# Evaluating and Benchmarking Antibiotic Use in German University Hospitals

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## Introduction

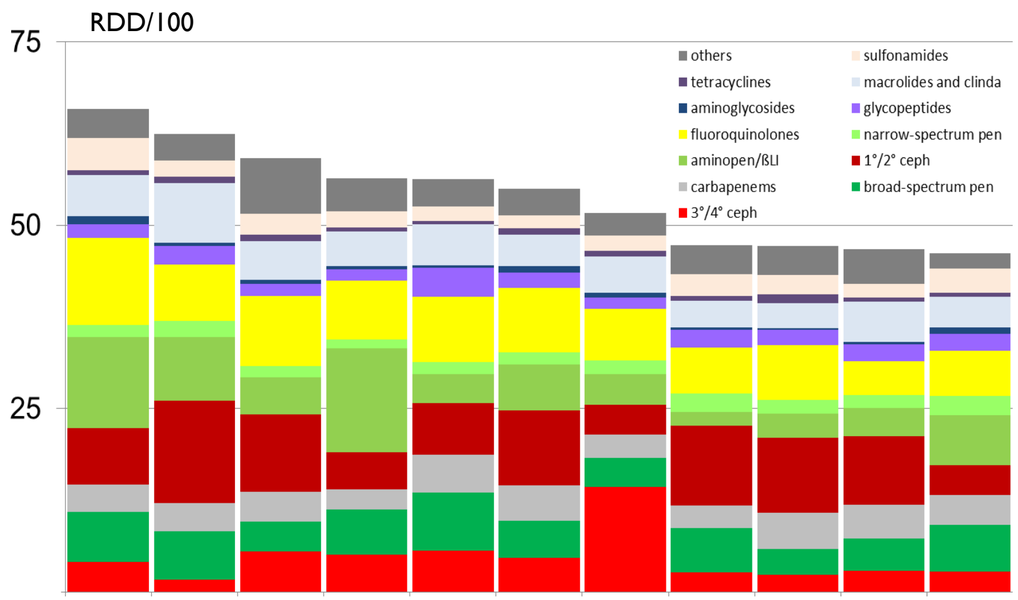
Previous studies indicate intensive antibiotic use density levels in tertiary care hospitals including many broad-spectrum agents likely to be associated with the develop-ment of bacterial resistance and high expenditures. We have repeatedly evaluated antibiotic use in German university hospitals in a sentinel network and present here data from 11 hospitals for the year 2013.

**Table 2. Antibiotic use density for different drug classes in DDD per 100 patient days (RDD/100 in parentheses).**

| | Median | Interquartile range |
|---|---|---|
| Carbapenems | 5,4 (4,0) | 4,4 - 6,2 (3,4 - 4,7) |
| Broad-spectrum penicillins | 5,2 (6,1) | 3,6 - 5,5 (4,2 - 6,4) |
| 3°/4° generation cephalosporins | 4,4 (4,1) | 3,0 - 6,0 (2,8 - 5,4) |
| 1°/2° generation cephalosporins | 16,7 (9,4) | 10,1 - 18,5 (6,0 - 10,4) |
| Aminopenicillin-ßLI | 11,6 (5,0) | 9,1 - 18,6 (3,9 - 7,7) |
| Narrow-spectrum penicillins | 5,7 (1,8) | 4,7 - 6,1 (1,7 - 2,0) |
| Fluoroquinolones | 10,7 (7,7) | 9,2 - 11,6 (7,7 - 8,8) |
| Glykopeptides (incl. daptomycin) | 2,1 | 1,7 - 2,3 |
| Aminoglycosides | 0,7 (0,5) | 0,5 - 1,0 (0,4 - 0,8) |
| Macrolides and clindamycin | 7,2 (4,9) | 6,0 - 7,9 (4,2 - 5,5) |
| Tetracyclines | 1,1 (0,6) | 1,0 - 1,5 (0,6 - 0,9) |
| Sulfonamides | 2,2 | 2,0 - 2,9 |
| others | 4,2 (2,5) | 3,7 - 4,6 (2,1 - 3,0) |

**Table 1. Antibiotic use density overall and in different services and intensive care units of 11 German university hospitals (2013) in DDD per 100 patient days (RDD/100 in parentheses).**

| | n | DDD/100 (RDD/100) Median | DDD/100 (RDD/100) Interquartile range | % proportion total use |
|---|---|---|---|---|
| Non-surgical services (normal wards) | 91 | 63,2 (44,0) | 57,7 - 68,5 (40,9 - 48,7) | 22 % (22 %) |
| Hematology-oncology service | 11 | 131,0 (102,1) | 105,9 - 140,7 (86,8 - 115,3) | 10 % (12 %) |
| Surgical services (normal wards) | 122 | 67,5 (43,0) | 60,5 - 80,0 (38,5 - 52,5) | 52 % (48 %) |
| Intensive care units | 68 | 129,6 (91,7) | 120,6 - 143,5 (88,6 - 108,3 | 17 % (18 %) |
| Total | | 78,5 (55,0) | 71,4 - 82,8 (47,3 - 57,8) | |




## Methods

Pharmacy data were transformed into WHO-defined DDD and hospital-adapted “recommended daily doses” (RDD, compensating for nonrealistic WHO-DDD definitions, in particular for penicillins and cephalo-sporins) per 100 patient (occupied bed) days. Analyses were done for different specialty services (excluding pediatrics and psychiatry) and for normal ward versus intensive care (ICU) areas.

## Results

The overall use density was 55 RDD/100 or 78.5 DDD/100 (Table 1) with some variation between sites (Figure). The differences between sites ware largest for cephalosporins and aminopenicillin/ßLI combinations (Table 2 and Figure) whereas small differences (<2-fold) were seen for carbapenems.

Similar differences between hospitals were discovered for different specialty services and normal versus ICU wards except that hematology-oncology departments showed major (>5-fold) differences in FQ use.

Hospital-wide, the (median) proportion of cephalo-sporins was 26% (RDD, range 15-36) to 28% (DDD, 15-31), and for penicillins it was 24% (RDD, 18-38) to 28% (DDD, 21-45), respectively. The FQ proportion was 14% (DDD range 9-17; RDD range 10-16).

A comparison of antibiotic use densities in the core services medicine (incl. hematology-oncology) and surgery of the 5 hospitals that participated in both 1998-2000 and 2013 surveys showed substantial increases both for medicine (medians, +18% DDD/100, +19% RDD/100) and surgery (+32% or +56%, respectively).

## Conclusions

The substantially increased overall use and major differences in the use of 3°generation cephalosporins and penicillins in university hospitals are key findings in the present work.

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