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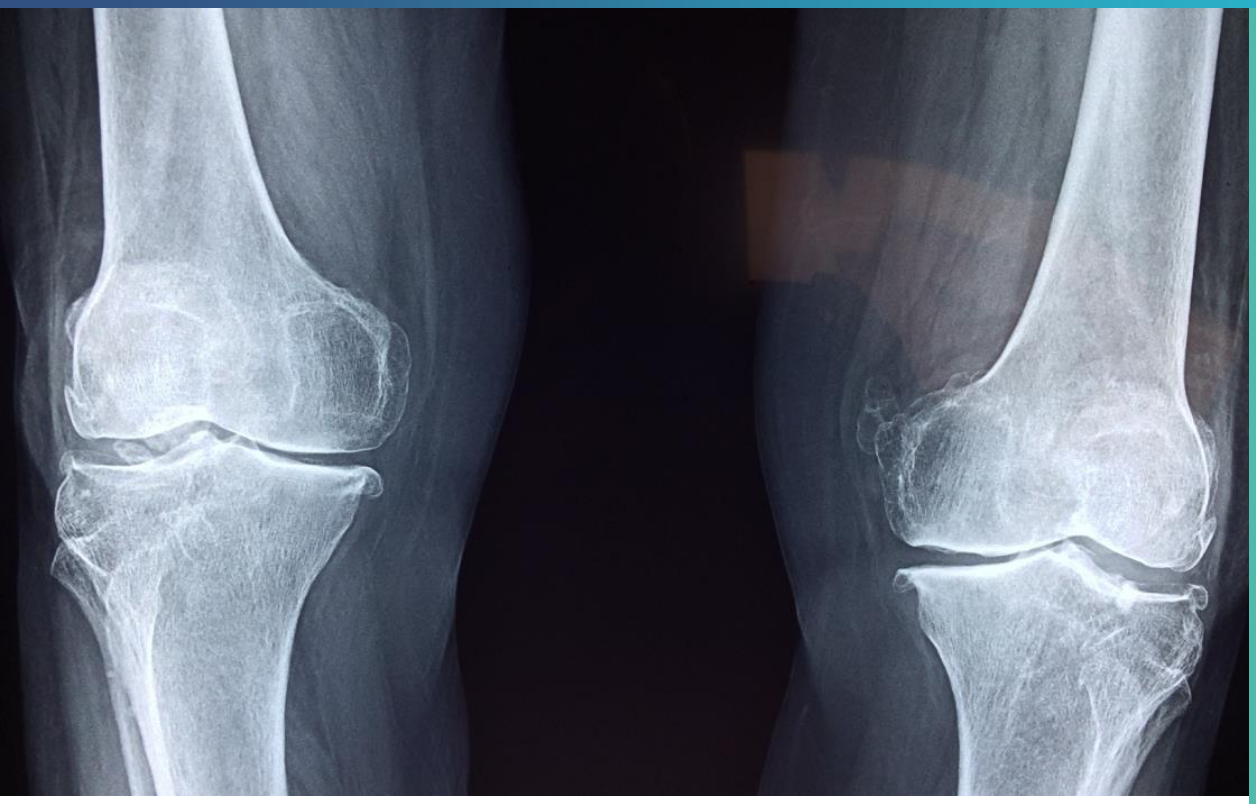

# Orthopaedic Surgical Site Infection Surveillance

## 2018 Annual Report:

## All Wales

Includes data from 01/01/2008 – 31/12/2018

Version 1

Issued: 27/11/2023

The Healthcare Associated Infection and Antimicrobial Resistance Programme can be accessed via the Public Health Wales website at:
http://www.publichealthwales.org

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# Table of Contents



# Tables



# Figures

# Introduction

The Healthcare Associated Infections team at Public Health Wales were instructed by the Welsh Government to develop and support the implementation of surveillance following orthopaedic procedures undertaken in NHS hospitals in Wales. This process has been mandatory since 2007.

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 preventable [3].

Serious patient consequences can result from SSIs, including pain, suffering and, on some occasions, they require additional surgical intervention [4]. It is important to recognise that SSIs can range from relatively trivial wound discharge with no other complications to a life-threatening condition. Other clinical outcomes of SSIs include poor scars that are cosmetically unacceptable, persistent pain and itching, restriction of movement and a significant impact on emotional wellbeing.

This report includes data captured both during the initial surgical procedure, revision surgery, and any other follow-up visits to the hospital (whether they were planned or not). The surveillance incorporates data collected by clinical teams and uses internationally agreed definitions [5], allowing Welsh data to be compared with and incorporated into other international databases, such as the ECDC European SSI database. This report details results obtained for surveillance data capture in 2018.

# Data interpretation

Surgical site infection (SSI) rates in this report are calculated as the number of infections as a proportion of total procedures entered onto the web form. This is reported as a rate per 100 procedures.

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

SSIs in orthopaedic procedures are most likely to occur within the first 90 days post-procedure. They can be reported later than 90 days and the system allows for surveillance of infections for up to five years following the procedure, however, an infection occurring more than a year following the procedure is rare, but is possible if the infection can be definitively linked to the surgery.

Extended surveillance only applies to electronically reported procedures, and older procedures reported on paper forms are generally monitored up to the post-discharge review at the surgeon's clinic.

All confidence intervals are set to 95% confidence unless stated otherwise.

