Scottish Antimicrobial Prescribing Group

European Surveillance of Antimicrobial Consumption Point Prevalence Survey 2009

Scottish Hospitals Report

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Contents

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Executive Summary

This report contains the results from the first national point prevalence survey of use of antimicrobials in hospitals in Scotland. The purpose of the report is firstly to support the work of the Scottish Antimicrobial Prescribing Group (SAPG) by estimating the national prevalence of antimicrobial use and identification of areas for quality improvement at national level and secondly to support the work of NHS Board Antimicrobial Management Teams (AMTs) by enabling participating hospitals to benchmark their local results against the national findings.

Antimicrobial resistance is recognised as a major threat to public health and patient safety. It reduces the available treatment options for infection and is associated with increased morbidity and mortality due to a failure of the initial choice of empirical treatment. It is accepted that the way in which antimicrobials are used, sometimes inappropriately, will increase the risk of antimicrobial resistance developing. Rational use of antimicrobials also plays a key role in preventing and controlling *Clostridium difficile* infection (CDI).

An initial priority for SAPG has been the production of guidance that would support AMTs to reduce the use of antimicrobials associated with a high risk of CDI. SAPG has issued guidance to AMTs to ensure that the use of agents such as fluoroquinolones, cephalosporins, clindamycin and co-amoxiclav are restricted for both treatment of infection and surgical prophylaxis.

Data on antimicrobial use in hospitals were collected as part of a Europe wide survey organised by the European Surveillance of Antimicrobial Consumption (ESAC) programme. It is usual for one or two hospitals from each country to participate in the survey. In Scotland a large number of acute hospitals and some non-acute hospitals participated in line with a recommendation from SAPG. Data were collected during two calendar weeks between 1st May 2009 and 26th June 2009. Following receipt of the necessary permissions from NHS Board Caldicott Guardians, results from 31 hospitals in thirteen territorial NHS Boards and one special NHS Board in Scotland were included in the national report.

The results of the survey have indentified a number of areas of good practice and some areas for improvement. Key findings include;

A total of 8,732 patients were included in the survey. The results indicate that 27.8% of patients surveyed were prescribed antimicrobials. The national prevalence of antimicrobial use in participating Scottish hospitals is very slightly lower than in the UK or Europe.

Compared to Europe there is lower use of ciprofloxacin, cephalosporins, clindamycin and co-amoxiclav in participating hospitals in Scotland and a greater use of narrower spectrum antimicrobials such as amoxicillin, doxycycline, metronidazole, trimethoprim and flucloxacillin. This reflects good practice and the observed pattern of prescribing needs to be sustained and improved further.

In 76.1% of cases where an antimicrobial was prescribed the reason for its use was recorded in the patients medical notes. Recording indication in the medical notes is a recognised standard of good prescribing practice and the results indicate that this is a key area for improvement.

All NHS Board AMTs have developed guidelines on the use of antimicrobials in hospitals. In this survey 57.9% of antimicrobials used were noted by investigators as being compliant with local NHS Board guidelines. This is also a key area for improvement.

SAPG and AMTs are currently monitoring compliance with prescribing indicators for hospital based empiric prescribing to support achievement of the Health Efficiency and Access to Treatment (HEAT) target of reduction in CDI by March 2011. The standard is that the reason for treatment should be recorded in the medical notes and the antimicrobial used should be in line with local policy in at least 95% of sampled cases. Progress with recording indication in medical notes and compliance with local guidance will be monitored against this indicator on an ongoing basis.

Use of antimicrobials for surgical prophylaxis accounted for 8.8% of total use of antimicrobials in the survey. One of the recommendations of SIGN Guideline 104; Antibiotic Prophylaxis in Surgery (July 2008) is that for many surgical procedures a single dose of antimicrobial with a long enough half life to achieve activity throughout the operation is recommended for prophylaxis. The results show that 30.3% of antimicrobial use for surgical prophylaxis had a duration greater than one day. This is a key area for improvement. SAPG has been working with the Scottish Patient Safety Programme (SPSP) to address this issue and it will be taken forward through the SPSP peri-operative and general ward interventions.

SAPG has issued guidance to AMTs on prescribing for surgical prophylaxis advising that cephalosporins, clindamycin, quinolones and where possible co-amoxiclav should be avoided and that narrower spectrum agents should be used. The results show that use of cephalosporins accounted for almost 40% of antimicrobials used for surgical prophylaxis. This indicates that there is room for improvement in compliance with SAPG guidance and this will be addressed by AMTs. Progress with duration of prophylaxis and choice of antimicrobial used for prophylaxis will be monitored against the prescribing indicator for surgical prophylaxis to support HEAT target reduction in CDI on an ongoing basis.

The results of this survey provide SAPG and AMTs with useful national baseline information on the quality of prescribing within participating hospitals in Scotland. This survey will be used to monitor changes in the key areas identified for improvement going forward.

Purpose

The purpose of this report is to support the work of Scottish Antimicrobial Prescribing Group (SAPG) and NHS Board Antimicrobial Management Teams (AMTs) by enabling;

- participating hospitals to benchmark across Scotland
- estimation of the national prevalence of antimicrobial use
- identification of areas for quality improvement at national level

Background

Resistance to antimicrobials is recognised nationally and internationally as a major threat to public health and patient safety. It is accepted that a major driver for the development of antimicrobial resistance is the way in which antimicrobials are used and misused. The surveillance of use of antimicrobials is important to understand the developing patterns of antimicrobial resistance and to monitor the impact of strategies that aim to improve antimicrobial stewardship in Scotland.

In the absence of electronic prescribing in hospitals the use of point prevalence surveys (PPS) is a practical method for surveillance and investigation of antimicrobial prescribing patterns. PPS can support identification of areas for more detailed audit on specific agents or within particular clinical areas; allow differences between hospitals to be identified and allow identification of changes in patterns of prescribing over time.

To allow meaningful comparison between hospital sites and across time a standardised methodology and data collection tool is required. The European Surveillance of Antimicrobial Consumption[1] (ESAC) PPS is a European wide multicentre survey of the quality of the use of antimicrobials in hospital. It is usual for one or two hospitals from each country to participate in the survey. Scotland is unique in that a large number of acute and some non-acute hospitals participated. This was a Scottish Antimicrobial Prescribing Group (SAPG) recommendation.

In 2007 a prevalence survey of healthcare acquired infection (HAI) across hospitals in Scotland involving 13,754 patients was published[2]. This survey collected some information about the use of antimicrobials and despite methodological differences to the work reported here is capable of providing some comparative data.

Also in 2007 a PPS in ten Scottish hospitals, involving 3,826 patients was published[3]. This used the Glasgow Antimicrobial Audit Tool. The data were collected in 2003 and there were a number of important methodological differences from the PPS presented here; intensive care units, haematology/oncology units and paediatric units were not included and additionally it did not collect any data on antimicrobials used for surgical prophylaxis. Despite these limitations and differences it allows some broad comparison to the data presented here.

Method

Participating hospitals

SAPG recommended that the ESAC PPS should be undertaken in at least one acute hospital and where possible one-non acute hospital in each NHS Board.

Data collection

Data on antimicrobial use were collected during two calendar weeks between 1st May 2009 and 26th June 2009 using an amended ESAC PPS 2009 form. The amendment was made to give further detail on the diagnostic codes to ensure consistency of approach in Scotland. A copy is attached as appendix 1.

Data entry

Following collection of data within participating hospitals, data were entered on to the dedicated ESAC web based survey programme known as ESAC WebPPS. Data were entered either directly by staff in participating hospitals or was transferred to Health Protection Scotland for data entry.

The ESAC WebPPS programme is designed to allow each participating site access to a summary of hospital findings compared with the average for all participating sites on the database at that time. It does not allow for the routine production of a summary report at Scotland level.

Data analysis

ESAC provided the SAPG information workstream individual spreadsheets of data extracted from ESAC WebPPS for each hospital. These were aggregated and analysed using SPSS statistical software. Permission of Caldicott Guardians in NHS Boards to aggregate data was obtained. When obvious data entry errors were identified as part of the analysis of the combined data these were excluded from the analysis.

Where appropriate aggregated data for Scotland is compared with the data from;

- UK and Europe overall from ESAC PPS (provided by ESAC)[4]
- NHS Scotland national HAI prevalence survey (2007)[2]
- 2007 PPS in Scottish hospitals[3]

Results and discussion

Following receipt of the necessary permissions from NHS Board Caldicott Guardians data from a total of **31** hospitals from thirteen territorial NHS Boards and one special NHS Board in Scotland are included in this national report.

