stay by procedure category, with hemiarthroplasty and #NOF patients in hospital longer before they received surgery.
- For hip arthroplasties with pre-op lengths of stay of 4 or more days, approximately one quarter (9/40) were reported as emergency procedures. For knee arthroplasties, 9% of procedures with pre-op lengths of stay of 4 or more days were emergencies.
- There were no significant differences in the median pre-operative length of stay between patients who developed an SSI and those that did not.
- For hip and knee arthroplasties, SSI rates were higher for patients with a preoperative length of stay of 4 or more days (hips: 7.5%; knees: 9.1%) than for those with a pre-op stay of 3 days or less (hips: 2.3%; knees: 2.4%), but the differences were not significant.

5.2 Total length of stay

The total length of stay is the number of days from date of admission to hospital to the date of discharge or death. A comparison of the total lengths of stay for procedures that resulted in an SSI and those that did not, is given in Table 20.

Table 20. Total length of stay for patients with and without an SSI following orthopaedic procedures in Wales in 2006

	Admission to Discharge (days)		
	Mean	Median	Range
All procedures			
<i>All patients</i>	10.4	8	1 – 373
Patients without SSI	10.2	8	1 – 373
Patients with SSI	18.6	13	4 – 97
Patients with SSI pre-discharge	23.7	16	4 – 97
Hemiarthroplasty			
<i>All patients</i>	19.8	16	4 - 94
Patients without SSI	19.7	16	4 - 94
Patients with SSI	22.0	19	7 - 53
Patients with SSI pre-discharge	25.0	23	9 - 53
Hip prosthesis			
<i>All patients</i>	9.5	8	1 - 135
Patients without SSI	9.3	8	1 - 135

Patients with SSI	18.5	12	4 - 97
Patients with SSI pre-discharge	21.8	13	6 - 97
Knee prosthesis			
<i>All patients</i>	9.0	7	1 - 373
Patients without SSI	8.8	7	1 - 373
Patients with SSI	16.9	12	4 - 55
Patients with SSI pre-discharge	23.5	17	4 - 55
#NOF			
<i>All patients</i>	15.9	12	1 - 104
Patients without SSI	15.7	12	1 - 104
Patients with SSI	29.2	30	12 - 46
Patients with SSI pre-discharge	29.2	30	12 - 46

Key Summary Points

- Approximately 80% of hip/knee arthroplasty patients in Wales in 2006 were discharged from hospital within 11 days of admission; total lengths of stay for hemiarthroplasty and #NOF patients were much longer, with 80% of patients discharged after more than 21 days in hospital.
- The lengths of stay for Wales for 2006 were more in line with the Pan Celtic dataset (80% discharged at 10 days for hip/knee prosthesis and 20 days for hemiarthroplasties)⁸ than in previous years of surveillance.
- The median total length of stay for patients who developed a pre-discharge SSI was 8 days longer than for those that did not develop an SSI.

5.3 Post-operative length of stay

The post-operative length of stay is the number of days from the date of procedure to the date of discharge or death. The post-operative lengths of stay by procedure category are given in Figure 9. The post-operative lengths of stay for procedures that resulted in an SSI and those that did not, stratified by risk index are given in Table 21.

Figure 9. Proportion of patients in hospital by days post surgery for orthopaedic procedures in Wales in 2006