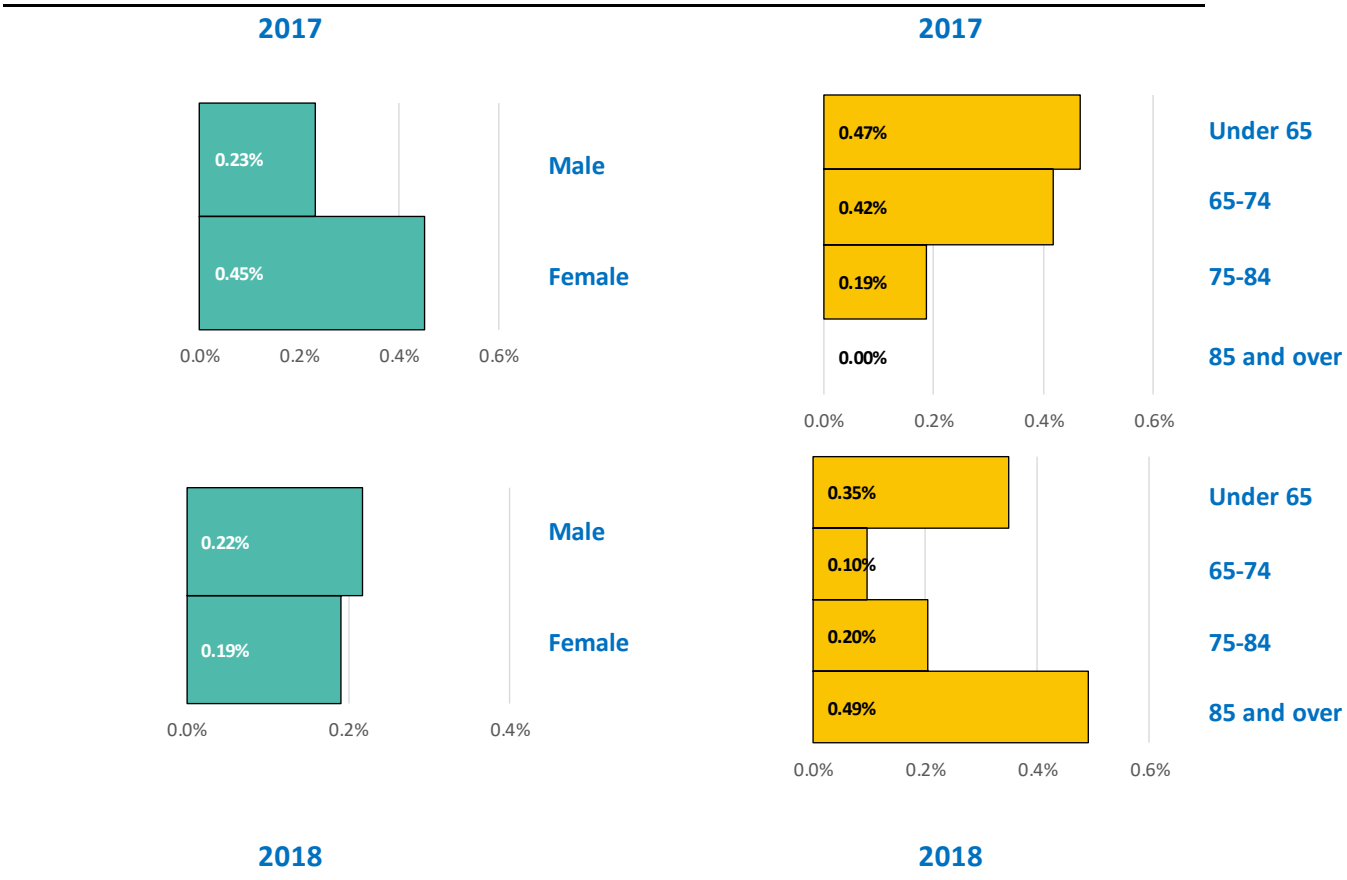
## Summary

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

**1 in 458**
**procedures had an SSI reported in 2018**

**Down from**

**1 in 285**
**procedures had an SSI reported in 2017**




***Streptococcus spp. are most frequently identified family of organisms***
**Identified in 83% of reported SSIs in 2018**
**SSI rate of 0.18% which is 9 times higher than the next most identified family of organisms**

**5,501 procedures were reported in 2018. Of these procedures, 12 were reported to have developed an SSI which equates to an SSI rate of 0.22%. Knee procedures had a higher SSI rate (0.37%) than hip procedures (0.12%).**