A list of hospitals providing data for this report is attached as appendix 2.

1. Patient demographics and overview of prescribing

a. Patient overview

A total of 8,732 patients were included in the survey. Of these 2,425 **(27.8%, hospital range 5.6%-47.1%)** were prescribed 3,511 antimicrobials. Of the patients receiving antimicrobials 51.1% were female. The mean age of patients treated with antimicrobials was 64 years. The Scottish prevalence of use of antimicrobials is very slightly lower than in the UK or rest of Europe (29%) collected as part of ESAC PPS[4]. It is very similar to the prevalence noted in the previous Scottish PPS where 28.2% of patients received an antimicrobial[3].

b. Use by speciality

The survey methodology required classification of patients into four specialities; medicine, surgery, intensive care and other. Table 1 shows the number of patients in each specialty and the proportion prescribed antimicrobials.

	Number of patients	% prescribed an antimicrobial
Medicine	5,053	26.6%
Surgery	2,688	30.2%
Intensive Care	349	54.4%
Other	642	12.3%

Table 1: Number and proportion of patients prescribed antimicrobials by specialty (n=8,732), ESAC PPS 2009.

c. Number of antimicrobials prescribed

Within all specialities there are occasions when patients will require treatment with more than one antimicrobial to achieve the desired clinical outcome. Table 2 shows the number of patients and the number of antimicrobials prescribed. This shows that the majority of patients were receiving monotherapy but 7.2% of all patients being treated received three or more antimicrobials.

	Number of patients	% (hospital range) of total prescribed antimicrobials
1 antimicrobial	1,542	63.6% (40%-100%)
2 antimicrobials	709	29.2% (0%-60%)
3 or more antimicrobials	174	7.2% (0%-20%)

Table 2: Number of patients and antimicrobials prescribed (n=2,425), ESAC PPS 2009.

In the 2007 HAI prevalence survey[2] 9.6% of patients prescribed antimicrobials received three or more agents. This survey included the use of topical antimicrobials.

Data on the number of antimicrobials prescribed by speciality is shown in appendix 3.

d. Route of administration

A standard for hospital antimicrobial prescribing policies is that they should include guidelines for the early switch of intravenous to oral treatment when clinically appropriate[4]. There are potential advantages to support the prompt switch from intravenous and an important measure of the quality of use of antimicrobials in hospital is the proportion of all antimicrobials used given by the parenteral route.

Of the total number of antimicrobials prescribed **50.5% (hospital range 0% - 85.7%)** were given by the parenteral route, 49.5% by the oral route and 0.1% by inhalation. This is a little lower than the UK[4] as a whole (52.5%) and much lower than in Europe[4] where 72% of all antimicrobials were given by the parenteral route. This difference between the UK and Europe is well recognised. It is not possible to make a comparison with the previous Scottish survey as this only reported the percentage of patients that were prescribed intravenous antibiotics (35.3%).

Data on the route of administration by speciality are shown in appendix 3.

e. Reason in notes

Recording in medical notes the reason why an antimicrobial is prescribed is a recognised standard of good practice and was included as a recommendation within Antimicrobial Prescribing Policy and Practice in Scotland[5] issued by the Scottish Medicines Consortium on behalf of the HAI taskforce in 2005. The recommendations of this report were accepted and expanded in the Scottish Management of Antimicrobial Resistance Action Plan (ScotMARAP)[6] in 2008. Recording of the reason not only allows clarity and communication of practice but also facilitates measurement of prescribing quality, such as through audit or compliance against prescribing indicators to support achievement of the Health Efficiency and Access to Treatment (HEAT) target of reduction in CDI by March 2011.[7] The HEAT target supporting indicator states that in equal to or greater than 95% of sampled cases the reason for antimicrobial prescribing should be recorded in the medical notes.

In **76.1% (hospital range 50%-100%)** of cases where an antimicrobial was prescribed the indication was recorded in the patient's medical notes. This is a key finding and is an area for improvement. The proportion of antimicrobials where the reason for use was recorded in the patient's notes was lower than the UK[4] (80.5%) but higher than for Europe[4] (71.5%). Progress with recording indication in medical notes will be monitored by SAPG and AMTs using the HEAT target supporting indicator on hospital based empiric prescribing on an ongoing basis.

Data on the recording of reason in notes by speciality is shown in appendix 3.

f. Compliance with local guidelines

All AMTs have developed guidelines on hospital use of antimicrobials based on SAPG guidance on minimum requirements for antimicrobial prescribing policies in hospitals[8]. This guidance advised that hospital prescribing policies include advice on the recommended empirical treatment of most commonly encountered infections and that regular audit of prescribing against local guidelines is required. The prescribing indicator of hospital based empiric prescribing in support of the HEAT target on CDI reduction states that in equal to or greater than 95% of sampled cases the antimicrobial used should be compliant with local prescribing guidelines.

Table 3 shows the results for compliance with local guidelines. In **57.9% (hospital range 26.7%-100%)** of antimicrobials used, investigators deemed the agent prescribed as being compliant with local NHS Board guidelines. This is a key finding and is an area for improvement. Work is currently being undertaken by SAPG and AMTs in this area. Compliance with empiric guidelines at the time of admission to hospital for surgery and medicine is being measured and will be monitored on an ongoing basis by SAPG and AMTs through the prescribing indicators to support HEAT target for CDI reduction.

	Number of antimicrobials	% of total antimicrobials
Compliant	2,034	57.9%
No information available	439	12.5%
Not assessable	563	16.0%
Not compliant	475	13.5%

Table 3: Antimicrobial compliance with local guidelines (n=3,511), ESAC PPS 2009

The proportion of antimicrobials used that were deemed by investigators as compliant with local guidelines in Scotland was lower than the figure for the UK[4] more widely (68%) but it is slightly higher to the figure for Europe[4] (54.5%).

Data on the compliance with local guidelines by speciality are shown in appendix 3.

2. Antimicrobials use by Anatomical Therapeutic Chemical classification

Analysis of the data on overall use of antimicrobials used at the Anatomical Therapeutic Chemical (ATC) level 4 (chemical sub group) is shown in table 4.

ATC Code	Name	Number of antimicrobials	% of total antimicrobials
J01CR	Penicillin combinations	584	16.6%
J01XD	Imidazole derivatives	383	10.9%
J01CA	Penicillins with extended spectrum	318	9.1%
J01MA	Fluoroquinolones	301	8.6%
J01CF	Beta-lactamase resistant penicillins	265	7.5%
J01FA	Macrolides	217	6.2%
J01XA	Glycopeptide antibacterials	201	5.7%
J01GB	Other aminoglycosides	161	4.6%
J01CE	Beta-lactamase sensitive penicillins	152	4.3%
J01DC	Second generation cephalosporins	146	4.2%
J01EA	Trimethoprim and derivatives	143	4.1%
J01DD	Third generation cephalosporins	116	3.3%
J02AC	Triaxole derivatives	108	3.1%
J01DH	Carbapenems	92	2.6%
J01AA	Tetracyclines	79	2.3%
J01FF	Lincosamides	47	1.3%
J04AB	Antibiotics (TB)	38	1.1%
J01EE	Combination of sulphonamides and trimethoprim	37	1.1%
J01DB	First generation cephalosporins	35	1.0%
J01XE	Nitrofuran derivatives	33	0.9%
J01XX	Other antibacterials	20	0.6%
J01XC	Steroid antibacterials	14	0.4%
J02AX	Other antimycotics for systemic use	13	0.4%
J02AA	Antibiotics (Antimycotic)	4	0.1%
J01XB	Polymyxins	2	0.1%
D01AE	Other antifungals for topical use	1	0.0%
J01DF	Monobactams	1	0.0%
	Total	3511	100.0%

Table 4: Antimicrobial use at Anatomical Therapeutic Classification (ATC) level 4, ESAC PPS 2009

This shows that the ten most commonly used ATC level 4 groups account for 77.7% of overall use of antimicrobials.

