Feidhmeannacht na Seirbhíse Sláinte
Health Service Executive

hpsc

CONSUMPTION OF ANTIBIOTICS IN PUBLIC ACUTE HOSPITALS IN IRELAND 2010 DATA

MAIN POINTS

- **Inpatient antibiotics consumption figures for 2010 from 43 public acute hospitals are shown**
- **There was a 4% rise in the median usage rate from 76.0 Defined Daily Doses per 100 Bed-Days Used (DDD/100BDU) for the updated 2009 figure to 79.3 DDD/100BDU in 2010. The increase was seen in all categories of hospitals**
- **There was a continued drop in the proportion of a specific set of antibiotics in injectable form (those that could be easily switched to oral form) by 0.6 percentage points to 7.5%**
- **As per recent trends, usage of penicillins with beta-lactamase inhibitor (such as co-amoxiclav) has continued to increase sharply, along with moderate increases in all other agents except fluoroquinolones**
- **Consumption of quinolones (including the fluoroquinolone ciprofloxacin) has been decreasing since 2007 and has shown a slight increase in the trend for the last three quarters**

As part of the HSE strategy for prevention and control of healthcare-associated infection (HCAI), launched in March 2007, the Health Protection Surveillance Centre (HPSC) was asked to coordinate the publication of data relating to antimicrobial consumption for acute public hospitals in Ireland. The first report was produced in 2007 providing the initial baseline publication of these data.

The primary value of this dataset is to the individual data providers, allowing individual hospitals to monitor trends over time, assess the impact of antibiotic stewardship programmes, and identify targets for future interventions and resource requirements. The data included in this report do not allow direct comparison of results between individual hospitals.

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SECTION A. METHODS AND LIMITATIONS

Using a protocol developed in conjunction with clinical pharmacists, quarterly antimicrobial data were extracted from appropriate hospital computer systems that record data on dispensed drugs. At the HPSC, the data from individual hospitals were converted to standardised units of doses. Only consumption relating to inpatients were taken further for rate calculation.

In this report the Anatomical Therapeutic Chemical (ATC) index (www.whocc.no/atcddd) is used to classify all drugs used in human medicine into a hierarchical system with five levels. Each systemic antimicrobial substance in conjunction with the route of administration (oral or intravenous) is given a defined daily dose (DDD), which is the assumed average maintenance dose per day for a drug used for its main indication in adults.

The main limitation for the ATC-DDD system is that the quantities refer to adult patients. There are many hospitals in the sample that provide maternity services and/or paediatric care, therefore there is an inherent bias in the system. A further limitation with the ATC-DDD system is that the measure is for the main indication only but a single drug can be used to treat several different conditions. Additionally, as well as the case-mix, guidelines for the optimal dosage regimen of an antibiotic within the same hospital may change over time.

The denominator data were obtained from the Performance Monitoring Unit (PMU) of the HSE National Hospitals Office. Rates are calculated by taking the total (inpatient) DDD per hospital and dividing by the total number of bed-days used (BDU) for the hospital. This is multiplied by 100 to obtain the rate in DDD per 100 BDU.

The HPSC provided each hospital with a detailed report, as advised by the Irish Antimicrobial Pharmacists Group.

Measures presented in table 1

1. Total acute inpatient antibiotic consumption in Defined Daily Doses per 100 Bed-Days Used (DDD/100BDU) for each hospital is presented for 2009 and 2010. Acute inpatient means that data on antibiotics dispensed to outpatients, day cases and external facilities are excluded

2. The following antimicrobial agents have good oral bioavailability and therefore, for many patients, it may be possible to switch from intravenous (IV) to oral use or initiate treatment orally: *ciprofloxacin, levofloxacin, moxifloxacin, linezolid, fusidic acid, clindamycin, metronidazole, erythromycin, clarithromycin* and *rifampicin*. In Table 1, the proportion of the volume used in DDD of these specific agents in IV form over total antibiotic use in DDD expressed as percentage for each hospital is presented for 2009 and 2010

Note that figures for previous years have been updated and may vary from previously published data

SECTION B. TOTAL CONSUMPTION BY INDIVIDUAL HOSPITAL (MAIN TABLE)

Table 1. Antibiotic consumption data for 43 public acute hospitals for 2010 presented with updated figures for 44 hospitals for 2009. See methods for details of the measures.