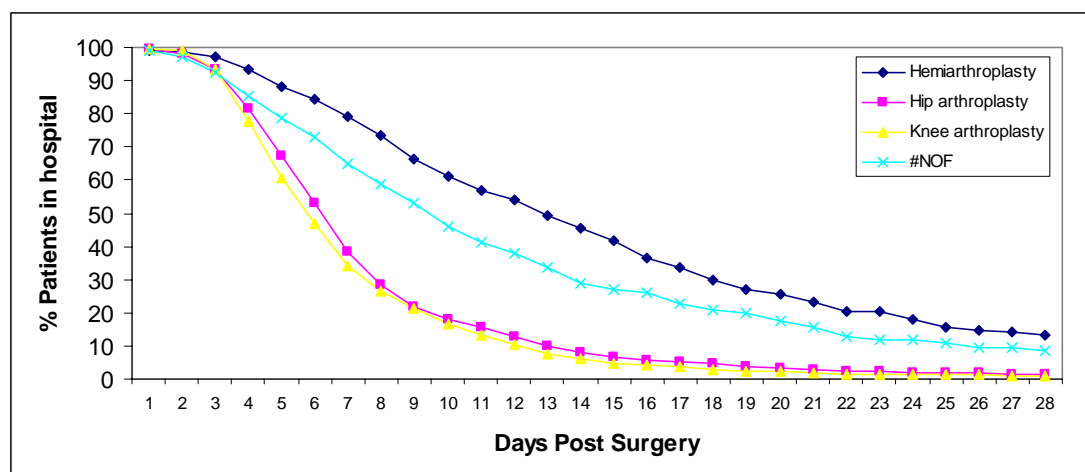


Table 21. Post-operative length of stay for patients with and without an SSI following orthopaedic procedures in Wales in 2006

		Procedure to Discharge (days)		
		Mean	Median	Range
<i>All Procedures</i>	<i>All patients</i> (n = 3905)	9.0	7	0 - 372
	Patients without SSI (n=3808)	8.8	7	0 - 372
	Patients with SSI (n=97)	16.6	12	3 - 88
	Patients with SSI pre-discharge (n=61)	21.3	15	3 - 88
Risk Index 0	<i>All patients</i> (n=2115)	7.5	6	0 - 120
	Patients without SSI (n=2072)	7.4	6	0 - 120
	Patients with SSI (n=43)	11.1	9	3 - 53
	Patients with SSI pre-discharge (n=22)	12.9	10	3 - 53
Risk Index 1	<i>All patients</i> (n=940)	10.7	8	1 - 103
	Patients without SSI (n=903)	10.4	8	1 - 103
	Patients with SSI (n=37)	18.1	12	3 - 48
	Patients with SSI pre-discharge (n=24)	23.7	19	7 - 48
Risk Index 2/3	<i>All patients</i> (n=83)	13.0	9	1 - 76
	Patients without SSI (n=76)	12.3	9	1 - 76
	Patients with SSI (n=7)	20.7	24	6 - 30
	Patients with SSI pre-discharge (n=6)	22.2	25	6 - 30

Key Summary Points

- In all procedures, the median length of post-operative stay for patients who developed a SSI during the hospital admission was 5 days longer than for those that did not. For patients who developed an SSI pre-discharge, the length of post-operative stay was 8 days longer than for those who did not.
- In patients with no pre-disposing risk factors for the development of a SSI i.e. risk index of 0, the median length of post-operative stay for patients who developed a SSI during the hospital admission was 3 days longer than for those that did not, and was 4 days longer for patients who developed an SSI pre-discharge.

5.4 Onset of Infection

Figure 10 details the number of days from the date of the orthopaedic procedure to the onset of infection. Tables 22 and 23 give the median numbers of days from admission date to onset of infection and procedure date to onset of infection.

Figure 10. Number of days from procedure date to onset of surgical site infection following orthopaedic procedures in Wales in 2006