Analysis of the data on overall antimicrobial use at ATC level 5 (individual agent) is shown in table 5

Name of substance	Number of antimicrobials	% of total antimicrobials	Hospital Range
Co-amoxiclav	389	11.1%	0 – 40.0%
Metronidazole	383	10.9%	0 – 25.0%
Amoxicillin	314	8.9%	0 – 40.0%
Ciprofloxacin	280	8.0%	0 – 24.0%
Flucloxacillin	265	7.5%	0 -17.4%
Piperacillin/tazobactam	195	5.6%	0 – 14.5%
Clarithromycin	177	5.0%	0 - 10.3%
Vancomycin	169	4.8%	0 - 17.7%
Gentamicin	153	4.4%	0 - 11.4%
Cefuroxime	146	4.2%	0 - 24.2%
Trimethoprim	143	4.1%	0 – 50.0%
Benzylpenicillin	110	3.1%	0 - 8.7%
Meropenem	90	2.6%	0 - 8.7%
Ceftriaxone	85	2.4%	0 - 8.8%
Fluconazole	79	2.3%	0 - 22.2%
Doxycycline	72	2.1%	0 - 50%%
Clindamycin	47	1.3%	0 - 7.1%
Phenoxymethylpenicillin	42	1.2%	0 – 10.0%
Rifampicin	38	1.1%	0 – 8.0%
Co-trimoxazole	37	1.1%	0 – 13.0%
Other	297	8.4%	0 – 50.0%
Total	3511	100.0%	

Table 5: Antimicrobial use at Anatomical Therapeutic Classification (ATC) level 5, ESAC PPS 2009

This shows that 20 different antimicrobial substances account for more than 90% of all antimicrobials used.

An initial priority for SAPG has been the production of guidance that would support AMTs to reduce the use of antimicrobials associated with a high risk of CDI. SAPG has issued guidance to AMTs to ensure that the use of agents such as fluoroquinolones, cephalosporins, clindamycin and co-amoxiclav are restricted for both treatment of infection and surgical prophylaxis.

These data show that co-amoxiclav is the most commonly prescribed antimicrobial in the participating hospitals and accounts for 11.1% of total antimicrobial use. Ciprofloxacin accounts for 8% of use and is the fourth most commonly prescribed antimicrobial. Cefuroxime accounts for 4.2% of use and when all cephalosporins are taken together they account for 8.5% of overall antimicrobial use. There is limited use of clindamycin which accounted for 1.3% of antimicrobial use.

Figure 1 shows a comparison of the use of a range of commonly used antimicrobials in Scotland the UK[4] and Europe[4].

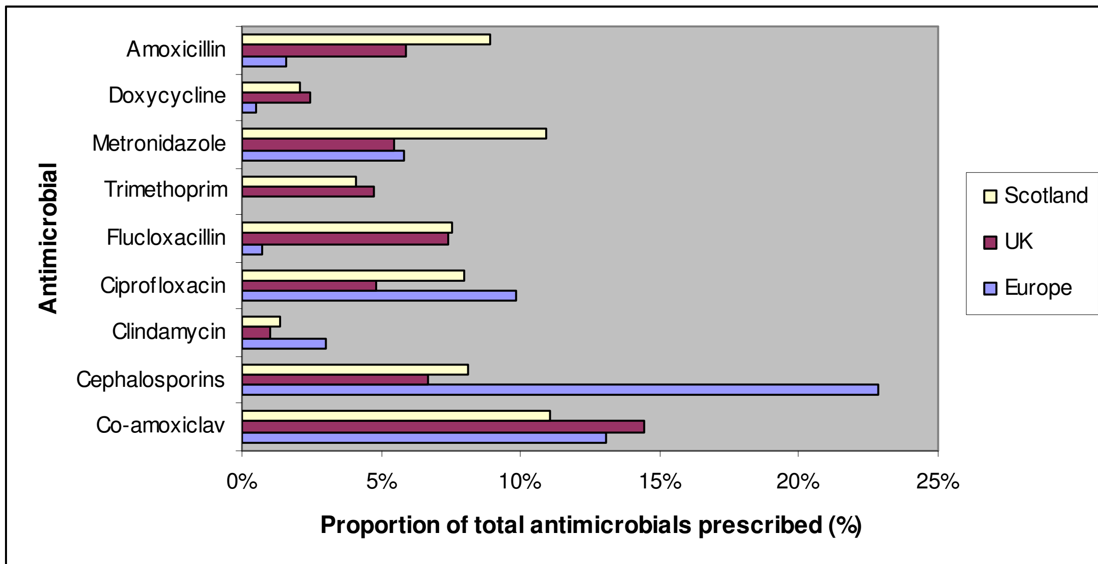

Figure 1: Scotland, UK and Europe comparison of proportion of total antimicrobials prescribed, ESAC PPS 2009

This shows Scotland has a greater use of narrower spectrum antimicrobials and a lower use of antimicrobials associated with a high risk of CDI compared to Europe. This is a key finding and it appears that Scotland is more conservative about the choice of agent than in Europe. This pattern of prescribing reflects good practice and should be sustained and improved further.

There are a number of key differences when antimicrobial use in Scotland is compared to the UK. Co-amoxiclav is the most commonly used agent in both Scotland and the UK but use in Scotland (11.1%) is lower than use in the UK (14.5%). There is a higher proportionate use of metronidazole in Scotland (10.9%) compared to the UK (5.4%). Similarly there is a greater use of amoxicillin in Scotland (8.9%) compared to the UK (5.9%). The use of ciprofloxacin in Scotland (8.0%) is higher than in the UK (4.8%).

The survey design and data presentation in the previous Scottish PPS[3] do not allow a direct comparison with these data but there are some significantly different patterns. In the previous Scottish survey third generation cephalosporins were the most commonly prescribed class of antimicrobials (used in 28.3% of patients) and co-amoxiclav was used in 20.2% of patients. The results here show much lower use of these agents.

3. Antimicrobials use by indication

a. Indication

Investigators were required to record the indication for treatment from a standard list provided. Figure 2 shows the total number of antimicrobials use by indication.

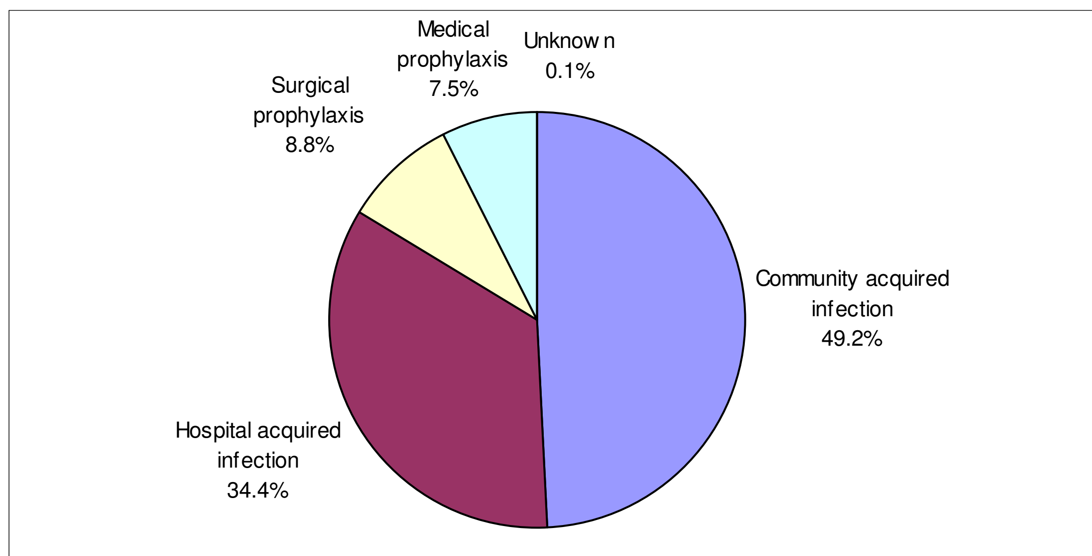

Figure 2: Proportion of antimicrobials by indication (n=3,511), ESAC PPS 2009

This shows that community acquired infection made up almost half of all antimicrobial use and that surgical prophylaxis accounted for almost 9% use.

The breakdown by indication in Scotland is broadly similar to the UK[4]. The main differences compared to Europe are that there is a lower proportion of community acquired infection in Europe and a higher proportion of surgical prophylaxis in Europe[4].

Medical prophylaxis accounts for 7.5% of overall use of antimicrobials in Scotland. This is similar to the UK and Europe[4].

b. Antimicrobial use by diagnostic site of infection

Investigators were required to record the diagnostic site of infection from a list of standard options. A breakdown of the use of antimicrobials, excluding surgical prophylaxis is shown in Figure 3.

