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Abstract

Background: Antibiotic (AB) use in French hospitals is among the highest in Europe. To improve AB use, French hospitals are required to implement AB stewardship programmes including surveillance of AB consumption.

Objective: A study was carried out by the regional nosocomial infection control coordinating centers to describe AB consumption at hospital and at ward levels and to provide tools for benchmarking.

Methods: Antibacterials for systemic use (class J01 of WHO Anatomical Therapeutic Chemical classification, ATC-DDD system, 2007) were surveyed. In addition, rifampicin and oral imidazole derivatives were included to better assess total AB exposure. Data were retrospectively collected by 530 voluntary hospitals accounting for almost 30% of French hospitals beds, with around 40 million patient-days (PD): 27 teaching hospitals, 323 non-teaching hospitals, 10 cancer hospitals, 86 rehabilitation centers, 39 local hospitals, 45 long term care (LTC) and psychiatric hospitals. AB consumption for inpatients, expressed in number of defined daily doses (DDD) per 1,000 PD, and number of PD in 2007, were collected for the whole hospital and detailed in 357 hospitals for each clinical activity: medicine, surgery, intensive care units (ICU), gynaecology, paediatrics, rehabilitation, LTC and psychiatry.

Results: Median AB use ranged from 60 DDD/1,000 PD in LTC and psychiatric hospitals to 633 in teaching hospitals, with variations among hospitals belonging to the same group. Level of consumption and pattern of use differed according to clinical activities in hospitals: 60 in psychiatric wards, 213 in rehabilitation, 308 in gynaecology, 333 in paediatrics, 553 in surgery, 583 in medicine, to 1466 in ICU. Amoxicillin-clavulanic acid had the highest consumption level, except in paediatrics and gynaecology where amoxicillin had. In medicine, surgery, ICU and rehabilitation wards, fluoroquinolones accounted for 14% to 19% of total use. Among similar wards, variations were seen in both the volume of AB use and their distribution.

Conclusions: This multicenter survey provided detailed information on AB use in a large sample of hospitals and wards, allowing relevant comparisons and benchmarking. Analysis of consumption at ward level should help hospitals to target practice audits on AB use. This surveillance network brings additional information to available data on antimicrobial resistance surveillance and practice audits, that are useful for hospitals, as shown by an increase participation in 2008 (861 hospitals, preliminary data). At regional and national level, these data are useful for policy-maker to better steer policies. From 2010, this surveillance network will be run by the national RAISIN network, along with surveillance of HCAI and multidrug resistant bacteria.

Background

- High antibiotic (AB) use in French hospitals according to the European surveillance of antimicrobial consumption (ESAC) project.
- Requirements from health authorities to implement AB stewardship programs and to monitor AB consumption at hospital level.
- Lack of information on AB use at ward level.

Objectives

- To describe AB consumption at hospital and at ward level.
- To provide tools for hospital benchmarking and better understanding of AB consumption.

Methods

STUDY DESIGN

- Retrospective survey in voluntary hospitals, by means of auto-questionnaire (Excel® file derived from ABC Calc software).

DATA COLLECTION

- Activity indicator: number of patient-days (PD) in 2007 for the whole hospital and at ward level.
- Antibiotic use, from pharmacy records:
 - AB surveyed, according to the WHO Anatomical Therapeutic Chemical (ATC) classification, Defined Daily Doses (DDD) system, 2007:
 - . antibacterials for systemic use (J01 class);
 - . other antimicrobials mainly used as antibacterials in hospitals: rifampicin (J04AB02) and oral imidazole derivatives (P01AB);
 - Data collected for AB dispensed to inpatient wards, excluding AB dispensed to outpatients, emergency departments and day-care centers.
- AB use indicator expressed in number of DDD per 1,000 PD.

SETTING

- 530 voluntary hospitals accounting for almost 30% of French hospitals beds, with around 40 million patient-days (PD):
 - 27 teaching hospitals;
 - 323 non-teaching hospitals;
 - 10 cancer hospitals;
 - 86 rehabilitation centers;
 - 39 local hospitals;
 - 45 long term care (LTC) and psychiatric hospitals.

