Automatiserad övervakning av antibiotikakonsumtion inom intensivvård i Region Västerbotten

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Automated surveillance of antimicrobial consumption in intensive care, northern Sweden: an observational case study

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Abstract

Background The digitalization of information systems allows automatic measurement of antimicrobial consumption (AMC), helping address antibiotic resistance from inappropriate drug use without compromising patient safety.

Objectives Describe and characterize a new automated AMC surveillance service for intensive care units (ICUs), with data stratified by referral clinic and linked with individual patient risk factors, disease severity, and mortality.

Methods An automated service collecting data from the electronic medical record was developed, implemented, and validated in a healthcare region in northern Sweden. We performed an observational study from January 1, 2018, to December 31, 2021, encompassing general ICU care for all ≥18-years-olds in a catchment population of 270000 in secondary care and 900000 in tertiary care. We used descriptive analyses to associate ICU population characteristics with AMC outcomes over time, including days of therapy (DOT), length of therapy, defined daily doses, and mortality.

Results There were 5608 admissions among 5190 patients with a median age of 65 (IQR 48-75) years, 41.2% females. The 30-day mortality was 18.3%. Total AMC was 1177 DOTs in secondary and 1261 DOTs per 1000 patient days and tertiary care. AMC varied significantly among referral clinics, with the highest total among 810 general surgery admissions in tertiary care at 1486 DOTs per 1000 patient days. Case-mix effects on the AMC were apparent during COVID-19 waves highlighting the need to account for case-mix. Patients exposed to more than three antimicrobial drug classes ($N = 242$) had a 30-day mortality rate of 40.6%, with significant variability in their expected rates based on admission scores.

Conclusion We introduce a new service and instructions for automating local ICU-AMC data collection. The versatile long-term ICU-AMC metrics presented, covering patient factors, referral clinics and mortality outcomes, are expected to be beneficial in refining antimicrobial drug use.

Keywords Automated surveillance, Intensive care, Antibiotics, Antimicrobial consumption, Antimicrobial stewardship, Antimicrobial resistance