# Section 1: SSI rates

## Annual SSI rates

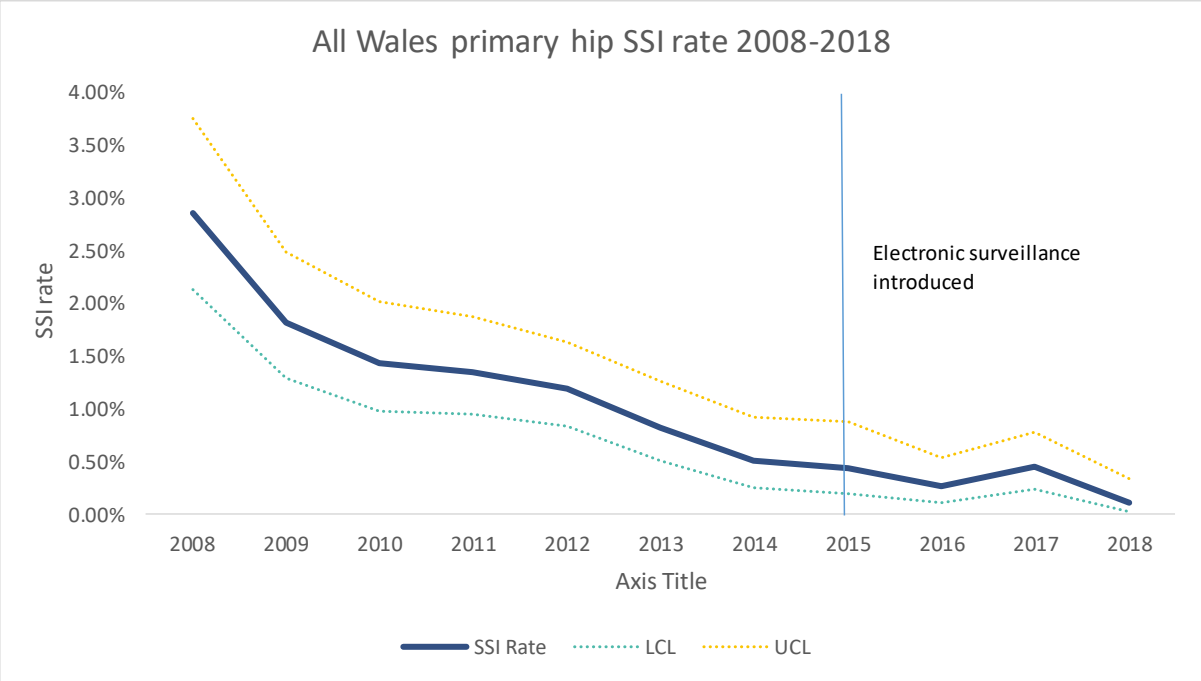



*Figure 1 – Graph showing the change in rate of SSI by year of procedure for primary hip procedures.*

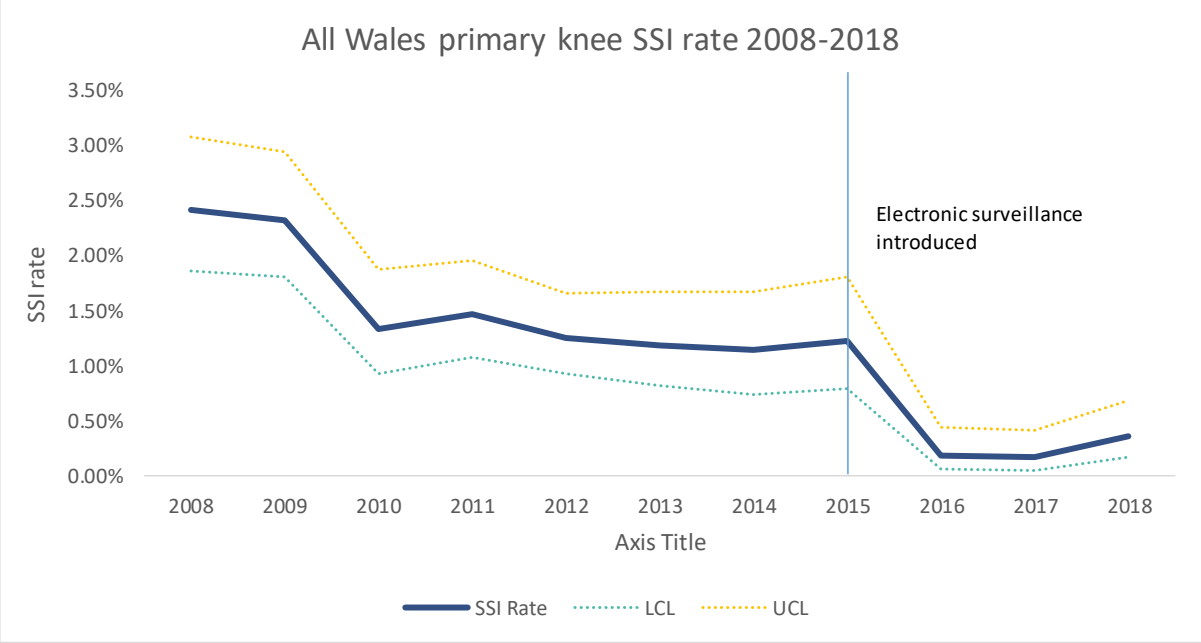



*Figure 2 – Graph showing the change in rate of SSI by year of procedure for primary knee procedures.*

The SSI rate has been gradually decreasing since 2008, however, there was a sharp decrease in primary knee procedures in 2016 when electronic data capture was introduced. This drop in rates is present for both hip and knee procedures, as well as the overall rates but most apparent in knee procedures.