- Including 357 voluntary hospitals collecting data at ward level: 195 medicine wards, 156 surgical, 86 intensive care units (ICU), 111 gynaecology, 75 paediatrics, 230 rehabilitation, 113 long-term care (LTC), 72 psychiatric wards.

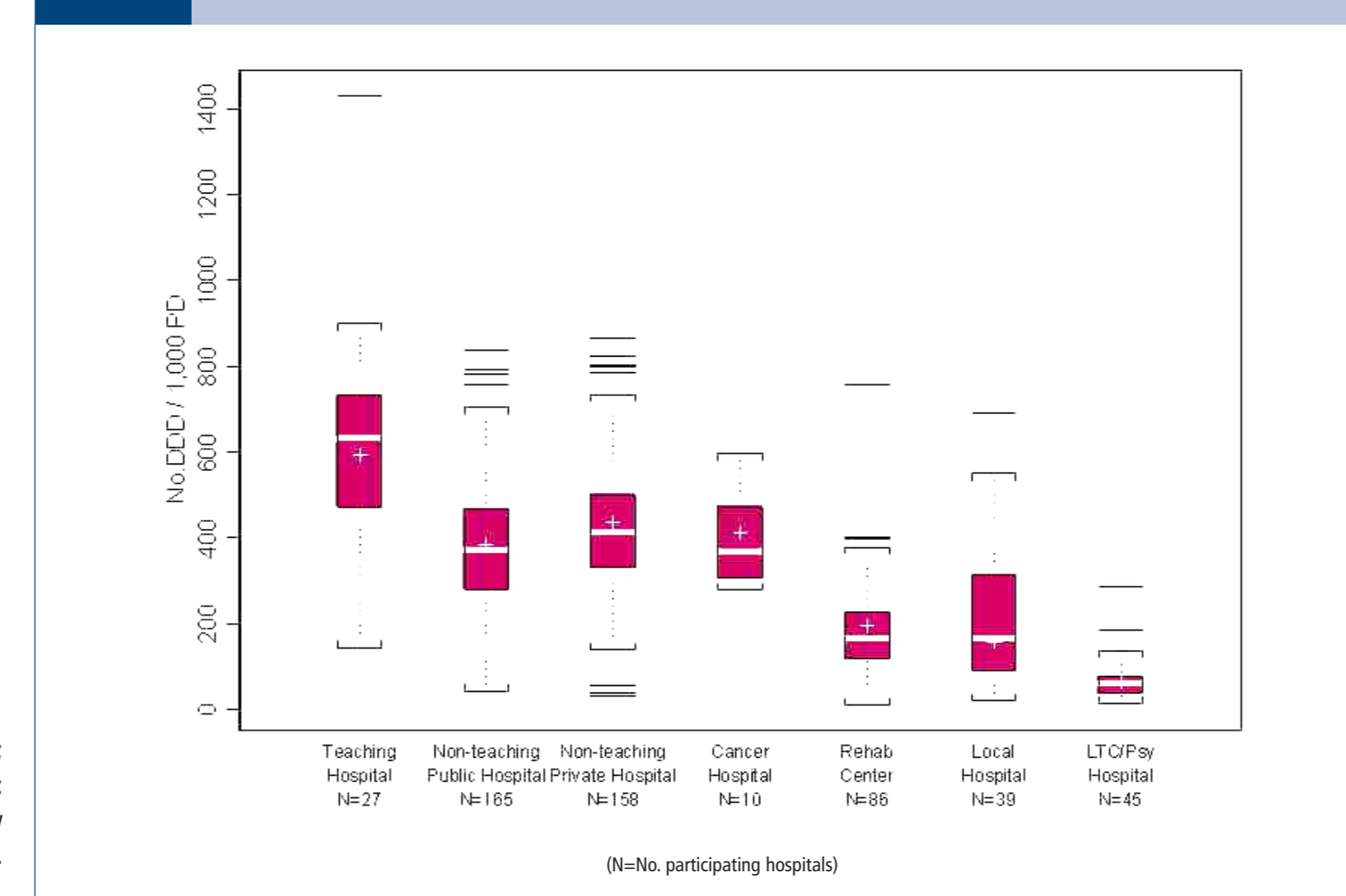
Results

OVERALL ANTIBIOTIC USE

Antibiotic use at hospital level

- Median AB use varied according to hospital status and ranged from 60 DDD/1,000 PD in LTC and psychiatric hospitals to 633 in teaching hospitals.
- Variations were seen among hospitals belonging to a same group.