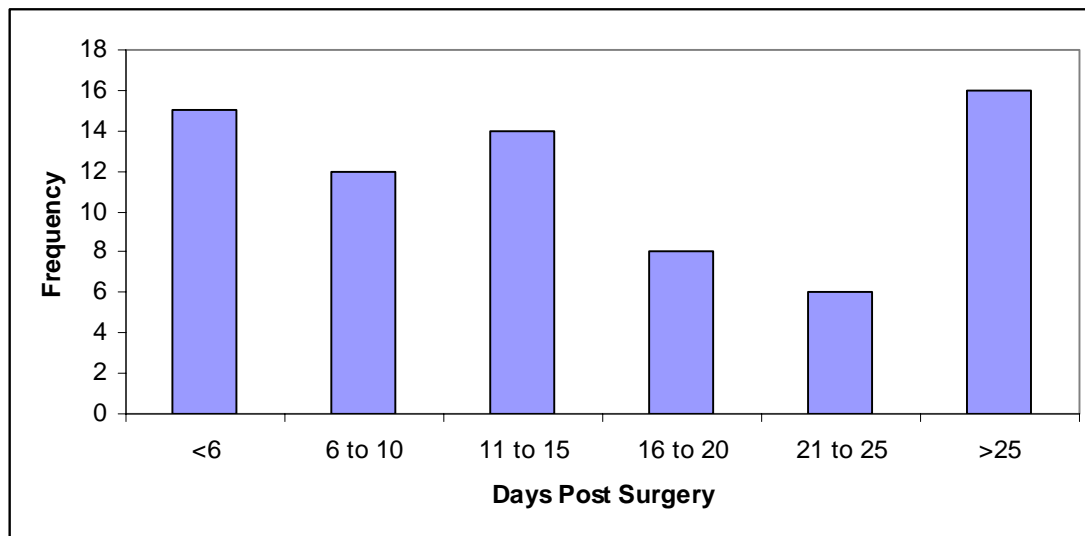


Table 22. Number of days from date of hospital admission to onset of surgical site infection in patients with an SSI following orthopaedic procedures in Wales in 2006

	Admission to Infection (days)		
	Mean	Median	Range
All patients with SSI (n=66)	19.4	15	3 - 80
Patients with SSI pre-discharge (n=37)	12.1	8	3 - 48
Patients with SSI post-discharge (n=26)	30.5	26	10 - 80

Table 23. Number of days from date of procedure to onset of surgical site infection in patients with an SSI following orthopaedic procedures in Wales in 2006

	Procedure to Infection (days)		
	Mean	Median	Range
All patients with SSI (n=71)	17.6	13	2 - 79
Patients with SSI pre-discharge (n=40)	10.7	7	2 - 40
Patients with SSI post-discharge (n=28)	28.2	23.5	9 - 79

Key Summary Points

- The median number of days from procedure to onset of infection was 13, whereas the median length of stay for all patients following surgery is 7 days. Post-discharge surveillance is therefore essential to identify infections.
- Infection data was only based on 99 records and should therefore be treated with caution.

6. Incidence of SSI over time

Four years of surveillance data is now available on SSI following orthopaedic procedures in Wales. Figure 11 compares the overall rates for 2003 to 2006. Table 29 compares the numbers of reports by procedure category for 2003 to 2006.

Figure 11. Procedures, SSIs and % SSI (95% CI) reported for orthopaedic procedures in Wales, 2003 - 2006