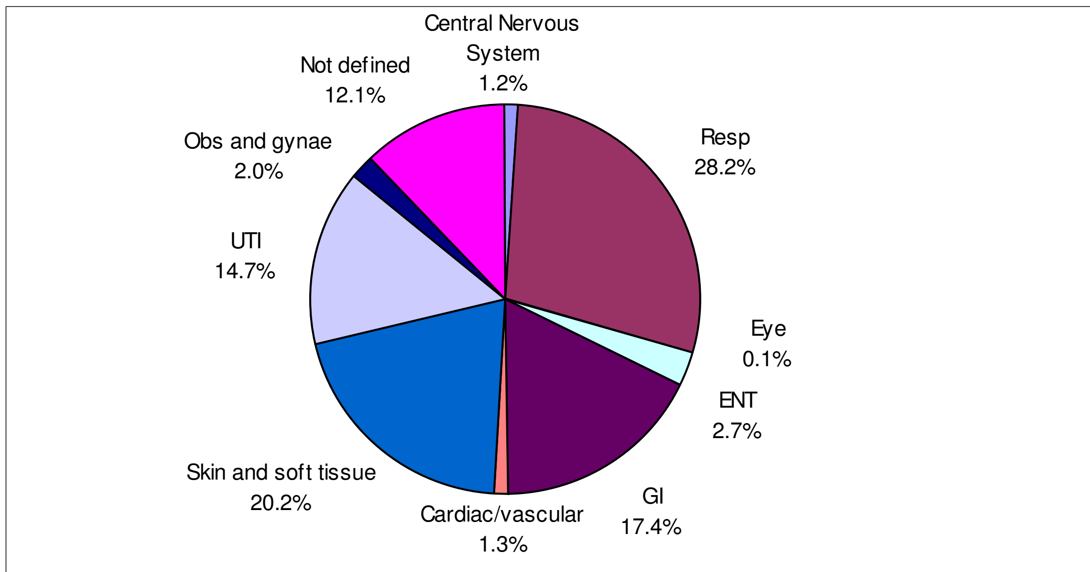

Figure 3: Use of antimicrobials (excluding surgical prophylaxis) by diagnostic site of infection (n=3,201), ESAC PPS 2009

This shows that four diagnostic sites of infection make up 81% of the overall use of antimicrobials. The most common sites of infection were respiratory, skin and soft tissue, gastrointestinal and urinary tract. Data illustrating which antimicrobials were used for each of these sites of infection data is presented below.

Respiratory infections

Figure 4 shows the antimicrobials used where the diagnostic code was respiratory infections.

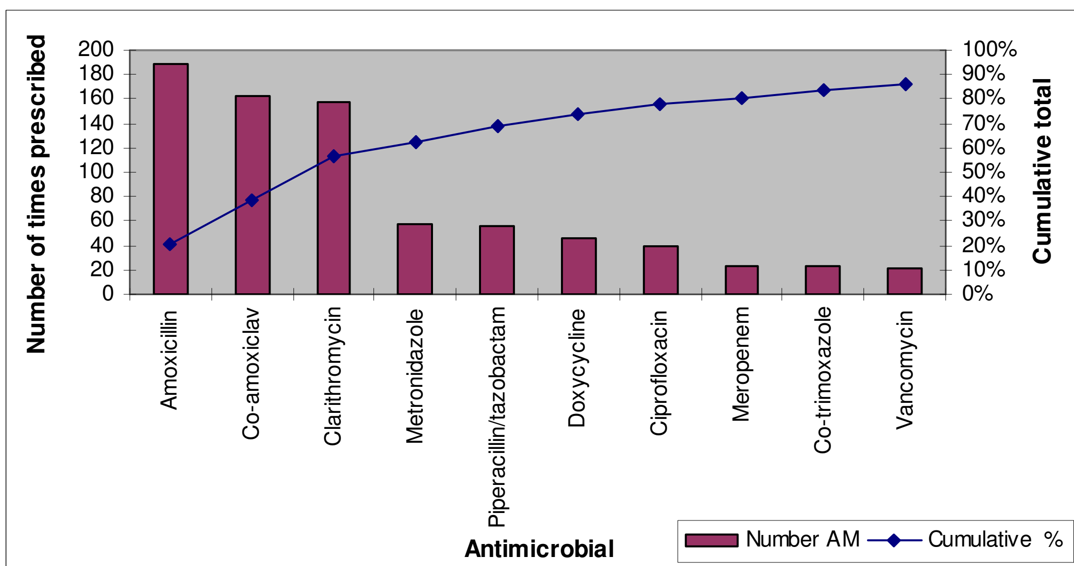

Figure 4: Use of antimicrobials (excluding surgical prophylaxis) by diagnostic site: respiratory (n=903), ESAC PPS 2009

This shows that ten antimicrobials account for almost 86% of use in a recorded diagnostic site of respiratory infection. Amoxicillin and clarithromycin are two of the three most commonly used antimicrobials for respiratory infections in hospital. Also noteworthy is the use of doxycycline and co-trimoxazole accounting for 5.1% and 2.5% of total use

respectively. There appears to be no significant use of cephalosporins for respiratory infection. The remaining 14% of use is made up of small numbers of 26 different agents.

Skin and soft tissue infections

Figure 5 shows the antimicrobials used where the diagnostic code was skin and soft tissue infections.

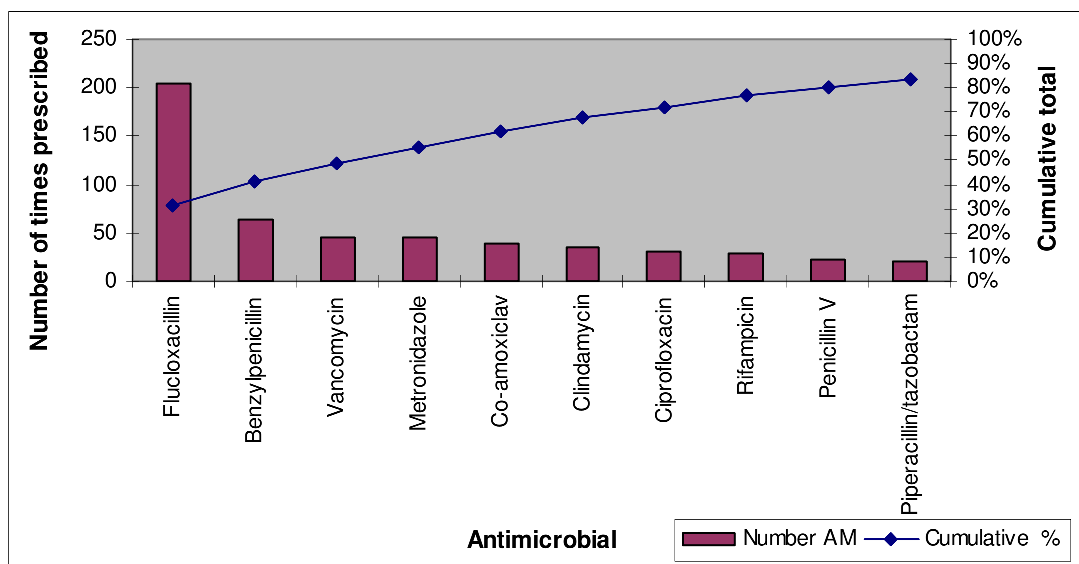

Figure 5: Use of antimicrobials (excluding surgical prophylaxis) by diagnostic site: skin and soft tissue (n=648), ESAC PPS 2009

This shows that ten antimicrobials account for 83% of use in a recorded diagnostic site of skin and soft tissue infection. Flucloxacillin and benzylpenicillin make up over 40% use of all antimicrobials for skin and soft tissue infection. The remaining 17% of use is made up of small numbers of 22 different agents.

Gastrointestinal Infections

Figure 6 shows the antimicrobials used where the diagnostic code was gastro-intestinal infections.