Acute Public Hospital	Acute Inpatient Antibiotic Consumption Rate (DDD per 100 bed-days used)		Proportion of Specific IV antibiotics	
	2009	2010	2009	2010
Adelaide & Meath & National Children's Hospital, Tallaght	**96.7**	**95.2**	12.5%	12.3%
Bantry General Hospital	*	*	*	*
Beaumont Hospital	**72.1**	**74.5**	6.7%	7.0%
Cappagh National Orthopaedic Hospital, Dublin	**57.9**	**54.2**	1.4%	4.0%
Cavan General Hospital	**80.6**	**80.5**	6.5%	4.2%
Children's University Hospital, Temple Street	**77.0**	**68.9**	9.9%	7.5%
Connolly Hospital, Blanchardstown	**73.7**	**69.5**	10.6%	9.0%
Coombe Women's Hospital	**25.9**	**29.9**	8.0%	7.0%
Cork University Hospital	**63.5**	**72.0**	7.7%	7.8%
Galway University Hospitals	**94.4**	**93.2**	8.2%	8.0%
Kerry General Hospital, Tralee	**63.3**	**65.8**	11.8%	9.0%
Letterkenny General Hospital	**79.0**	**78.8**	8.3%	9.0%
Lourdes Orthopaedic Hospital, Kilcreene, Kilkenny	**33.5**	**25.6**	1.5%	0.8%
Louth County Hospital, Dundalk[1]	**90.0**	**72.2**	7.5%	4.0%
Mallow General Hospital[2]	**75.7**	**79.3**	16.3%	16.9%
Mater Misericordiae University Hospital	**78.0**	**81.3**	11.1%	9.6%
Mayo General Hospital, Castlebar	**91.2**	**89.7**	5.0%	4.8%
Mercy University Hospital, Cork	**91.6**	**90.1**	7.3%	6.6%
Midland Regional Hospital Mullingar[3]	**75.3**	**83.2**	14.4%	16.6%
Midland Regional Hospital Portlaoise	*	*	*	*
Midland Regional Hospital Tullamore	**71.6**	**80.6**	7.1%	6.7%
Mid-Western Regional Hospital Ennis	**81.6**	**83.9**	10.6%	3.4%
Mid-Western Regional Hospital Nenagh	**84.8**	**93.7**	10.1%	2.4%
Mid-Western Regional Hospital, Dooradoyle, Limerick	**72.9**	**78.1**	11.3%	11.5%
Monaghan General Hospital[4]	**79.7**	NA	8.6%	NA
Naas General Hospital	**77.3**	**90.1**	9.9%	8.1%
National Maternity Hospital, Holles Street	**20.1**	**23.6**	3.8%	7.9%
Our Lady of Lourdes Hospital, Drogheda	**77.5**	**88.4**	12.6%	9.5%
Our Lady's Hospital for Sick Children, Crumlin	**73.9**	**72.0**	7.5%	7.5%
Our Lady's Hospital, Navan	**87.3**	**98.0**	9.4%	7.3%
Portiuncula Hospital, Ballinasloe	**73.3**	**78.8**	8.0%	8.6%
Roscommon County Hospital	**100.9**	**98.5**	5.9%	5.8%
Rotunda Hospital	**27.9**	**33.9**	6.7%	8.4%
Royal Victoria Eye & Ear Hospital, Dublin	**74.1**	**55.6**	18.1%	16.8%
Sligo General Hospital	**64.6**	**63.0**	8.9%	8.4%
South Infirmary - Victoria University Hospital, Cork	**70.3**	**63.9**	4.9%	5.1%
South Tipperary General Hospital, Clonmel	**81.2**	**78.1**	8.1%	7.3%
St Columcille's Hospital, Loughlinstown	**82.8**	**81.5**	7.6%	8.5%
St James's Hospital	**71.8**	**80.1**	9.7%	9.8%
St John's Hospital, Limerick	**91.8**	**91.3**	8.8%	4.8%
St Luke's General Hospital, Kilkenny	**74.5**	**72.5**	6.0%	5.1%
St Luke's Hospital, Dublin	**26.9**	**26.8**	3.7%	5.8%
St Mary's Orthopaedic Hospital, Gurranebraher, Cork	*	*	*	*
St Michael's Hospital, Dun Laoghaire	**76.2**	**97.2**	5.9%	7.5%
St Vincent's University Hospital	**112.9**	**124.9**	11.1%	9.5%
Waterford Regional Hospital	**81.8**	**81.9**	8.2%	6.7%
Wexford General Hospital	**70.5**	**85.2**	5.7%	6.2%