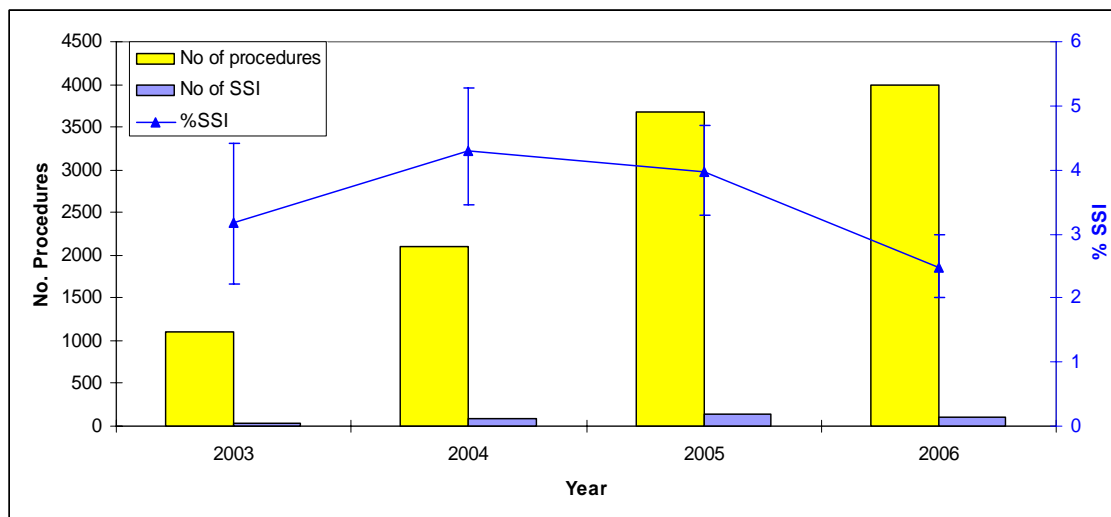


Table 30. Procedures, SSIs and % SSI (95% CI) by procedure category in Wales, 2003 - 2006

Procedure Category	Year	No. Procedures	No. SSI	% SSI
All Procedures	2006	3993	99	2.5
	2005*	3682	146	4.0
	2004	2093	90	4.3
	2003	1101	35	3.2
Hemiarthroplasty	2006	231	7	3.0
	2005*	323	11	3.4
	2004	290	19	6.6
	2003	52	3	5.8
Hip arthroplasty	2006	1608	41	2.5
	2005*	1488	49	3.3
	2004	744	20	2.7
	2003	472	17	3.6
Knee arthroplasty	2006	1790	45	2.5
	2005*	1440	69	4.8
	2004	624	28	4.5
	2003	370	11	3.0
#NOF	2006	364	6	1.6
	2005*	422	17	4.0
	2004	435	23	5.3
	2003	207	4	1.9

*NB 2005 data has been updated since the 2005 orthopaedic report was released

Key Summary Point

- Numbers of reports of hip and knee arthroplasties increased in 2006, whereas reports of the other two procedures decreased.
- Rates of infection in 2006 are lower for all procedures than in any of the previous years of surveillance.
- Infection rates for knee arthroplasties were significantly lower in 2006 compared to 2005. This is the procedure where there has been the largest increase in numbers of reports.

7. Comparative Results

Table 30 displays the pre-discharge and total orthopaedic SSI rates following hip arthroplasties and knee arthroplasties in Wales for patients in risk index categories 0 and 1, compared to rates reported from Scotland, Northern Ireland, England and the USA.

Table 31. Rates of SSI following orthopaedic procedures in patients with a risk index of 0 or 1 in Wales and other countries

Procedure Type	Risk Index	Wales Pre – Dis rate 2006	Wales Total rate 2006	Scotland Pre – Dis rate ¹⁰	Scotland Total rate ¹⁰	Northern Ireland Total rate ⁷	English Pre-Dis SSI rate ¹¹	American Pre-Dis SSI rate ^{12*}
Hip arthroplasty	0	1.5	1.9	1.0	2.4	0.7	0.8	0.9
	1	2.6	4.0	1.8	3.9	1.7	1.4	1.7
Knee arthroplasty	0	0.9	2.1	0.5	2.3	1.5	0.4	0.9
	1	2.3	4.1	1.7	8.9	3.0	1.0	1.3

*Rate for hip arthroplasty and hemiarthroplasty combined

Key Summary Point

- In general, SSI rates in Wales in 2006 for hip and knee arthroplasties were higher than the data available for other countries.