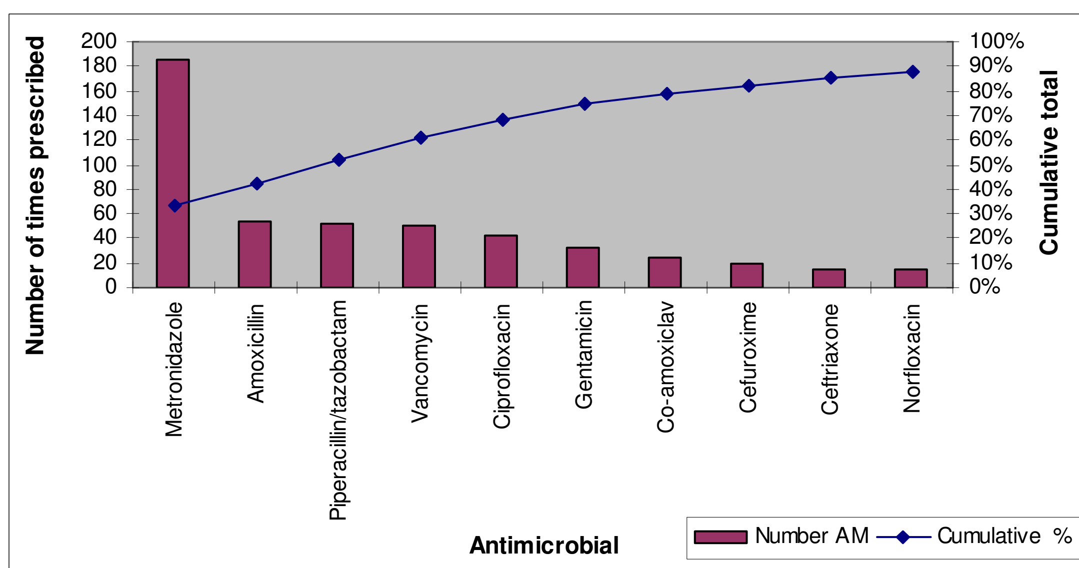

Figure 6: Use of antimicrobials (excluding surgical prophylaxis) by diagnostic site: gastro-intestinal infection (n=558), ESAC PPS 2009

This shows that ten antimicrobials account for just under 88% of use in a recorded diagnostic site of gastro-intestinal infections. Cefuroxime and ceftriaxone together account for around 6.1% of antimicrobial use for gastrointestinal infections. The remaining 12% of use is made up of small numbers of 21 different agents.

Urinary tract infections

Figure 7 shows the antimicrobials used where the diagnostic code was urinary tract infection.

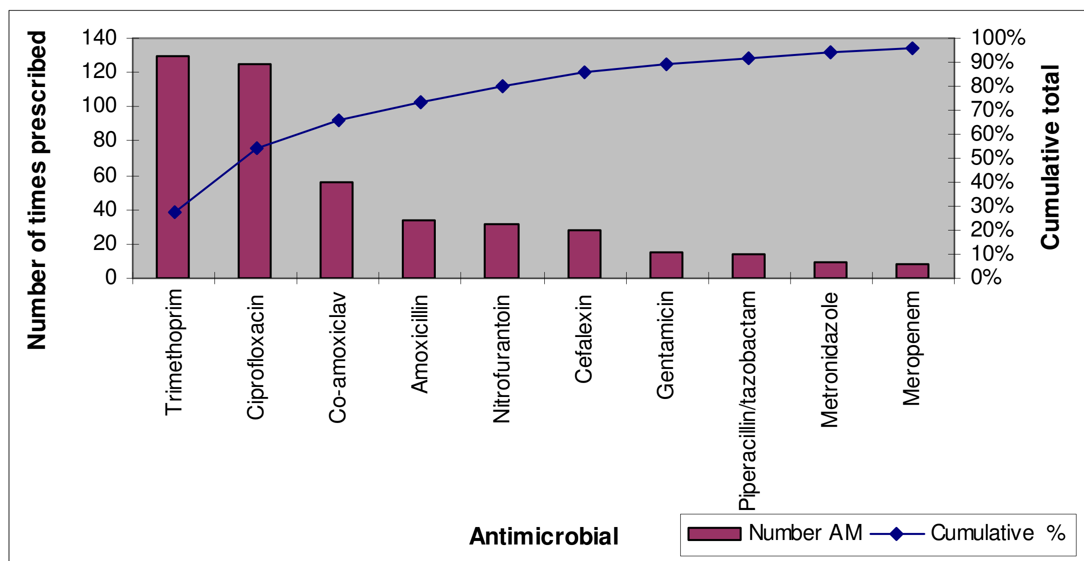

Figure 7: Use of antimicrobials (excluding surgical prophylaxis) by diagnostic site: urinary tract infection (n=471), ESAC PPS 2009

This shows that ten antimicrobials account for almost 96% of use in a recorded diagnostic site of urinary tract infections. It also shows that trimethoprim and nitrofurantoin account together for over one third of all antimicrobial use for urinary tract infections. Ciprofloxacin is the second most commonly used antimicrobial for urinary tract infection and accounts for over one quarter of all antimicrobials used for this infection. The oral cephalosporin cefalexin accounts for 6% of all antimicrobials used for urinary tract infections. This is an area for improvement. The remaining 4% of use is made up of small numbers of 12 different agents.

c. Antimicrobial use for surgical prophylaxis

Scottish Intercollegiate Guideline Network (SIGN) 104, Antibiotic prophylaxis in surgery, published in July 2008, outlined which surgical procedures require prophylactic antibiotic(s) based on a review of the available evidence. One of the main recommendations of this guidance is that a single dose of an appropriate antimicrobial is required for the majority of surgical procedures.

In this survey where investigators recorded an indication of surgical prophylaxis there was a requirement to record the duration from a series of standard options.

Table 6 shows the recorded duration of surgical prophylaxis.

Duration of surgical prophylaxis	Number of antimicrobials	% (hospital range) of total surgical prophylaxis
Single dose	155	50.0% (0%-100%)
one day	61	19.7% (0%-78.9%)
>1 day	94	30.3% (0%-100%)

Table 6: Recorded duration of surgical prophylaxis (n=310), ESAC PPS 2009

This shows that in **30.3% (hospital range 0% - 100%)** of antimicrobial use for surgical prophylaxis the duration was greater than one day. This is a key finding and shows some progress toward the SIGN guideline recommendation but illustrates that there is room for improvement. Work is currently being undertaken by SAPG and AMTs to collect data on the duration of surgical prophylaxis and compliance with local policy through the prescribing indicator on surgical prophylaxis to support HEAT target to reduce CDI. SAPG and AMTs are also collaborating with the Scottish Patient Safety Programme (SPSP) to address this issue through SPSP peri-operative and general ward interventions.

There are some differences noted in the duration of surgical prophylaxis between Scotland, the UK and Europe[4]. In Scotland just over 30% had a duration of more than one day which is similar to the UK but much lower than in Europe (>65%). In Scotland 50% of patients received the recommended single dose. This is higher than in the UK (42%) or Europe (15%).

Investigators were asked to record the diagnosis for use of all antimicrobials thereby allowing analysis of the duration of surgical prophylaxis in a range of standardised settings. Figure 8 shows a different pattern across different recorded diagnostic sites. In all cases where the recorded diagnosis was central nervous system the duration of prophylaxis was a single dose. When prophylaxis was used for ear, nose and throat surgery in 71.4% of cases the duration was more than one day.