# Section 2: Frequency of revisions

## Annual Revisions

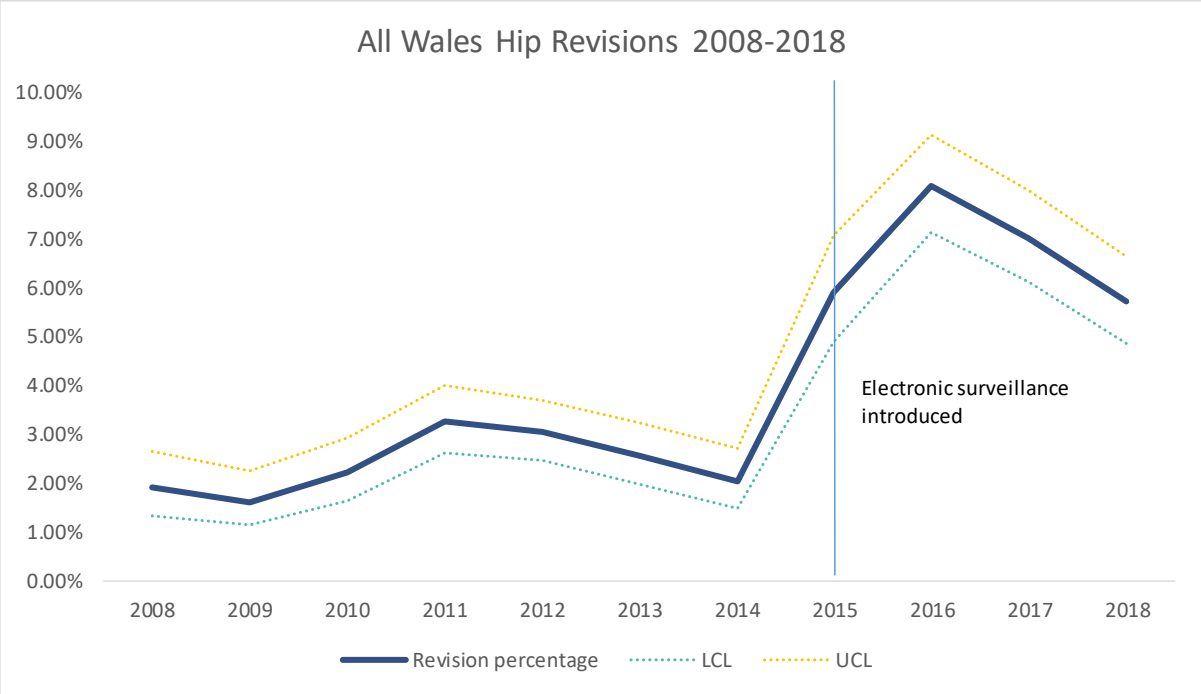



*Figure 3 – Graph showing the change in frequency of revision procedures by year for all hip procedures.*

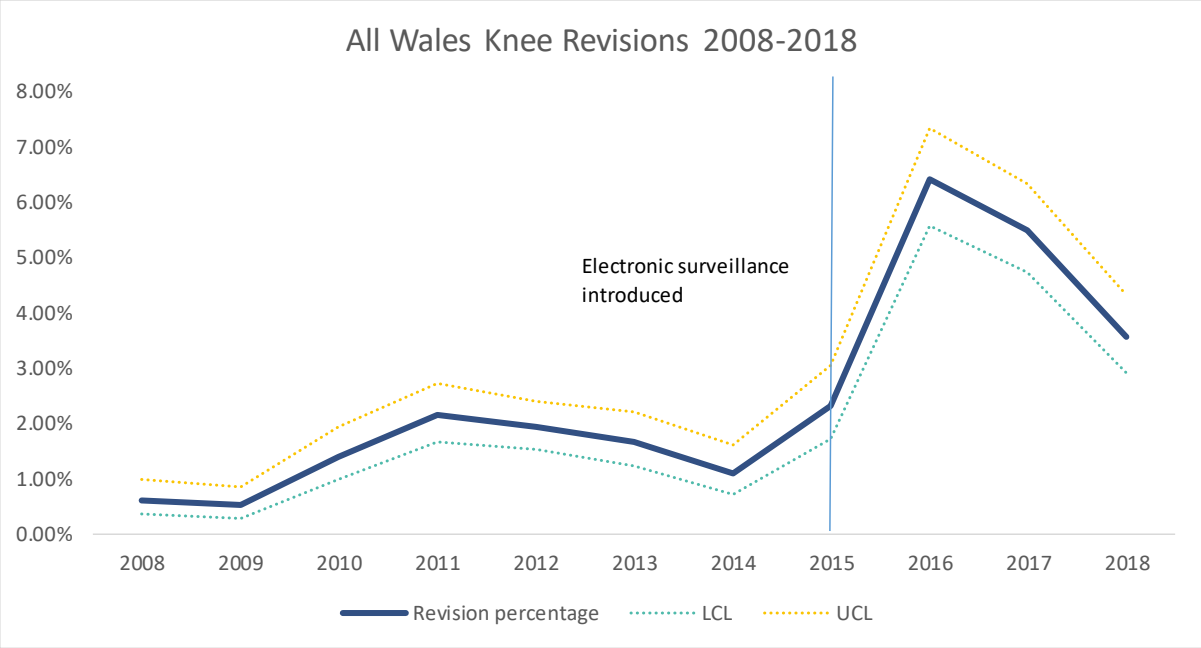



*Figure 4 – Graph showing the change in frequency of revision procedures by year for all knee procedures.*