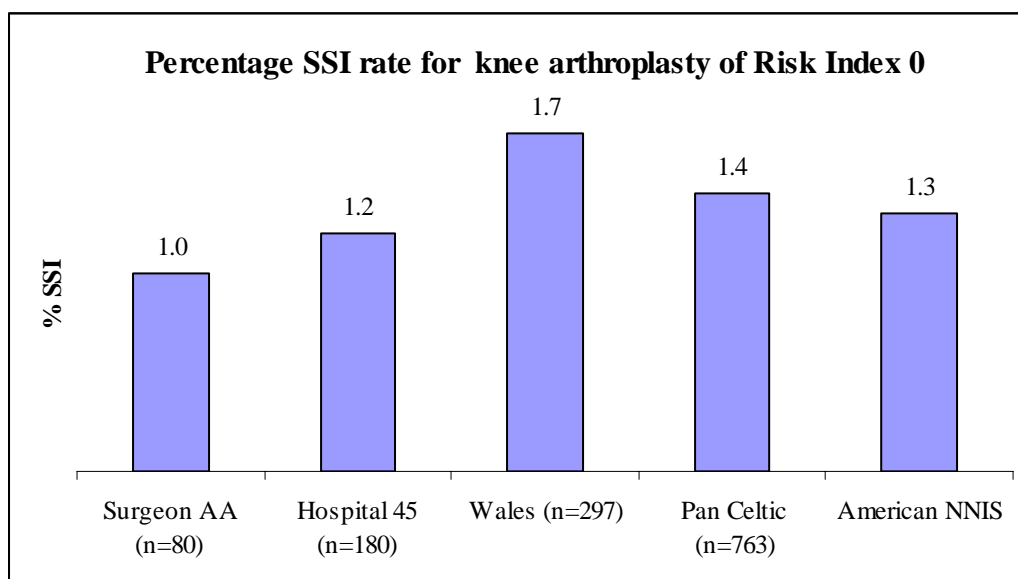
8. Conclusions

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

Overall rates of infection should be interpreted with caution since for some of the Trusts, there are still concerns about the reliability of the surveillance, in terms of completing and returning data for all the required procedures. Examination of the PEDW data shows that a considerable proportion of the mandatory orthopaedic procedures have not been captured via the surveillance scheme. Those sites with higher form returns will have a disproportionate influence on the overall figures. Additionally not all trusts in Wales carrying out orthopaedic procedures contributed data in 2006. There are also differences between sites in the degree of post-discharge surveillance undertaken, which obviously has a major impact on their infection rates. Primary data collection should take place for 30 days post surgery, unless an implantable device was placed in the patient, in which case surveillance should continue for 1 year. Although included in the mandatory data set, it has taken Trusts varying amounts of time to set up their post-discharge surveillance, therefore differences currently exist between them. Despite these drawbacks, results for 2006 are mainly consistent with those found in 2005 and are similar to those described for other orthopaedic SSI surveillance schemes.

This all-Wales report should be used in conjunction with surgeon specific reports, hospital/Trust specific reports, as well as alongside the Pan Celtic report and reports from SSI schemes in other countries. The WHAIP team can provide surgeons with individual surgeon rates and hospital specific rates. An example of how an individual surgeon may use comparative data is given below:

Figure X. Surgeon AA SSI rates for knee prosthesis with risk index of 0, compared to rates for hospital, country, Pan Celtic collaboration and American NNIS



9. References

1. Whitehouse JD et al. The impact of SSI following orthopaedic surgery at a community hospital and a university hospital: Adverse quality of life, excess length of stay and extra cost. *Infection Control & Hospital Epidemiology* 2002; **23**: 183-189.
2. O'Donoghue MA & Allen KD. Costs of an outbreak of wound infections in an orthopaedic ward. *Journal of Hospital Infection* 1992; **22**: 73-79.
3. Cruse PJ & Foord R. The epidemiology of wound infection. A 10 year prospective study of 62,939 wounds. *Surgical Clinics of North America* 1980; **60**: 27-40.
4. Schneeberger PM et al. Surveillance as a starting point to reduce surgical site infection rates in elective orthopaedic surgery. *Journal of Hospital Infection* 2002; **51**: 179-184.
5. Horan T et al. CDC Definitions of Surgical Site Infections, 1992: A modification of CDC Definitions of Surgical Wound Infections. *Infection Control & Hospital Epidemiology* 1992; **13**: 606-608.
6. Hospitals in Europe Link for Infection Control through Surveillance (HELICS). Available at: www.helics.univ-lyon1.fr/home.htm
7. Office of Population Censuses and Surveys (OPCS). Tabular list of the Classification of Surgical Operations and Procedures, Fourth Revision 1990. HMSO, London.
8. Pan Celtic Collaborative Orthopaedic Surgical Site Infection Surveillance Report, data January 2004 to December 2004. July 2005.
9. Culver et al. Surgical wound infection rates by wound class, operative procedure and patient risk index. *American Journal of Medicine* 1991; **91** (Suppl B): 3B-152S – 157S.
10. Reilly JS, Hill R & Allardice G. Procedure specific surgical site infection rates and post-discharge surveillance in Scotland – An update. Available at: <http://www.documents.hps.scot.nhs.uk/posters/2007/ssi-rates-postdischarge-surveillance-hai.pdf>
11. Health Protection Agency. Second report of the mandatory surveillance of surgical site infection in orthopaedic surgery. April 2004 to Mar 2006. London: Health Protection Agency, Jan 2007. Available at: http://www.hpa.org.uk/infections/topics_az/surgical_site_infection/documents/SSI2ndMandatory29-01-07.pdf
12. National Nosocomial Infections Surveillance (NNIS) System Report, data January 1992 to October 2004. *American Journal of Infection Control* 2004; **32**: 470-485.