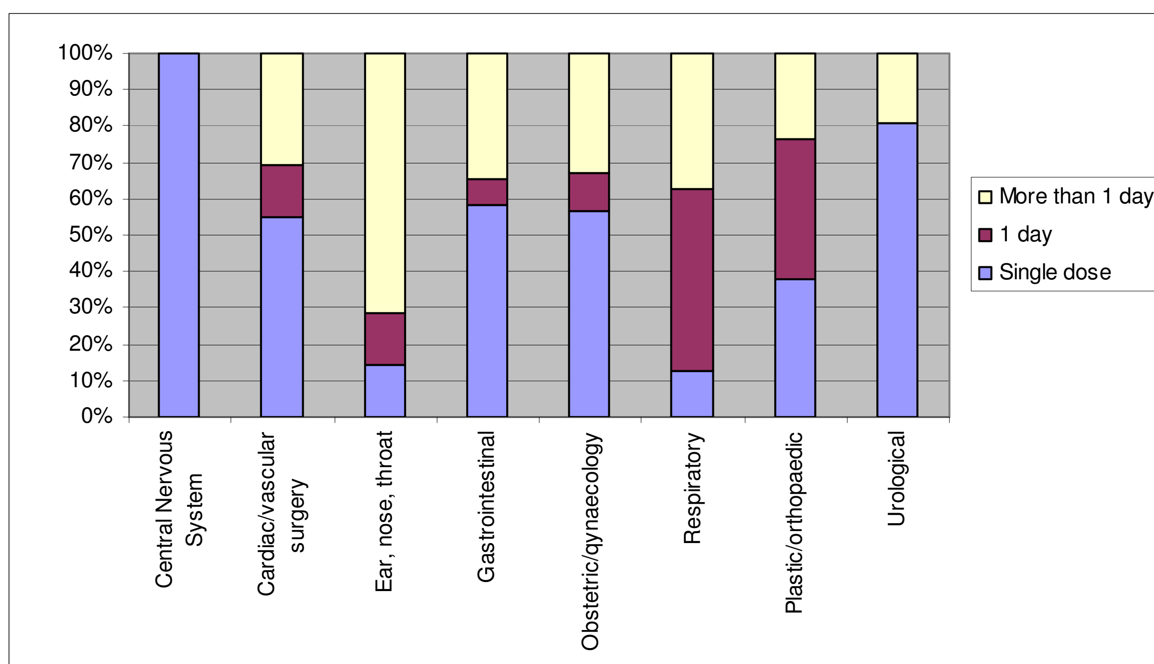

Figure 8: Duration of surgical prophylaxis by recorded diagnostic site (n=310), ESAC PPS 2009

SAPG has issued guidance to AMTs on antibiotic prophylaxis in surgery[9]. In relation to the choice of agent it advises avoidance of cephalosporins, clindamycin, quinolones and co-amoxiclav whenever possible and recommends the use of narrow spectrum agents such as flucloxacillin and gentamicin.

Table 7 shows a list of the antimicrobials used for surgical prophylaxis.

Antimicrobial	Total Number	Number by Duration		
		Single dose	1 day	More than 1 day
Cefuroxime	103	45	40	18
Co-amoxiclav	57	26	5	26
Metronidazole	44	20	4	20
Gentamicin	37	34	1	2
Flucloxacillin	18	6	2	10
Ceftriaxone	16	14	0	2
Amoxicillin	6	2	1	3
Ciprofloxacin	6	1	1	4
Benzylpenicillin	5	1	2	2
Cefotaxime	4	2	2	0
Piperacillin/tazobactam	3	0	1	2
Vancomycin	3	2	0	1
Clarithromycin	2	0	1	1
Teicoplanin	2	1	0	1
Ampicillin	1	0	0	1
Aztreonam	1	0	0	1
Clindamycin	1	0	1	0
Erythromycin	1	1	0	0
Total	310	155	61	94

Table 7: Antimicrobials prescribed for surgical prophylaxis, ESAC PPS 2009

This shows that cefuroxime is the most commonly used agent and accounts for 33.2% (hospital range 0%-78.9%) of all antimicrobials used for surgical prophylaxis. Cephalosporins account for almost 40% (hospital range 0%-78.9%) of all antimicrobials used for surgical prophylaxis. This indicates that there is room for improvement in compliance with SAPG guidance. This will continue to be addressed by SAPG and AMTs and monitored through the prescribing indicator on surgical prophylaxis to support HEAT target to reduce CDI. Gentamicin and flucloxacillin are the fourth and fifth most commonly used antimicrobials for surgical prophylaxis accounting for 11.9% (hospital range 0%-45.5%) and 5.8% (hospital range 0%-50.0%) of use respectively.

d. Hospital Acquired Infection

Figure 2 shows that hospital acquired infection accounted for 34.4% of antimicrobial use in this survey. Figure 9 shows a breakdown of the number of antimicrobials used by speciality where the recorded indication was hospital acquired infection. This shows that the speciality of medicine accounts for over 50% of the use of antimicrobials for hospital acquired infection.

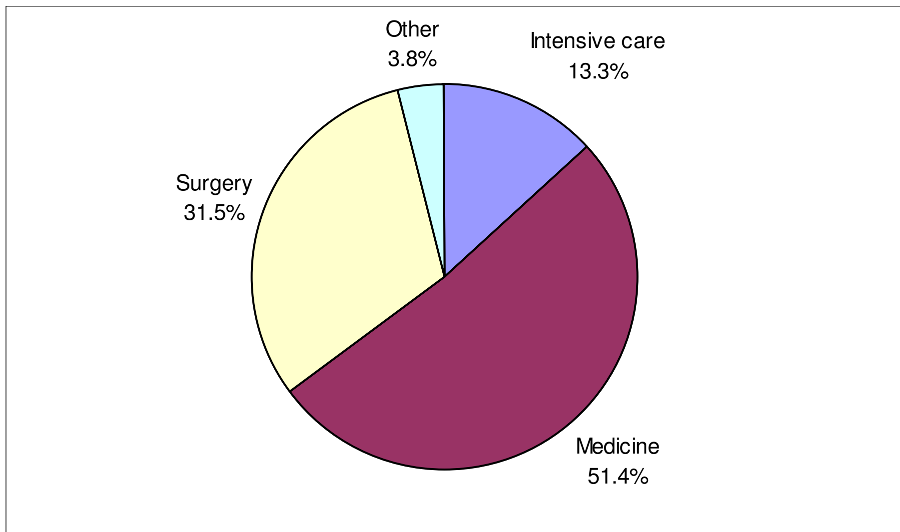

Figure 9: Antimicrobials for hospital acquired infection by speciality (n=1,208), ESAC PPS 2009

When the indication for use was recorded as hospital acquired infection investigators were required to indicate from a list of standard options the type of hospital acquired infection. Figure 10 shows the proportion of use of antimicrobials for each type of hospital acquired infection. This shows that in almost 25% of cases the antimicrobial was used for treatment of post operative infection but that the single biggest group was classed as other. The methodology of the survey did not require the 'other' group to be further split.

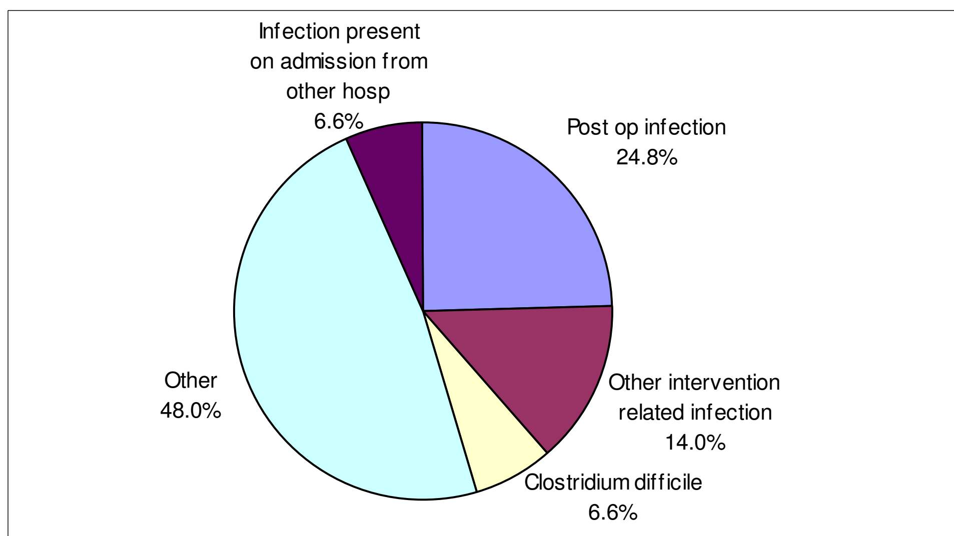

Figure 10: Antimicrobials use by type of hospital acquired infection (n=1,208), ESAC PPS 2009

Conclusion

This is the first national PPS of antimicrobial use in hospitals in Scotland. It provides SAPG and AMTs with a useful national baseline on the quality of prescribing within participating hospitals in Scotland and will be used to monitor changes in the key areas in the future. The results of the survey show a number of areas where good practice was observed and a number of areas where improvement is required.

Areas of good practice

The results indicate that 27.8% (hospital range 5.6% - 47.1%) of patients surveyed were prescribed antimicrobials. The national prevalence of antimicrobial use in participating Scottish hospitals is very slightly lower than in the UK or Europe.

Compared to Europe there is lower use of agents that are associated with an increased risk of CDI such as ciprofloxacin, cephalosporins, clindamycin and co-amoxiclav in participating hospitals in Scotland and a greater use of narrower spectrum antimicrobials such as amoxicillin, doxycycline, metronidazole, trimethoprim and flucloxacillin. This reflects good practice and the observed pattern of prescribing needs to be sustained and improved further.