* Data not available

[1] Acute activity too low for reporting after 2010 Q2

[2] Data collection began in 2009 Q4

[3] No 2009 Q3 & Q4 data

[4] To end of 2009 Q2 only

[NA] Not applicable

SECTION C. BREAKDOWN BY HOSPITAL CATEGORY

Graph 1. Box plot of antibiotic consumption in DDD per 100 BDU for public acute hospitals by hospital category, from 2007 to 2010. See end of page 5 for an explanation of the plot.

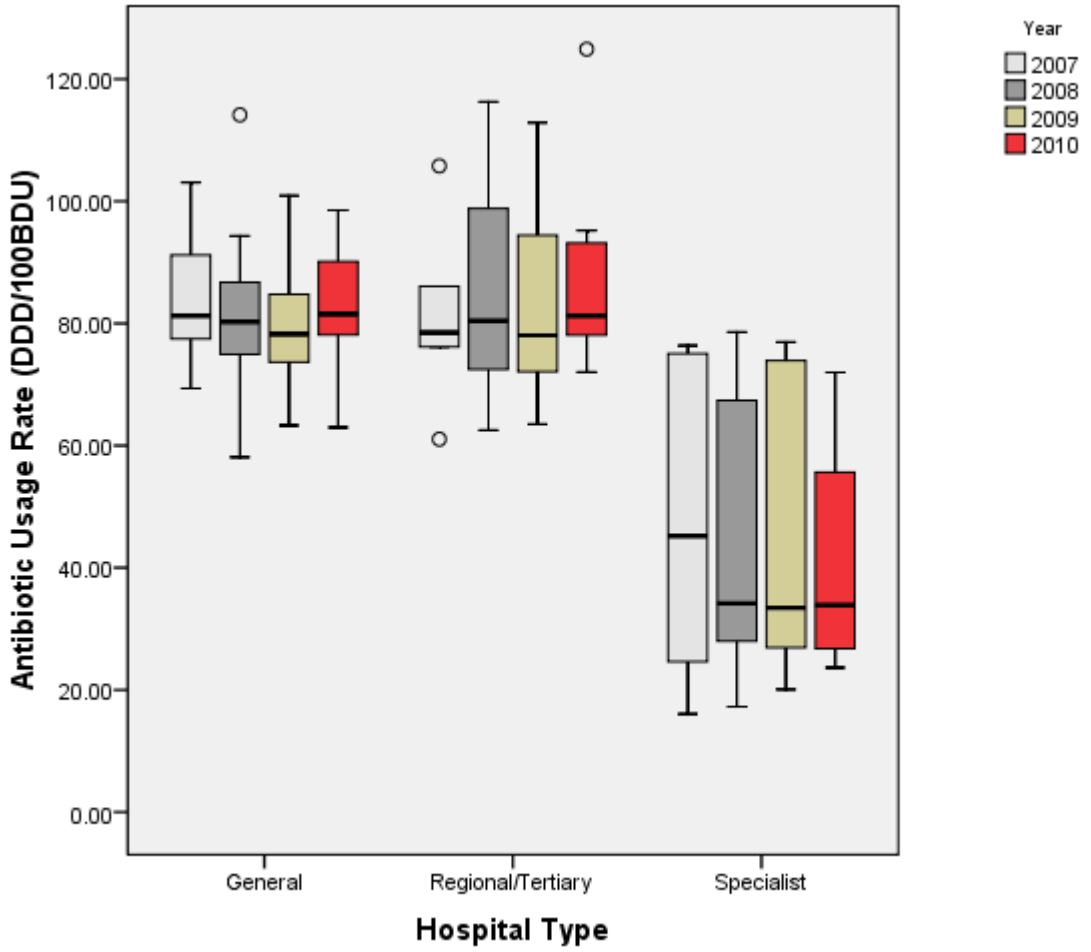


Table 2. Median antibiotic consumption (rate) in DDD per 100 BDU for public acute hospitals by hospital category and the number of hospitals (n), from 2007 to 2010

	2007		2008		2009		2010	
Hospital Category	**Rate**	**n**	**Rate**	**n**	**Rate**	**n**	**Rate**	**n**
General	81.2	21	80.3	25	78.2	26	81.5	25
Regional/Tertiary	78.5	5	80.4	8	78.0	9	81.3	9
Specialist	45.2	8	34.2	9	33.5	9	33.9	9
All Hospital	**78.0**	**34**	**76.4**	**42**	**76.0**	**44**	**79.3**	**43**

Graph 2. Box plot of proportion of specific agents in intravenous form over total (%) for public acute hospitals by hospital category, from 2007 to 2010. Please see methods section for list of specific agents and see end of this page for an explanation of the plot.