10. Acknowledgements

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11. Appendix

Overall OPCS IV category	Sub-categories
W19 Primary open reduction of fracture of bone and intramedullary fixation <i>Includes: Open reduction of fracture of bone and intramedullary fixation NEC Excludes: Fracture dislocation (W65)</i>	W19.1 Primary open reduction of fracture of neck of femur and open fixation using pin and plate <i>Includes: Primary open reduction of fracture of neck of femur and open fixation using dynamic hip screw</i>
W37 Total prosthetic replacement of hip joint using cement	W37.1 Primary total prosthetic replacement of hip joint using cement W37.2 Conversion to total prosthetic replacement of hip joint using cement W37.3 Revision of total prosthetic replacement of hip joint using cement W37.4 Revision of one component of total prosthetic replacement of hip joint using cement W37.8 Other specified W37.9 Unspecified W37.0 Conversion from previous cemented total prosthetic replacement of hip joint
W38 Total prosthetic replacement of hip joint not using cement	W38.1 Primary total prosthetic replacement of hip joint not using cement W38.2 Conversion to total prosthetic replacement of hip joint not using cement W38.3 Revision of total prosthetic replacement of hip joint not using cement W38.4 Revision of one component of total prosthetic replacement of hip joint not using cement W38.8 Other specified W38.9 Unspecified W38.0 Conversion from previous uncemented total prosthetic replacement of hip joint
W39 Other total prosthetic replacement of hip joint	W39.1 Primary total prosthetic replacement of hip joint NEC W39.2 Conversion to total prosthetic replacement of hip joint NEC W39.3 Revision of total prosthetic replacement of hip joint NEC W39.4 Attention to total prosthetic replacement of hip joint NEC W39.5 Revision of one component of total prosthetic replacement of hip joint NEC W39.6 Closed reduction of dislocated total prosthetic replacement of hip joint W39.8 Other specified W39.9 Unspecified W39.0 Conversion from previous total prosthetic replacement of hip joint NEC
W46 Prosthetic replacement of head of femur using cement <i>Includes: Prosthetic hemiarthroplasty of head of femur using cement</i>	W46.1 Primary prosthetic replacement of head of femur using cement W46.2 Conversion to prosthetic replacement of head of femur using cement W46.3 Revision of prosthetic replacement of head of femur using cement W46.8 Other specified W46.9 Unspecified W46.0 Conversion from previous cemented prosthetic replacement of head of femur
W47 Prosthetic replacement of head of femur not using cement <i>Includes: Prosthetic hemiarthroplasty of head of femur not using cement</i>	W47.1 Primary prosthetic replacement of head of femur not using cement W47.2 Conversion to prosthetic replacement of head of femur not using cement W47.3 Revision of prosthetic replacement of head of femur not using cement W47.8 Other specified