Flucloxacillin and gentamicin are the fourth and fifth most commonly prescribed antimicrobial for surgical prophylaxis, together accounting for 17.7% of all antimicrobials used for this indication. This pattern needs to be sustained and improved further.

Areas for improvement

In 76.1% of cases where an antimicrobial was prescribed the reason for its use was recorded in the patients medical notes. This is an area for improvement and will be addressed by SAPG and AMTs. Progress will be monitored through the prescribing indicator for hospital based empiric prescribing to support HEAT target for CDI reduction.

Overall 57.9% of antimicrobials used were noted by investigators as being compliant with local NHS Board Guidelines. Improvements with recording the reason for the use of antimicrobials are being addressed by SAPG and AMTs and monitored through the prescribing indicator for hospital based empiric prescribing.

In 30.3% of all antimicrobial use for surgical prophylaxis the duration was greater than one day. This is being addressed by the collaboration between SAPG and AMTs with the SPSP peri-operative and general ward interventions. Progress will be monitored through the HEAT target indicator on surgical prophylaxis.

There is room for improvement in choice of antimicrobial used for surgical prophylaxis. All cephalosporins together account for almost 40% of all antimicrobials used for surgical prophylaxis. This indicates scope for improvement in compliance with the SAPG recommendation to avoid cephalosporins for surgical prophylaxis. This will continue to be monitored through the HEAT target indicator for surgical prophylaxis.

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Appendix 1

ESAC-3 (Scotland) Point Prevalence Survey 2009

Ward Form

Date of survey				
Auditor Code (person completing form)				
Hospital				
Ward				
Mixed Ward	**yes**		**No**	
Specialty (Please tick the appropriate box) In case of mixed ward, tick all that apply	**Medicine**	**Surgery**	**Intensive Care**	**Other (please specify)**
Denominator Patient Numbers: The total number of patients in the ward at 08.00 am on the day of the survey. In the case of mixed ward fill in the total number in each speciality				

Include in survey: All patients who are receiving non-topical antibacterials and antifungals

Prophylaxis: Include any patient who received one or more doses of prophylaxis on the day before the survey is carried out (the previous 24 hour period). N.B., check the number of doses received on the previous day to ascertain if prophylaxis is 1 dose, 24hours or >24hours.

THIS FORM ONLY NEEDS TO BE FILLED IN ONCE FOR EACH WARD INCLUDED IN THE POINT PREVALNCE SURVEY, IN ORDER TO CAPTURE THE WARD DETAILS.

ESAC-3 (Scotland) Point Prevalence Survey 2009

Patient Form (Please fill in one form per patient)

Hospital	Ward	Speciality [a]	(Patient Identifier hospital number) [b]	Survey Number [c]	Age[d]	Sex

[a] Only specify the speciality in event of mixed ward (M: medical, S: surgical, IC: intensive care, O: other)
[b] Please enter the patients hospital number to allow local linkage to patient records for more detailed audit if required. NB this identifier will not be entered onto the electronic database and is for internal use only.
[c] A unique but non-identifiable number for each patient entered in the survey by this hospital; it is suggested that consecutive number are used. This number will be used in the electronic database and will be used in any communications regarding individual data.
[d] Age in years for patients aged 2 year of above, age in months for patients under 2 year

Essential Fields

Drug	Unit Dose [1]	Doses per day [2]	Route [3]	Diagnosis Site[4]	Diagnosis Code[4]	Indication[5]	Local Guideline Compliance[6] (Y/N/NA/NI)	Reason in Notes (Y/N)[7]
Metronidazole	0.5g	3	P	GI	Proph GI	C2	Y	Y
1								
2								
3								
4								
5								

[1] Dose per administration in grams
[2] Provide fractions of doses if necessary, e.g. every 16h = 1.5 doses per day, every 36h = 0.67 doses per day, every 48h = 0.5 doses per day
[3] Parenteral (injections), oral, rectal, inhalation (or **P**, **O**, **R**, **I**)
[4] Diagnosis – please enter both site and diagnosis code from code sheet
[5] Indication – please enter indication code from ward from code sheet
[6] local guideline compliance – record as yes or no or not assessed or no information
[7] reason in notes- record as yes or no

ESAC-3 (Scotland) Point Prevalence Survey 2009

Diagnosis and indication codes

Diagnosis: by anatomical site of infection treated or prevented (prophylaxis).

Site	Codes	Examples
CNS	**Proph CNS**	Prophylaxis for CNS (neurosurgery, meningococcal)
	CNS	Infections of the Central Nervous System
EYE	**Proph EYE**	Prophylaxis for eye operations
	EYE	Endophthalmitis
ENT	**Proph ENT**	Prophylaxis for Ear, Nose or Throat , Dental, Facial, Head & Neck, (surgery or medical)
	ENT	Infections of ear, mouth, nose, throat or larynx
RESP	**Proph RES**	Pulmonary surgery, prophylaxis for respiratory pathogens, including prophylaxis for cystic fibrosis
	Bron	Acute bronchitis, exacerbations of chronic bronchitis, COPD or COAD, treatment of for cystic fibrosis and any other lower respiratory tract infections other than pneumonia
	Pneu	Pneumonia
CVS	**Proph CVS**	Cardiac or vascular surgery, endocarditis prophylaxis
	CVS	Cardiovascular infections: endocarditis, vascular graft
GI	**Proph GI**	Surgery of the GI tract, liver or biliary tree, GI prophylaxis in neutropenic patients or hepatic failure
	GI	GI infections (salmonellosis, antibiotic associated diarrhoea)
	IA	Intra-abdominal sepsis including hepatobiliary
SSTBJ	**Proph SBJ**	Prophylaxis for plastic or orthopaedic surgery (bone or joint) or breast surgery
	SST	Cellulitis, wound, deep soft tissue not involving bone
	BJ	Septic arthritis (including prosthetic joint), osteomyelitis
UTI	**Proph UT**	Prophylaxis for urological surgery, recurrent UTI
	Cys	Lower UTI
	Pye	Upper UTI
GUOB	**Proph GyOb**	Prophylaxis for obstetric or gynaecological surgery
	OBGY	Obstetric or gynaecological infections, STD in women
	GUM	Prostatitis, epididymo-orchitis, STD in men
Not Defined	**BAC**	Bacteraemia (not endocarditis) with no clear anatomical site, including positive blood cultures
	SIRS	Systemic inflammatory response with no clear anatomic site, including neutropaenic sepsis
	UND	Completely un-defined site with no systemic inflammation

Indication codes:

<table>
<tr><td>A Community acquired infection</td><td colspan="3">Symptoms or antibiotics started <48h after patient was admitted</td></tr>
<tr><td rowspan="5">B Hospital acquired infection

Symptoms start 48h after admission to hospital</td><td colspan="3">B1 Post-operative infection
(within 30 days after surgery or 1 year after implant surgery)</td></tr>
<tr><td colspan="3">B2 Other intervention related infections (IV catheter, VAP, CAPD)</td></tr>
<tr><td colspan="3">B3 C difficile associated diarrhoea >48h after admission or <30 days after previous admission</td></tr>
<tr><td colspan="3">B4 Other hospital acquired infection</td></tr>
<tr><td colspan="3">B5 Infection present on admission from another hospital</td></tr>
<tr><td>C Surgical prophylaxis</td><td>C1 Single dose</td><td>C2 one day</td><td>C3 >1 day</td></tr>
<tr><td>D Medical prophylaxis</td><td colspan="3"></td></tr>
</table>

Appendix 2 hospitals providing data for this report

NHS Board	Hospital
NHS Ayrshire & Arran	Ayr Hospital
NHS Ayrshire & Arran	Crosshouse Hospital
NHS Ayrshire & Arran	Davidson Cottage Hospital
NHS Ayrshire & Arran	East Ayrshire Community Hospital
NHS Borders	Borders General Hospital
NHS Dumfries & Galloway	Dumfries & Galloway Royal Infirmary
NHS Fife	Cameron Hospital
NHS Fife	Queen Margaret Hospital
NHS Fife	Victoria Hospital
NHS Forth Valley	Stirling Royal Infirmary
NHS Grampian	Aberdeen Royal Infirmary
NHS Grampian	Doctor Gray's Hospital
NHS Grampian	Royal Aberdeen Children's Hospital
NHS Grampian	Royal Cornhill Hospital
NHS Grampian	Woodend General Hospital
NHS Greater Glasgow & Clyde	Victoria Infirmary
NHS Highland	Belford Hospital
NHS Highland	Caithness General Hospital
NHS Highland	Raigmore Hospital
NHS Lanarkshire	Monklands Hospital
NHS Lothian	Astley Ainslie Hospital
NHS Lothian	Royal Infirmary of Edinburgh
NHS Lothian	St John's Hospital
NHS Lothian	Western General Hospital
NHS Orkney	Balfour Hospital
NHS Shetland	Gilbert Bain Hospital
NHS Tayside	Arbroath Infirmary
NHS Tayside	Ninewells Hospital
NHS Tayside	Perth Royal Infirmary
NHS Tayside	Royal Victoria Hospital
NHS National Waiting Times Centre	Golden Jubilee National Hospital

Appendix 3 Breakdown by speciality

The survey methodology required classification of patients into four specialities; medicine, surgery, intensive care and other. A summary of a number of measures by speciality is presented below.