FIGURE 1 OVERALL ANTIBIOTIC USE ACCORDING TO HOSPITAL STATUS, 2007

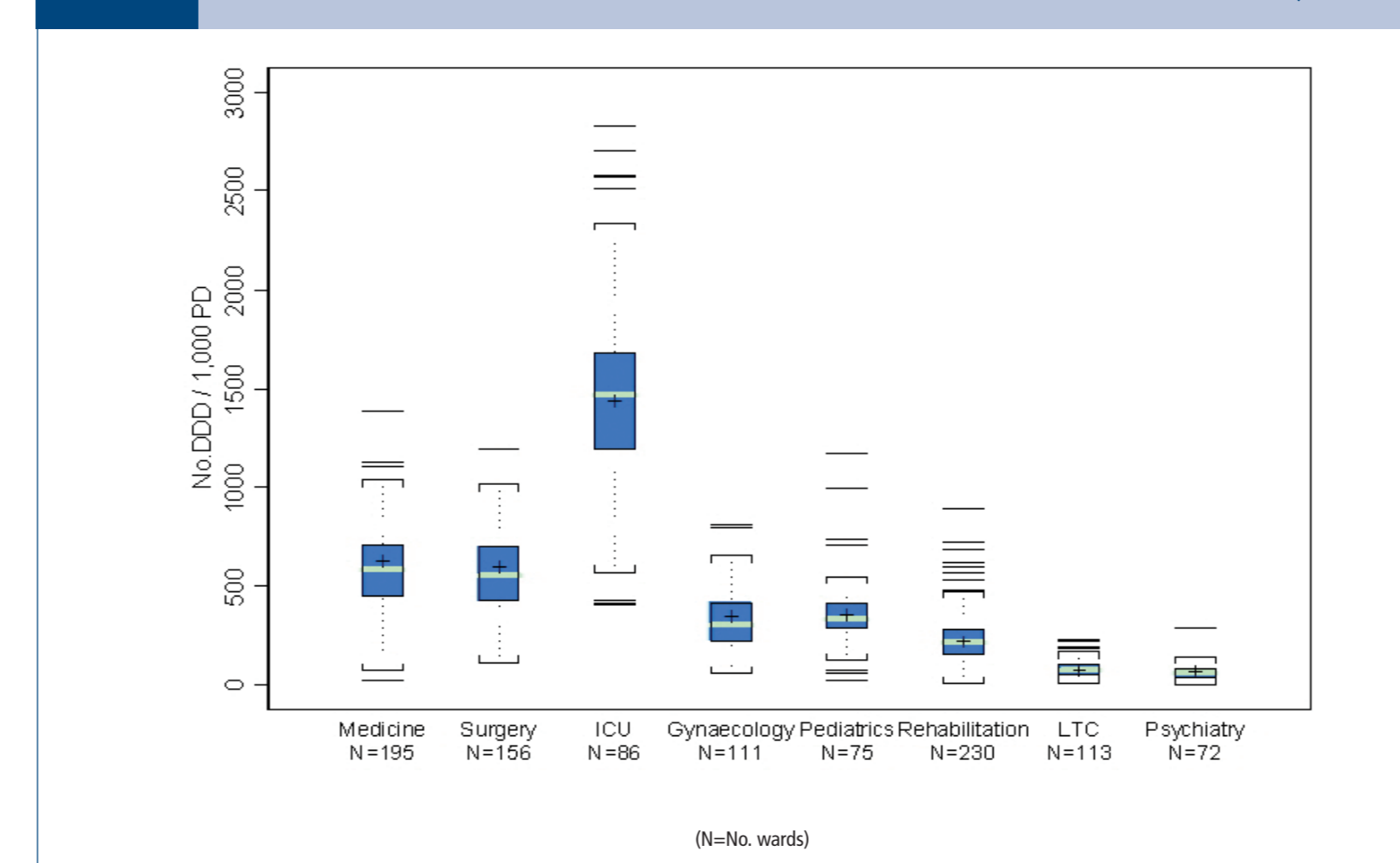


Box plot explanation: bottom of the box: P25; top of the box: P75; line in the middle: median; cross: pooled mean; end of the whiskers: lowest data point still within 1.5 times the interquartile range (IQR) below P25, and highest data point still within 1.5 times the IQR above P75. Lines outside the box and whiskers: outliers. (N=No. participating hospitals)