# Section 2: Procedure details and demographics

*Table 1 – Procedure numbers and SSI rate breakdown by procedure type and demographic details.*

| | Wales 2018 | | | | Wales 2008-2018 | | |
|---|---|---|---|---|---|---|---|
| | *Procedures* | *SSI* | *SSI rate* | | *Procedures* | *SSI* | *SSI rate* |
| **Overall** | **5,501** | **12** | **0.2%** | **Overall** | **59,534** | **644** | **1.1%** |
| **Procedure types** | | | | **Procedure types** | | | |
| Primary hip | 2,532 | 3 | 0.1% | Primary hip | 26,310 | 256 | 1.0% |
| Revision hip | 154 | 0 | 0.0% | Revision hip | 1,131 | 12 | 1.1% |
| Primary knee | 2,402 | 9 | 0.4% | Primary knee | 29,669 | 359 | 1.2% |
| Partial knee* | 290 | 0 | 0.0% | Partial knee* | 979 | 1 | 0.1% |
| Revision knee | 100 | 0 | 0.0% | Revision knee | 808 | 11 | 1.4% |
| Other/unknown | 23 | 0 | 0.0% | Other/unknown | 637 | 5 | 0.8% |
| **Age groups** | | | | **Age groups** | | | |
| Under 65 | 1,725 | 6 | 0.3% | Under 65 | 19,316 | 230 | 1.2% |
| 65-74 | 2,071 | 2 | 0.1% | 65-74 | 22,193 | 224 | 1.0% |
| 75-84 | 1,467 | 3 | 0.2% | 75-84 | 15,101 | 162 | 1.1% |
| 85 and over | 204 | 1 | 0.5% | 85 and over | 2,265 | 19 | 0.8% |
| Unknown | 34 | 0 | 0.0% | Unknown | 659 | 9 | 1.4% |
| **Sex** | | | | **Sex** | | | |
| Male | 2,294 | 5 | 0.2% | Male | 25,158 | 319 | 1.3% |
| Female | 3,147 | 6 | 0.2% | Female | 34,016 | 321 | 0.9% |
| Unknown | 60 | 1 | 1.7% | Unknown | 360 | 4 | 1.1% |
| **Report source** | | | | **Report source** | | | |
| Electronic | 5,501 | 12 | 0.2% | Electronic | 19,666 | 60 | 0.3% |
| Paper forms | 0 | 0 | | Paper forms | 39,868 | 584 | 1.5% |

**Unicondylar and patellofemoral knee replacements.*

| Wales Mean 2008-2018 |
|---|
| 2.57% |
| 1.93% |
| 1.29% |
| 0.64% |
| 0.00% |

Analysing data across different demographics enables the observation of potential risk factors associated with the development of an SSI, in this case the SSI rate for primary knee procedures appears to be four times higher to that of primary hip procedures in 2018. This observation does not hold across years, with 2017 seeing the reverse, with a primary hip SSI rate more than twice that of primary knee procedures (0.46% and 0.18% respectively).

There is a loose association between age and the risk of SSI across annual data, with those patients aged under 65 being at a greater risk than patients aged 65 and over, this trend is not apparent when looking at 2018 data only (P=0.029, P=0.068 for 2018 data only). There is also a significant difference in SSI rates between sexes (P=0.007), and men have a higher risk of developing an SSI than women. This trend is also present in 2018, however with lower numbers and therefore, less significance

A comparison in SSI rates between procedures reported on paper and procedures reported electronically will be made in the last section (Data quality) but, as can be seen in the above table, the SSI rate in the electronic data is still substantially lower than paper-based data. Individual hospital and health board SSI rates can be found in the appendix.

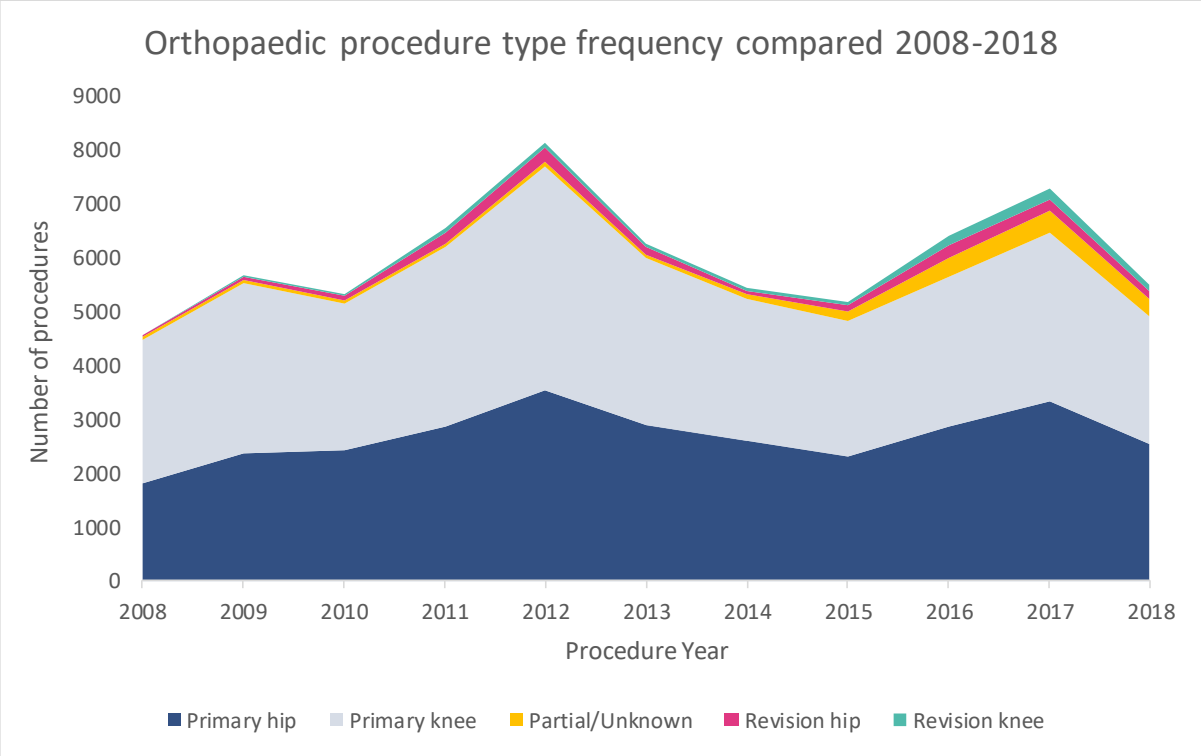



*Figure 5 – Graph to show the proportion of different procedure types for Orthopaedic procedures conducted each year, 2008-2018.*

It is evident that since the introduction of electronic data capture in 2015 that the numbers of revision knee procedures have increased, this is in contrast to revision hip procedures, which have seen relative increases and decreases at all times since 2008.