Number of antimicrobials prescribed

Figure 11 shows the number of antimicrobials given to patients by specialty.

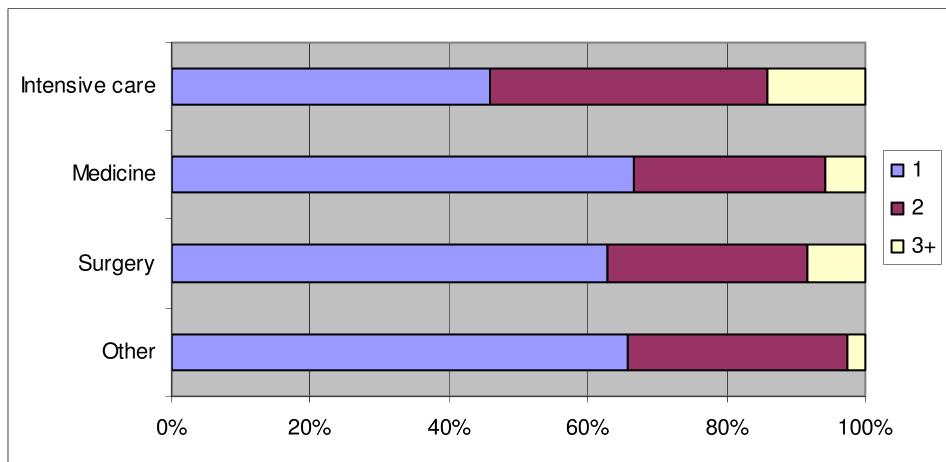

Figure 11: Number of antimicrobials prescribed by speciality

This shows that patients in intensive care are more likely to receive more than one antimicrobial. 14.2% of patients in intensive care were prescribed three or more antimicrobials compared to the other specialities of medicine (5.7%), surgery (8.5%) and other (2.5%).

Route of administration

Figure 12 shows the route of administration by specialty.

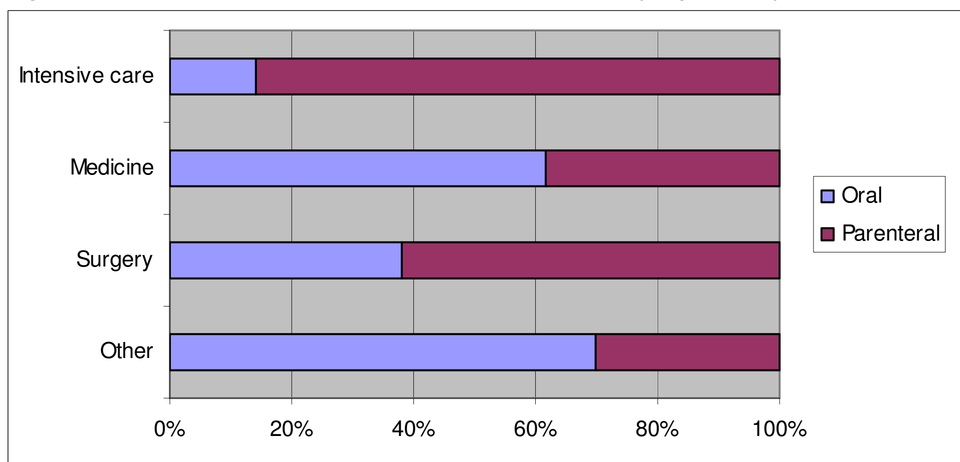

Figure 12: Route of administration by speciality

This shows that within intensive care 86% of antimicrobials were administered by parenteral route. In the surgical speciality 61.9% of patients received parenteral antimicrobials whereas in medicine only 38.3% of patients were receiving parenteral therapy.

Recording of reason in notes

Figure13 shows the recording of reason in notes by specialty.

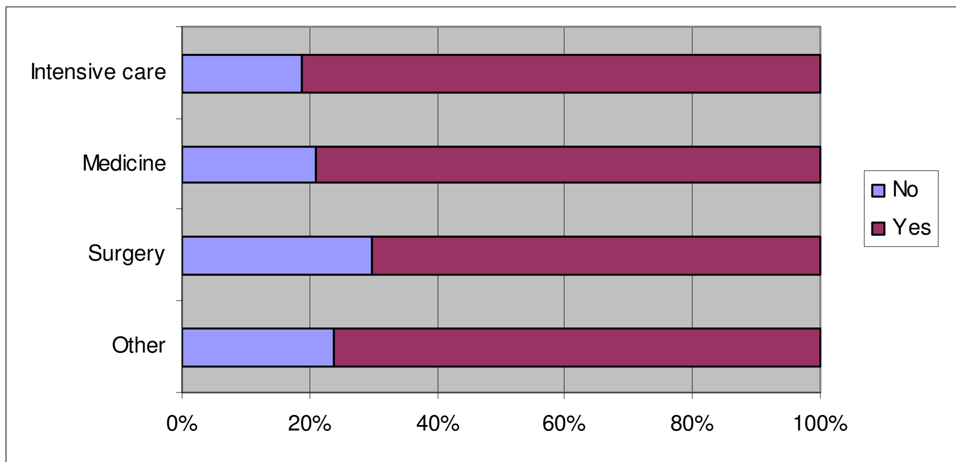

Figure 13: Recording of indication in notes by speciality

This shows that intensive care was the speciality with the highest proportion of cases where the reason for use of antimicrobial was recorded in the notes at 81.1% compared to the surgical speciality with the lowest at 70.4%.

Compliance with guidelines

Figure 14 shows the compliance with local guidelines by specialty.

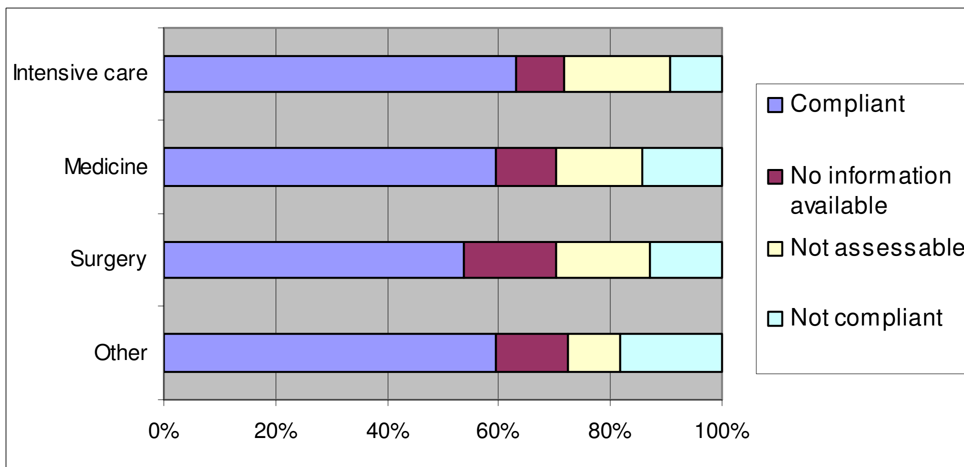

Figure 14: Compliance with local guidelines by speciality

This shows that intensive care was the speciality with the highest proportion of antimicrobials recorded as compliant with local guidelines (63.1%) and the lowest was surgery with 53.9% compliance with local guidance.

In the speciality classed as other there was the highest proportion of antimicrobials which were recorded as non complaint at 18.3% of total use.