Antibiotic use at ward level

- Median AB use ranged from 60 DDD/1,000 PD in psychiatric wards to 1466 in ICU.
- Surgical and medical wards had quite similar total consumption: 553 and 583 DDD/1,000 PD respectively.
- Consumption level was much lower in paediatrics (333), gynaecology (308) and rehabilitation (213).
- Wide variations among wards into each category: the maximum AB use was 7-fold the minimum value in ICU; the range reached 89-fold in rehabilitation wards.

FIGURE 2 OVERALL ANTIBIOTIC USE ACCORDING TO CLINICAL ACTIVITY, 2007



PATTERN OF USE AT WARD LEVEL

- Amoxicillin-clavulanic acid combination was the most common AB, except in gynaecology and paediatrics where amoxicillin was.
- Rifampicin and oral imidazole derivatives accounted for 1 to 2% and for 0.3 to 1.3% respectively of total use.

TABLE 1 MEDIAN ANTIBIOTIC CONSUMPTION ACCORDING TO CLINICAL ACTIVITY FOR MAIN ANTIBIOTIC GROUPS, 2007, (DDD/1,000PD)

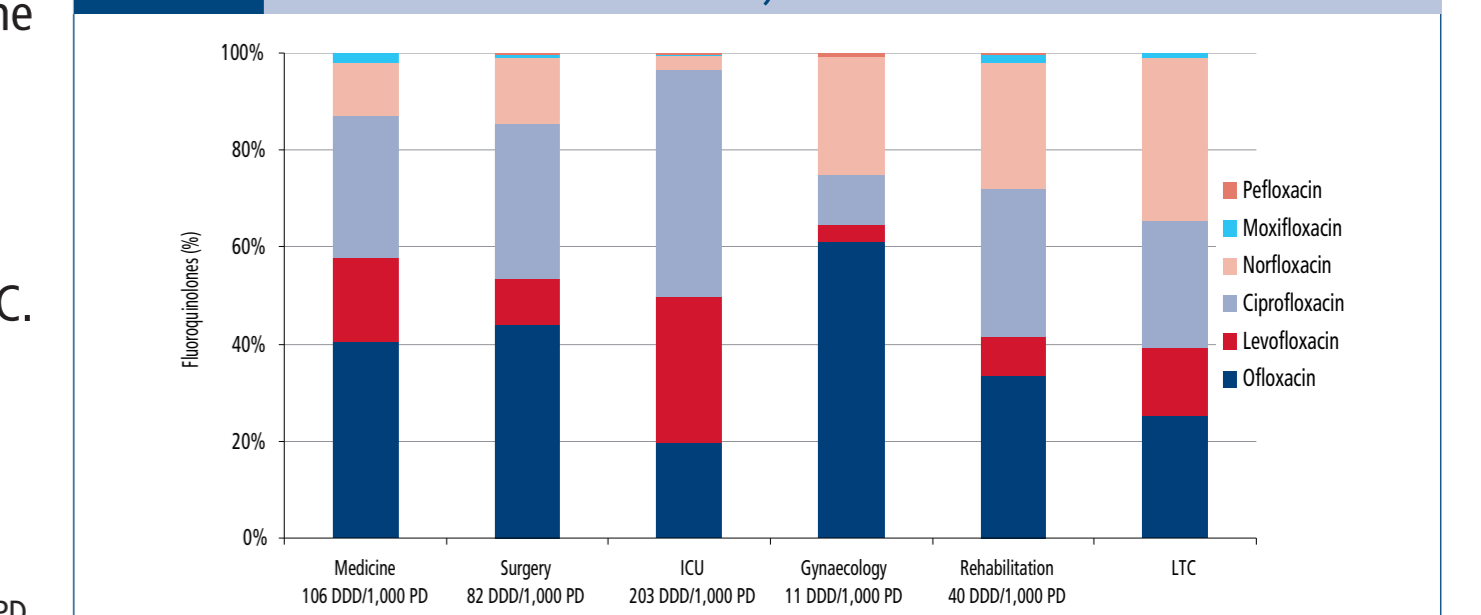
Antibiotics	Medicine N=195	Surgery N=156	ICU N=86	Gynaecology N=111	Paediatrics N=75	Rehabilitation N=230	LTC N=113	Psychiatry N=72
Cloxacillin/oxacillin	11.8	10.7	37.5	0.5	8.4	3.4	0.8	0.7
Amoxicillin	76.2	49.3	144.6	156.3	98.5	31.5	14.8	14.3
Amoxicillin/ clavulanic acid	217.8	203.9	253.6	78.0	81.6	64.8	25.8	22.2
Pseudomonal penicillins (1)	1.4	2.6	77.1	0.0	0.3	0.0	0.0	0.0
First and second GC	0.6	54.8	3.1	2.5	0.4	0.0	0.0	0.0
Non pseudomonal third generation cephalosporins (2)	36.2	19.8	128.1	7.7	61.2	8.4	4.1	0.7
Pseudomonal third GC (3)	3.3	1.3	33.7	0.0	1.6	0.2	0.0	0.0
Carbapenems	2.1	2.2	36.9	0.0	0.0	0.2	0.0	0.0
Aminoglycosides	9.7	22.0	90.3	3.3	17.4	1.3	0.3	0.0
Fluoroquinolones	97.8	77.7	192.2	8.0	1.6	41.5	8.6	4.9
Glycopeptides	3.3	5.5	52.0	0.0	4.9	0.2	0.0	0.0
Macrolides	14.8	4.4	37.9	7.1	11.4	3.5	2.2	1.8
Streptogramins (pristinamycin mostly)	15.1	8.0	7.3	0.7	0.4	10.1	2.8	1.7
Imidazoles derivatives (including oral derivatives)	12.2	26.3	49.8	2.5	5.5	2.2	0.8	0.4
Rifampicin	5.9	9.8	27.8	0.0	3.7	4.5	0.0	0.0