## Procedure types

*Table 2 – Breakdown of procedure numbers and SSI rates for individual procedure types.*

| Joint | OPCS | Name | Procedures | SSI | SSI rate | (95% CI) |
|---|---|---|---|---|---|---|
| Hip | W371 | Primary total hip replacement using cement | 871 | 2 | 0.23% | (0.03 - 0.83) |
| | W373 | Revision of total hip replacement using cement | 30 | 0 | 0.00% | (0.00 - 11.57) |
| | W381 | Primary total hip replacement not using cement | 1034 | 1 | 0.10% | (0.00 - 0.54) |
| | W383 | Revision of total hip replacement not using cement | 110 | 0 | 0.00% | (0.00 - 3.30) |
| | W391 | Primary total hip replacement NEC | 296 | 0 | 0.00% | (0.00 - 1.24) |
| | W393 | Revision of total hip replacement NEC | 14 | 0 | 0.00% | (0.00 - 23.16) |
| | W581 | Primary hip resurfacing | 0 | 0 | 0.00% | (0.00 - 0.00) |
| Knee | W401 | Primary total knee replacement using cement | 2251 | 8 | 0.36% | (0.15 - 0.70) |
| | W403 | Revision of total knee replacement using cement | 95 | 0 | 0.00% | (0.00 - 3.81) |
| | W411 | Primary total knee replacement not using cement | 145 | 1 | 0.69% | (0.02 - 3.78) |
| | W413 | Revision of total knee replacement not using cement | 5 | 0 | 0.00% | (0.00 - 52.18) |
| | W421 | Primary total knee replacement NEC | 13 | 0 | 0.00% | (0.01 - 24.71) |
| | W423 | Revision of total knee replacement NEC | 0 | 0 | 0.00% | (0.00 - 60.24) |
| | W428 | Other total replacement of knee joint | 4 | 0 | 0.00% | (0.00 - 13.72) |
| | Z844 | Patellofemoral knee replacement | 25 | 0 | 0.00% | (0.00 - 1.46) |
| | Z845 | Unicondylar knee replacement - medial | 250 | 0 | 0.00% | (0.00 - 21.80) |
| | Z846 | Unicondylar knee replacement - lateral | 15 | 0 | 0.00% | (0.00 - 21.80) |
| Unknown | W05 | Prosthetic replacement of bone | 1 | 0 | 0.00% | (0.00 - 0.98) |

*Procedures reported in 2018 only

| | |
|---|---|
| Mean SSI Rate | 0.58% |
| | 0.39% |
| | 0.19% |
| | 0.10% |
| | 0.00% |

## Prophylactic antibiotics

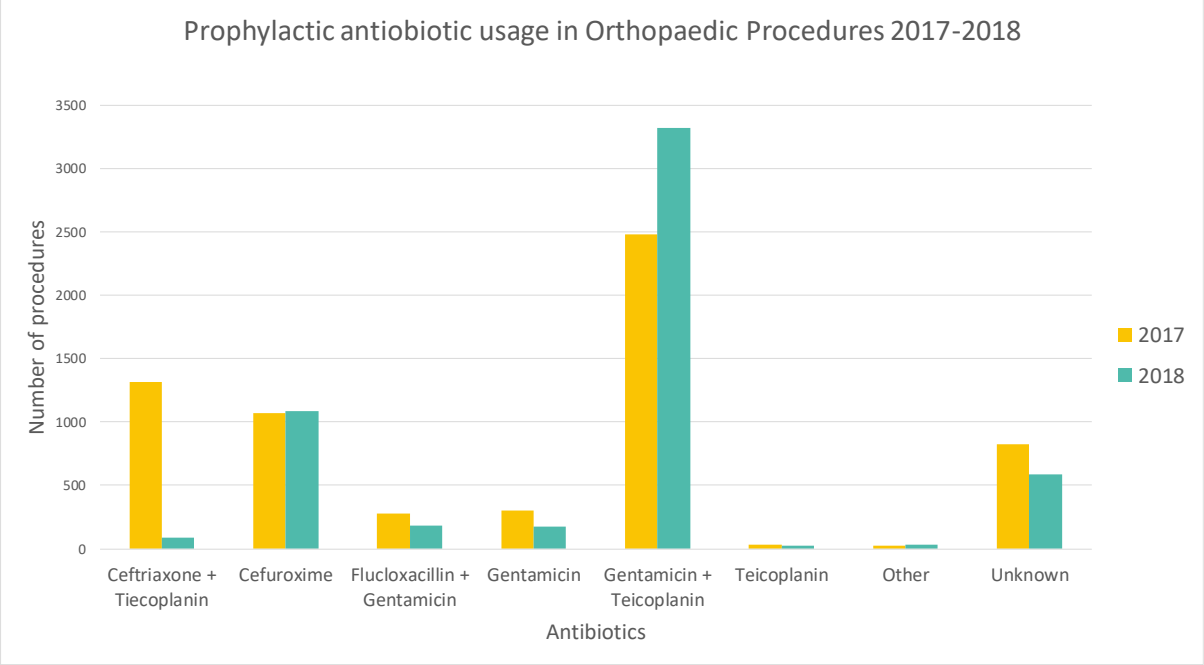



*Figure 6 – Graph showing the relative usage of prophylactic antibiotics in 2017 vs 2018.*