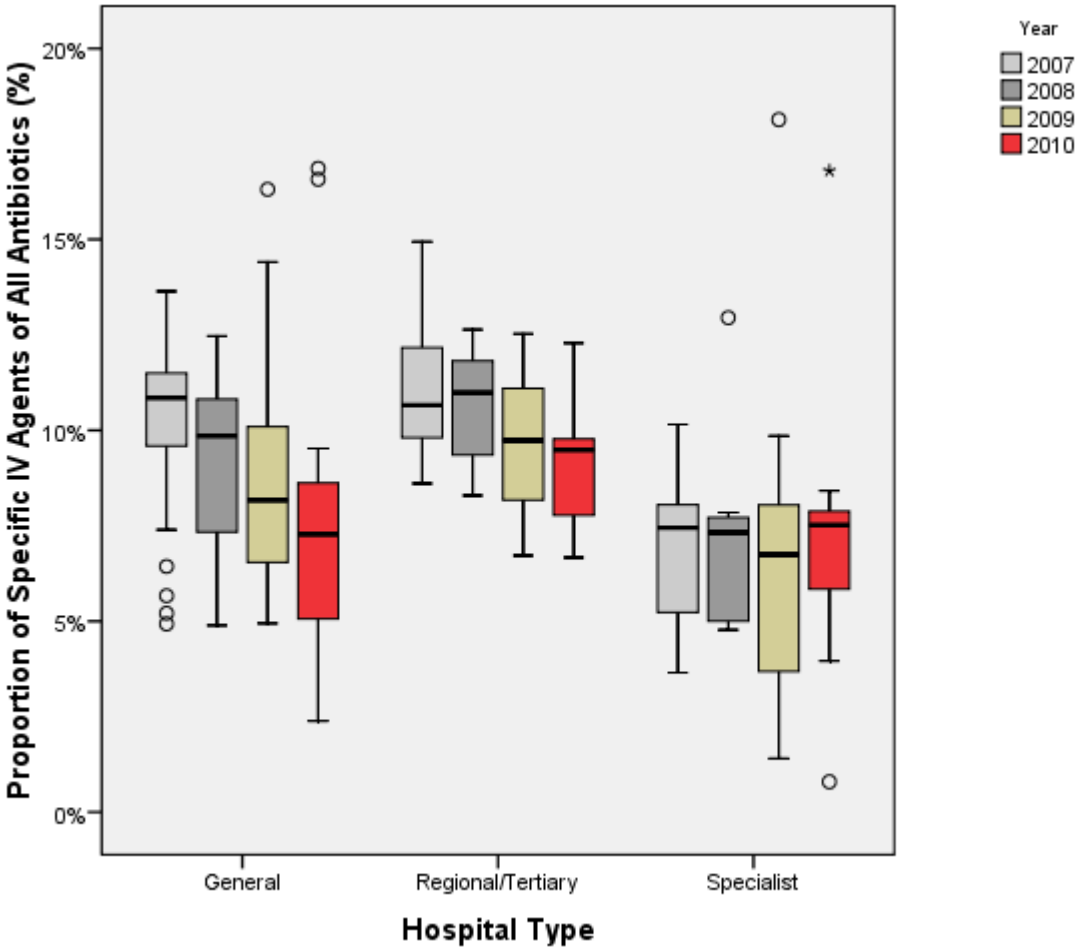


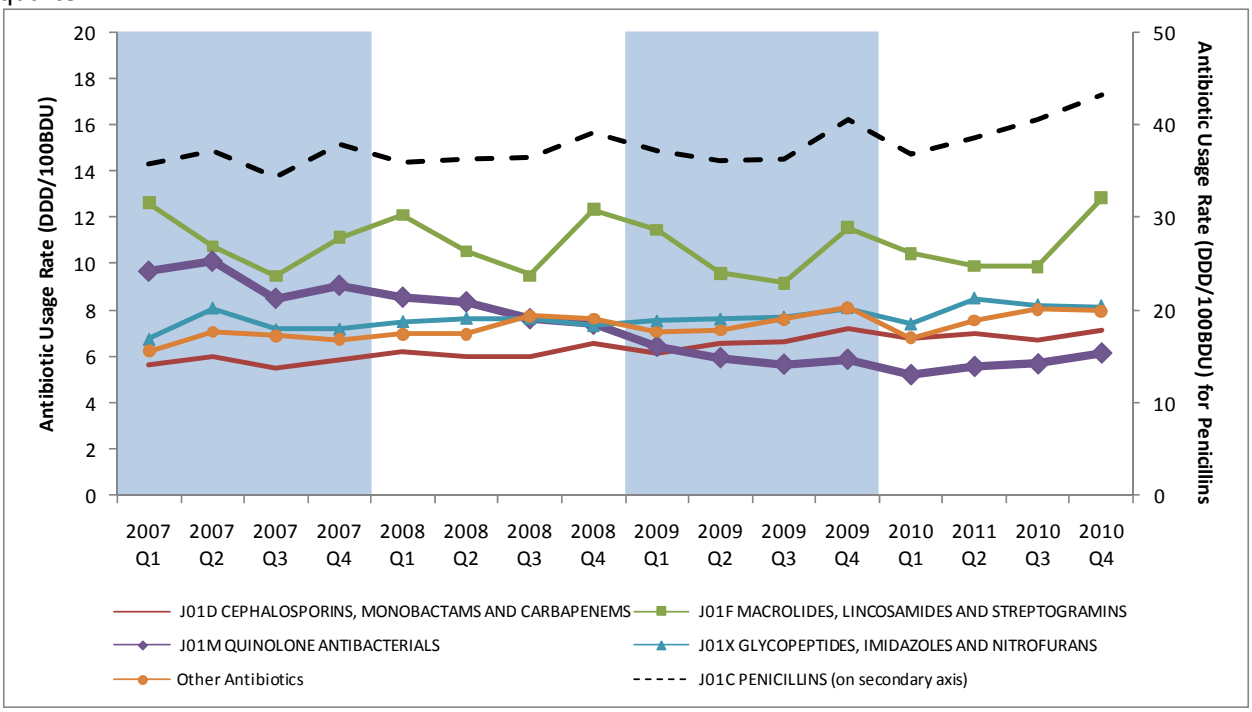
Table 3. Median proportions of specific agents in intravenous form over total (Percent) for public acute hospitals by hospital category and the number of hospitals (n), for 2007 to 2010. Please see methods section for list of specific agents.