	<p>W47.9 Unspecified</p> <p>W47.0 Conversion from previous uncemented prosthetic replacement of head of femur</p>
<p>W48 Other prosthetic replacement of head of femur</p> <p><i>Includes: Prosthetic hemiarthroplasty of head of femur NEC</i></p>	<p>W48.1 Primary prosthetic replacement of head of femur NEC</p> <p>W48.2 Conversion to prosthetic replacement of head of femur NEC</p> <p>W48.3 Revision of prosthetic replacement of head of femur NEC</p> <p>W48.4 Attention to prosthetic replacement of head of femur NEC</p> <p>W48.5 Closed reduction of dislocated prosthetic replacement of head of femur</p> <p>W48.8 Other specified</p> <p>W48.9 Unspecified</p> <p>W48.0 Conversion from previous prosthetic replacement of head of femur NEC</p>
<p>W58 Other reconstruction of joint</p> <p><i>Excludes: Some similar operations for correction of congenital deformity (X19-X27)</i></p>	<p>W58.1 Primary resurfacing arthroplasty of joint</p> <p>W58.2 Revision of resurfacing arthroplasty of joint</p> <p>W58.8 Other specified</p> <p>W58.9 Unspecified</p> <p>W58.0 Conversion from previous resurfacing arthroplasty of joint</p>
<p>W93 Hybrid prosthetic replacement of hip joint using cemented acetabular component</p>	<p>W93.1 Primary hybrid prosthetic replacement of hip joint using cemented acetabular component</p> <p>W93.2 Conversion to hybrid prosthetic replacement of hip joint using cemented acetabular component</p> <p>W93.3 Revision of hybrid prosthetic replacement of hip joint using cemented acetabular component</p> <p>W93.8 Other specified</p> <p>W93.9 Unspecified</p> <p>W93.0 Conversion from previous hybrid prosthetic replacement of hip joint using cemented acetabular component</p>
<p>W94 Hybrid prosthetic replacement of hip joint using cemented femoral component</p>	<p>W94.1 Primary hybrid prosthetic replacement of hip joint using cemented femoral component</p> <p>W94.2 Conversion to hybrid prosthetic replacement of hip joint using cemented femoral component</p> <p>W94.3 Revision of hybrid prosthetic replacement of hip joint using cemented femoral component</p> <p>W94.8 Other specified</p> <p>W94.9 Unspecified</p> <p>W94.0 Conversion from previous hybrid prosthetic replacement of hip joint using cemented femoral component</p>
<p>W40 Total prosthetic replacement of knee joint using cement</p>	<p>W40.1 Primary total prosthetic replacement of knee joint using cement</p> <p>W40.2 Conversion to total prosthetic replacement of knee joint using cement</p> <p>W40.3 Revision of total prosthetic replacement of knee joint using cement</p> <p>W40.4 Revision of one component of total prosthetic replacement of knee joint using cement</p> <p>W40.8 Other specified</p> <p>W40.9 Unspecified</p> <p>W40.0 Conversion from previous cemented total prosthetic replacement of knee joint</p>
<p>W41 Total prosthetic replacement of knee joint not using cement</p>	<p>W41.1 Primary total prosthetic replacement of knee joint not using cement</p> <p>W41.2 Conversion to total prosthetic replacement of knee joint not using cement</p> <p>W41.3 Revision of total prosthetic replacement of knee joint not using cement</p>

	<p>W41.4 Revision of one component of total prosthetic replacement of knee joint not using cement W41.8 Other specified W41.9 Unspecified W41.0 Conversion from previous uncemented total prosthetic replacement of knee joint</p>
<p>W42 Other total prosthetic replacement of knee joint</p>	<p>W42.1 Primary total prosthetic replacement of knee joint NEC W42.2 Conversion to total prosthetic replacement of knee joint NEC W42.3 Revision of total prosthetic replacement of knee joint NEC W42.4 Attention to total prosthetic replacement of knee joint NEC W42.5 Revision of one component of total prosthetic replacement of knee joint NEC W42.8 Other specified W42.9 Unspecified W42.0 Conversion from previous total prosthetic replacement of knee joint NEC</p>