*Table 3 – Prophylactic antibiotics by frequency of use, with their associated SSI rates for 2018.*

| | Procedures | SSI | SSI rate | (95% CI) |
|---|---|---|---|---|
| Ceftriaxone + Teicoplanin | 86 | 0 | 0.00% | (0.00% - 0.61%) |
| Cefuroxime | 1087 | 0 | 0.00% | (0.00% - 12.34%) |
| Flucloxacillin + Gentamicin | 182 | 0 | 0.00% | (0.11% - 1.49%) |
| Gentamicin | 177 | 0 | 0.00% | (0.00% - 0.31%) |
| Gentamicin + Teicoplanin | 3322 | 11 | 0.33% | (0.00% - 1.89%) |
| Teicoplanin | 27 | 0 | 0.00% | (0.00% - 2.06%) |
| Other | 32 | 1 | 3.13% | (0.17% - 0.59%) |
| Unknown | 588 | 0 | 0.00% | (0.07% - 14.16%) |

| | |
|---|---|
| Mean SSI Rate | 0.58% |
| | 0.39% |
| | 0.19% |
| | 0.10% |
| | 0.00% |

Compared to 2017 the usage profile of prophylactic antibiotics has shifted, the use of Ceftriaxone and Teicoplanin has reduced and the combination of Gentamicin and Teicoplanin has increased as a result to become the most frequently used antibiotic combination for pre-surgery prophylaxis.

# Section 3: Post-procedure details

## Microbiology results

*Table 4 – Rates of SSI by individual microorganism.*

| | 2018 | | 2014*-2018 | |
|---|---|---|---|---|
| | Number of SSI | SSI rate | Number of SSI | SSI rate |
| ***Enterococcus*** | 1 | 0.02% | 13 | 0.05% |
| *E. faecalis* | 0 | 0.00% | 5 | 0.02% |
| *E. faecium* | 1 | 0.02% | 8 | 0.03% |
| ***Escherichia*** | 1 | 0.02% | 2 | 0.01% |
| *E. coli* | 1 | 0.02% | 2 | 0.01% |
| ***Klebsiella*** | 1 | 0.02% | 3 | 0.01% |
| *K. pneumoniae* | 1 | 0.02% | 2 | 0.01% |
| ***Pseudomonas*** | 1 | 0.02% | 1 | 0.00% |
| *P. aureginosa* | 1 | 0.02% | 1 | 0.00% |
| ***Staphylococcus*** | 10 | 0.18% | 43 | 0.16% |
| *S. aureus* | 6 | 0.11% | 28 | 0.11% |
| *-No resistance data* | 6 | 0.11% | 28 | 0.11% |
| *S. (not specified)* | 2 | 0.04% | 2 | 0.01% |
| *Coagulase negative* | 2 | 0.04% | 13 | 0.05% |
| *-S. epidermidis* | 1 | 0.02% | 7 | 0.03% |
| *-S. haemolyticus* | 0 | 0.00% | 5 | 0.02% |
| *-Not specified* | 1 | 0.02% | 1 | 0.00% |
| **Other** | 1 | 0.02% | 1 | 0.00% |
| *Other Gram negative bacilli* | 1 | 0.02% | 1 | 0.00% |
| **No microbiology results** | 1 | 0.02% | 699 | 2.63% |

*SSI rate shown as a percentage of procedures where the organism was present.*

*Tests can be positive for multiple organisms, therefore, some infections may be present multiple times under different organisms.*

**Microbiology data was not collected prior to 2014*

| |
|---|
| 0.20% |
| 0.19% |
| 0.16% |
| 0.08% |
| 0.00% |

Overall, the most common organism present in SSIs is *Staphylococcus sp.* Within this group, *S. aureus* is the most common single species, and this was present six times in 2018, which represents 50% of all infections in the year. It should be noted that while the frequency of *S. aureus* positive tests decreased, its relative proportion of infections has increased from 2017 at 10 times and 43% respectively. Resistance data was not provided for these cases, and it is therefore not possible to confirm whether these were methicillin sensitive or resistant. Coagulase negative Staphylococci as well as Enterococci were also relatively common.

Since the surveillance system captures multiple organisms, these numbers are higher than the total number of SSI, as some infections have multiple organisms recorded. There is also no way to indicate causation and, therefore, we are unable to confirm whether any of these organisms are the causative agent or are simply commensal organisms picked up along with the causative agent. There is a high probability that some Staphylococci and Enterococci in the surveillance system are purely commensal, and that others are the causative agent.

## Section 4: Data quality

There are many inconsistencies in data reporting for the orthopaedic SSI surveillance scheme, with some hospitals reporting more consistently than others.

Most hospitals across Wales remain compliant in reporting Orthopaedic procedures that we have under surveillance, but a major issues arises in the fact that many of these hospitals have not reported any SSIs for periods ranging from a few months to several years. A lot of this disparity can be attributed to the 2015 switch over to electronic data reporting, where the change in procedures has meant that some hospitals are reporting most procedures on the system but are not updating these records when an infection is identified.