	2007		2008		2009		2010	
Hospital Category	**Percent**	**n**	**Percent**	**n**	**Percent**	**n**	**Percent**	**n**
General	10.8%	21	9.9%	25	8.2%	26	7.3%	25
Regional/Tertiary	10.7%	5	11.0%	8	9.7%	9	9.5%	9
Specialist	7.4%	8	7.3%	9	6.7%	9	7.5%	9
All Hospital	**10.0%**	**34**	**9.3%**	**42**	**8.1%**	**44**	**7.5%**	**43**

Explanation of the box (or **box-and-whiskers**) plot: the bottom and top of the box are the 25th and 75th percentile (the lower and upper quartiles, respectively, so the box represents the inter-quartile range or IQR). The band near the middle of the box is the 50th percentile or the median. The ends of the whiskers represent the lowest data point still within 1.5 times the IQR of the lower quartile, and the highest data point still within 1.5 times the IQR of the upper quartile. Any data point not included between the whiskers is plotted as an outlier with a circle. Box plots are used to display differences between populations or categories without making any assumptions of the underlying statistical distribution. They help to indicate the degree of dispersion (spread) and skewness in the data, and identify outliers.

SECTION D. QUARTERLY TRENDS

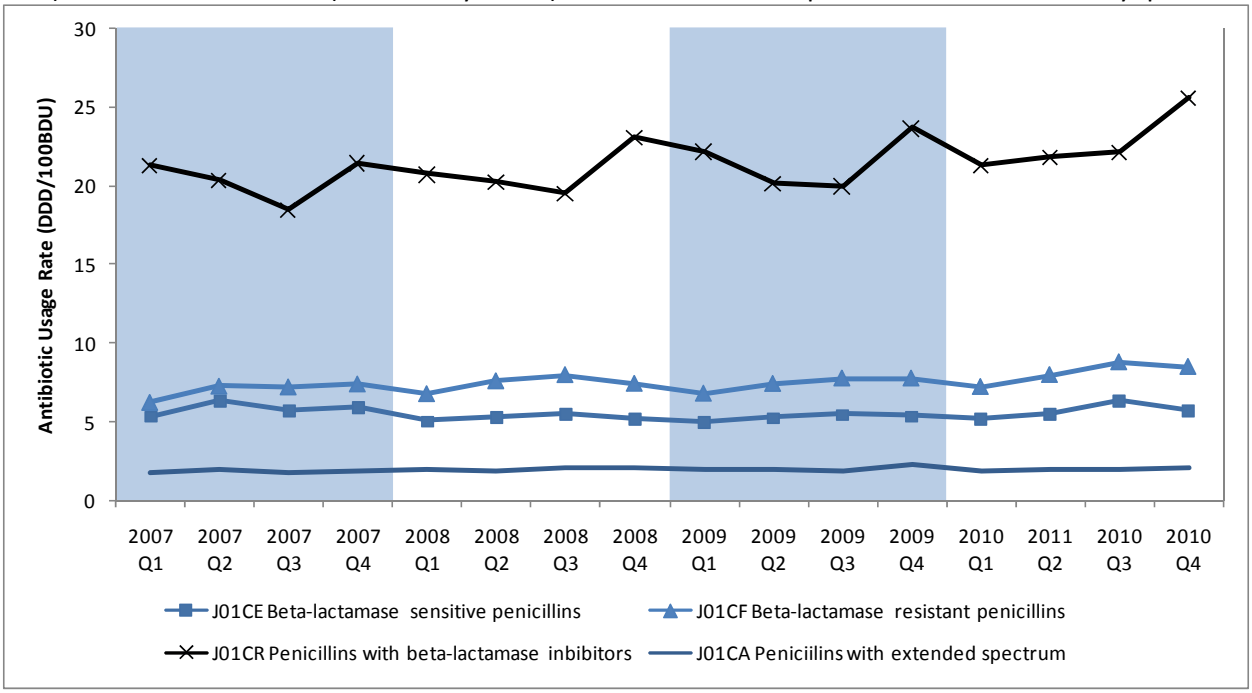
Graph 3. Antibiotic consumption grouped by pharmacological subgroup of the drugs used (ATC level 3). Rates are in DDD per 100 BDU as overall average inpatient antibiotic consumption for all quarters from 2007 to 2010. The overall average or weighted mean is calculated only where both the numerator (i.e. total DDD) and the denominator (i.e. bed days used) are available for hospitals with valid data in any quarter.