(1) piperacillin +/- betalactamase inhibitors ; ticarcillin +/- betalactamase inhibitors ; mezlocilline (i.e. J01 CA 10, CA12, CA13, CR03, CR05)
 (2) ceftazidime, ceftazidime, ceftazidime
 (3) ceftazidime, cefsulodine, cefepime, ceftipime

FOCUS ON FLUOROQUINOLONES (FQ)

- FQ accounted for 14% to 19% of total use in surgery, ICU, medicine and rehabilitation wards.
- Ciprofloxacin was the main FQ in ICU (50%).
- Levofloxacin was mostly used in ICU.
- Norfloxacin was mostly used in gynaecology, rehabilitation and LTC.
- Little use of pefloxacin and moxifloxacin in 2007.

FIGURE 3 FLUOROQUINOLONES USE ACCORDING TO CLINICAL ACTIVITY, 2007



Paediatrics and psychiatric wards not shown due to low FQ use in no. DDD/1,000PD.

Conclusion

- This multicentre survey provided detailed information on AB use in a large sample of wards. The survey was limited to voluntary hospitals and relied on self-reported data. However, given the variety of wards and hospitals involved, it can be assumed that AB use figures from this survey allow relevant comparisons and benchmarking.
- Analysis at ward level is more helpful than at hospital level for feedback to prescribers when exploring discrepancies in AB use, since information on antimicrobial resistance and on patient case-mix is easier to consider at ward level. This surveillance on AB consumption brings information useful to target key areas for further investigation.
- Total AB consumptions in French ICU were quite similar to those reported in Sweden [Hanberger H, 2007]. However, the pattern of use differed, with higher use of carbapenems and cefuroxime in Sweden, more FQ and glycopeptides in France.
- Analysis of AB consumption in hospitals is also useful for public health organizations and decision-makers to assess policies and to prioritize actions. As of 2010, this surveillance network is run by the national RAISIN network, along with surveillance of HCAI and multidrug resistant bacteria.

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