This issue was highlighted in 2017 and there have been steps taken this year to attempt to engage hospitals with reporting infections and to identify the issues that need to be dealt with in order to improve compliance. Morriston hospital has seen the largest relative gains in compliance going into the New Year, 2019.

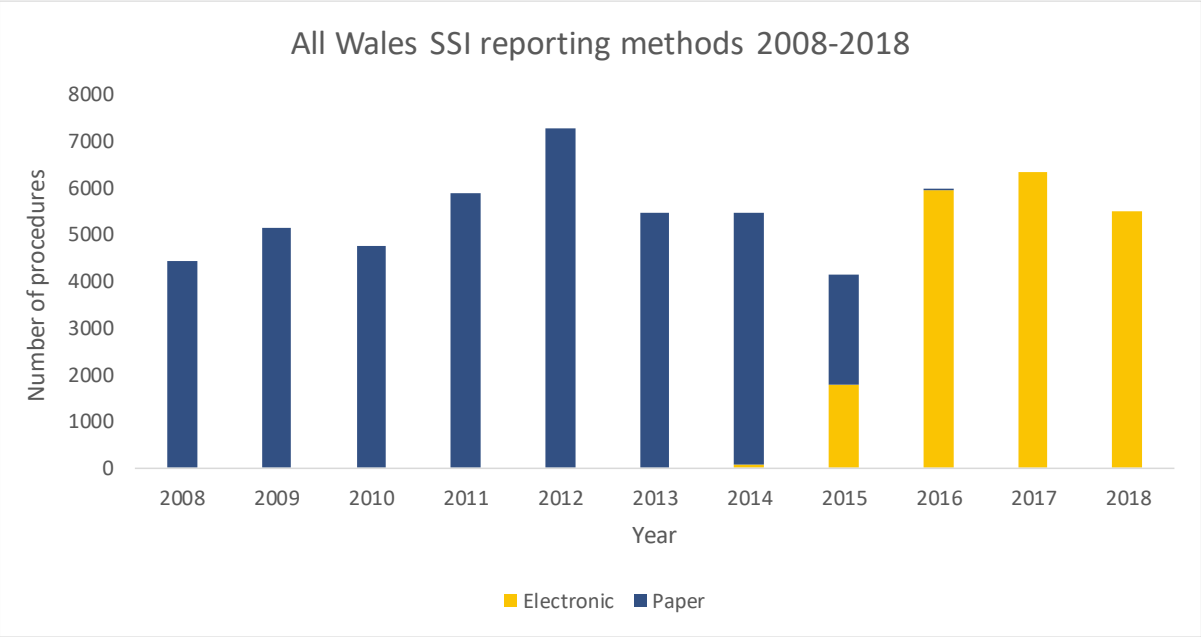



*Figure 7 – Proportions of data reporting sources per year, depicting the change from Paper to Electronic reporting sources since 2014.*

Paper surveillance of orthopaedic procedures was discontinued in 2016 and, despite the switch, there has been no substantive change in the number of procedures being reported to PHW. There was a slight decrease in the number of procedures reported in 2018 compared to the previous year.

# Discussion

In 2018, there were 5,501 procedures reported to Public Health Wales. Of these procedures, 12 were reported to have developed an SSI following the procedure, which equates to a Wales SSI rate of 0.22%.

It is difficult to ascertain the major risk factors contributing to the development of SSIs, however it appears as though there is a negative correlation between SSI rate and age with the under 65s having an SSI rate of 0.35%, and 50% of all SSIs reported this year being within this age group. The trend is not linear however, as a small numbers of procedures and a single SSI have inflated the SSI rate of the over 85s to 0.49%.

The gender disparity in SSI rate was not significant in 2018 with the female SSI rate at 0.22% compared to the male SSI rate at 0.19%. The 2018 data is a reversal of the 10 year trend which shows a significant slant towards males having a higher prevalence of SSIs at 1.27% compared to 0.94% for females.

In general, there is a lot of variability in reporting practices at hospitals. Some are fully compliant with the surveillance scheme while others are not reporting infections, and some not even reporting procedures. This means that comparing a hospital's infection rates to the Wales average is not recommended, as simply the act of reporting infections is enough for them to be above the average SSI rate for Wales. It is unlikely that the zero rates at some hospitals is a true reflection of the SSI rate, especially given the procedure numbers involved.

When discussing the volatility in SSI it is important to consider the effect of using electronic data capture. As can be seen from the SSI rates after 2014, the switch to electronic data capture may have contributed to a reduction in SSI rates as a result of under-reporting. It is also interesting to note the rise in reported revision procedures in the same period. Our data capture method does not list the reporting of revision procedures as an optional component in the way that it was presented when paper based reporting was the norm, this is likely to be the source of the observed increase.

The orthopaedic reports have been kept at a monthly reporting frequency. This has enabled several hospitals to review their reported procedures from a provided line listing for the following month in a timely manner, which has aided the quality of the orthopaedic dataset. Unfortunately, this line listing does not seem to have acted as the necessary prompt required to trigger infection reporting generally.

The HARP team are committed to the improvement of the Orthopaedic surveillance system and therefore have been investigating a variety of methods to capture infection data from hospitals in a heuristic system that will limit the work hours required to produce an SSI rate for each hospital included. This system will act as an interim solution until a more permanent system is developed. While we go through the process of developing and implementing these new methods, we would appreciate it if hospitals could continue reporting via the usual channels.

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