- From 2009 to 2010 the overall antibiotic consumption increased by 4% to 79.3 DDD/100BDU*
- Consumption of J01M agents, consisting of quinolones including the fluoroquinolone ciprofloxacin and representing 7% of all inpatient antibiotic usage, decreased by 6% in 2010 to 5.7 DDD/100BDU. Quinolone usage has been decreasing since 2007 and has shown a slight increase in the trend for the last three quarters
- Consumption of J01D agents, consisting of cephalosporins, monobactams and carbapenems, and representing 9% of all inpatient antibiotic usage, increased by 4% in 2010 to 6.9 DDD/100BDU
- Consumption of J01X agents, consisting of glycopeptides (like IV vancomycin), imidazoles (like IV metronidazole) and nitrofurans, and representing 10% of all inpatient antibiotic usage, increased by 4% in 2010 to 8.1 DDD/100BDU
- Consumption of J01F agents, which includes erythromycin and represents 14% of all inpatient antibiotic usage, increased by 3% in 2010 to 10.8 DDD/100BDU; note the seasonality with higher use in winter
- Other antibiotics in this graph are a collection of less frequently used agents in hospitals consisting of J01A tetracyclins, J01E sulfonamides/trimethoprim, J01G aminoglycosides and non-J01 systemic antibiotics. Collectively these drugs, representing 10% of all inpatient antibiotic usage, increased by 1% in 2010 to 7.6 DDD/100BDU
- The biggest group, J01C penicillins, representing 51 % of all inpatient antibiotic usage, increased by 6% in 2010 to 40.0 DDD/100BDU. See graph 4 for a breakdown of penicillins

*True weighted mean of 78.8 DDD/100BDU adjusted to match the median on Table 2

Graph 4. Penicillin consumption breakdown by chemical subgroup of the drugs used (ATC level 4). Rates are in DDD per 100 BDU as overall average inpatient antibiotic consumption for all quarters from 2007 to 2010. The overall average or weighted mean is calculated only where both the numerator (i.e. total DDD) and the denominator (i.e. bed days used) are available for hospitals with valid data in any quarter.



- J01CR Penicillin in combination with beta-lactamase inhibitor (such as amoxicillin with clavulanic acid or co-amoxiclav and piperacillin with tazobactam) representing the largest proportion of penicillins (57% of all penicillins and 29% of all inpatient antibiotics). Oral co-amoxiclav was the most frequently prescribed of these. There is seasonality with higher use in winter and the trend is markedly upward
- J01CF Beta-lactamase resistant penicillin (such as flucloxacillin) representing 20% of penicillins and 10% of all inpatient antibiotics. There is seasonality with slightly lower use in winter and the trend is moderately upward
- J01CE Beta-lactamase sensitive penicillin (such as benzylpenicillin) representing 14% of penicillins and 7% of all inpatient antibiotics. There is seasonality with slightly lower use in winter and the trend is moderately upward
- J01CA Broad-spectrum penicillin (such as ampicillin and amoxicillin) representing 20% of penicillins and 10% of all inpatient antibiotics and the usage is stable