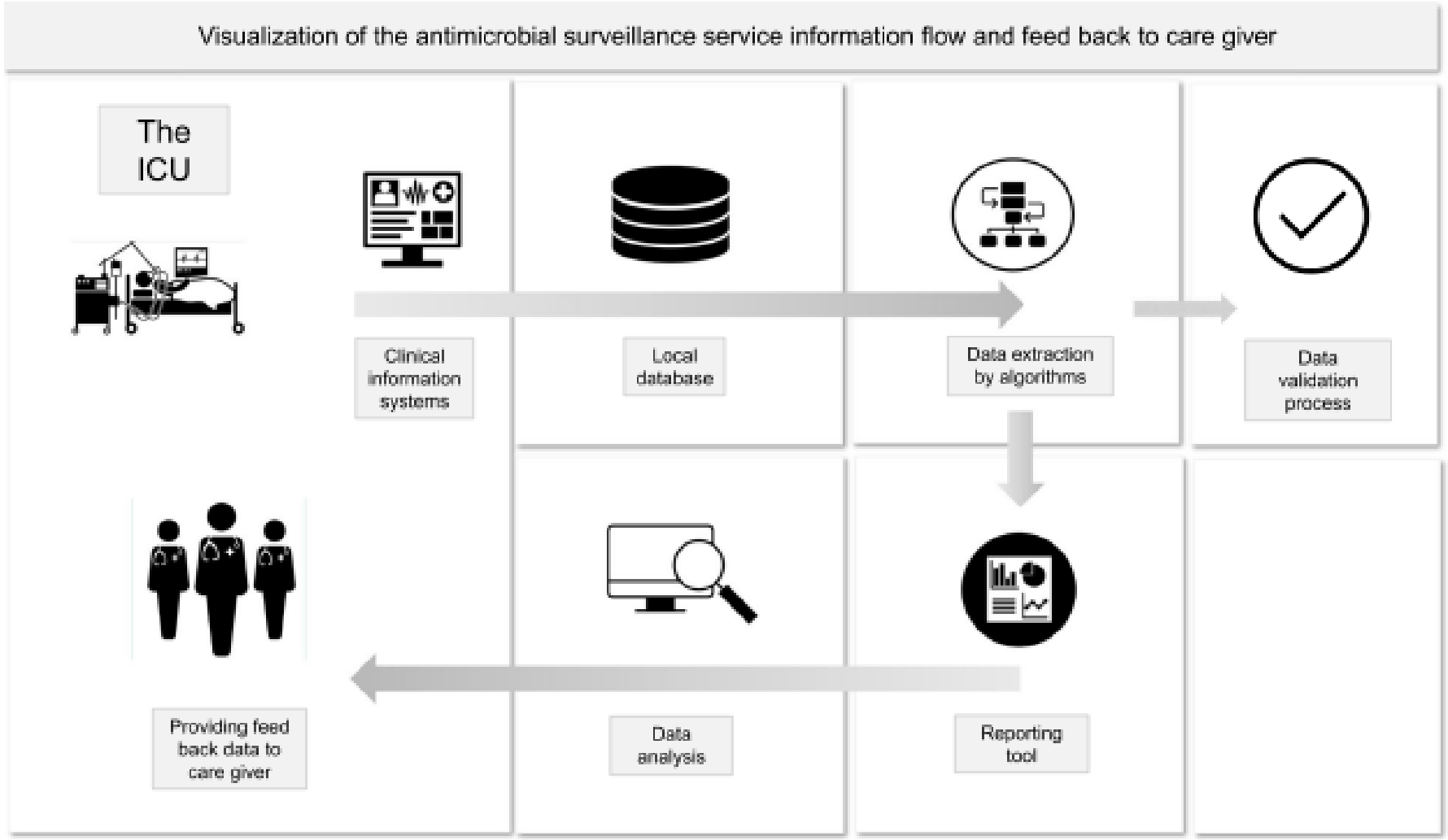


Fig. 1 Real-time patient data is processed within a local database by algorithms that link AMC metrics with a comprehensive set of other relevant patient information. The reporting tool compiles data that can be utilised for analysis and facilitates the provision of feedback to caregivers

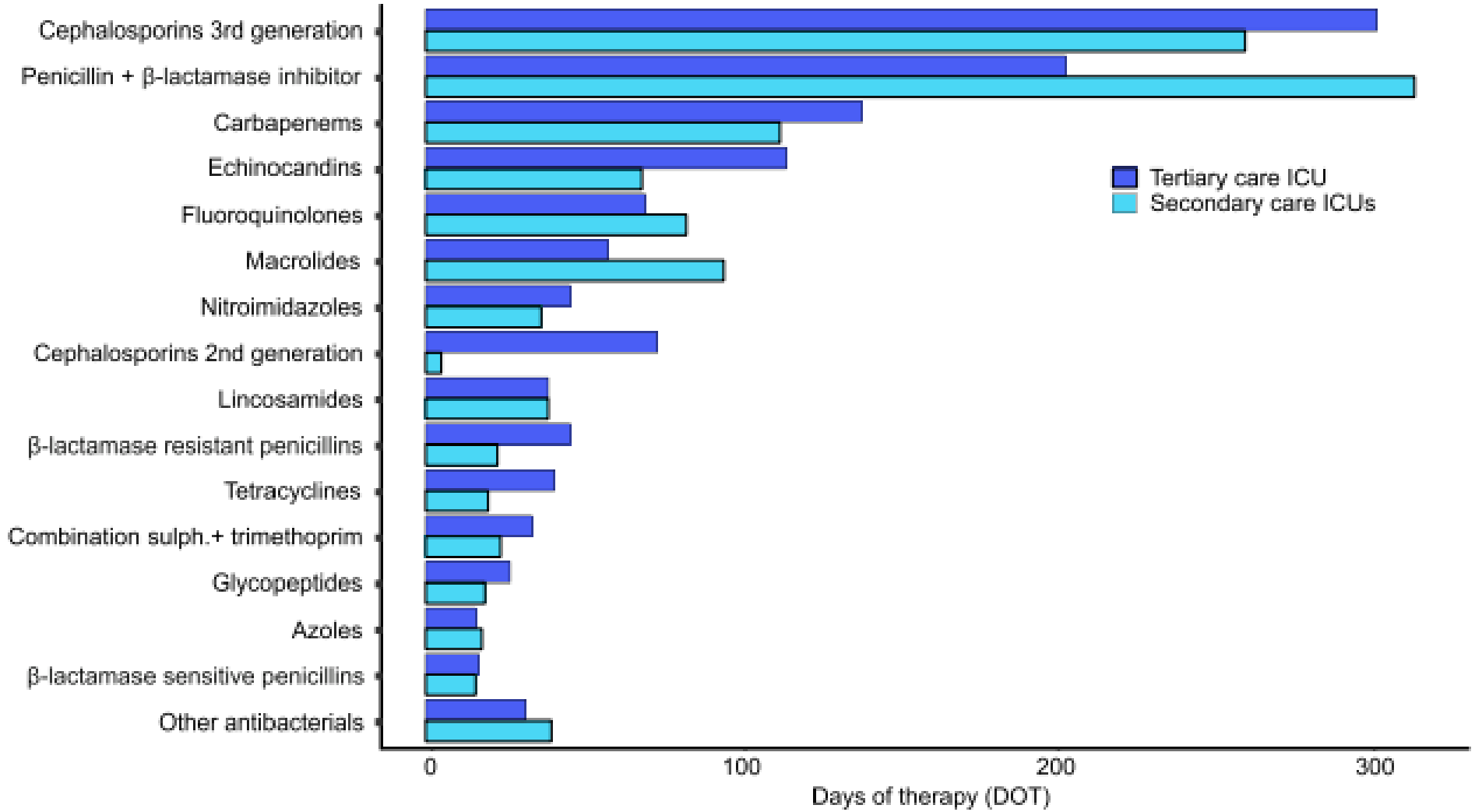
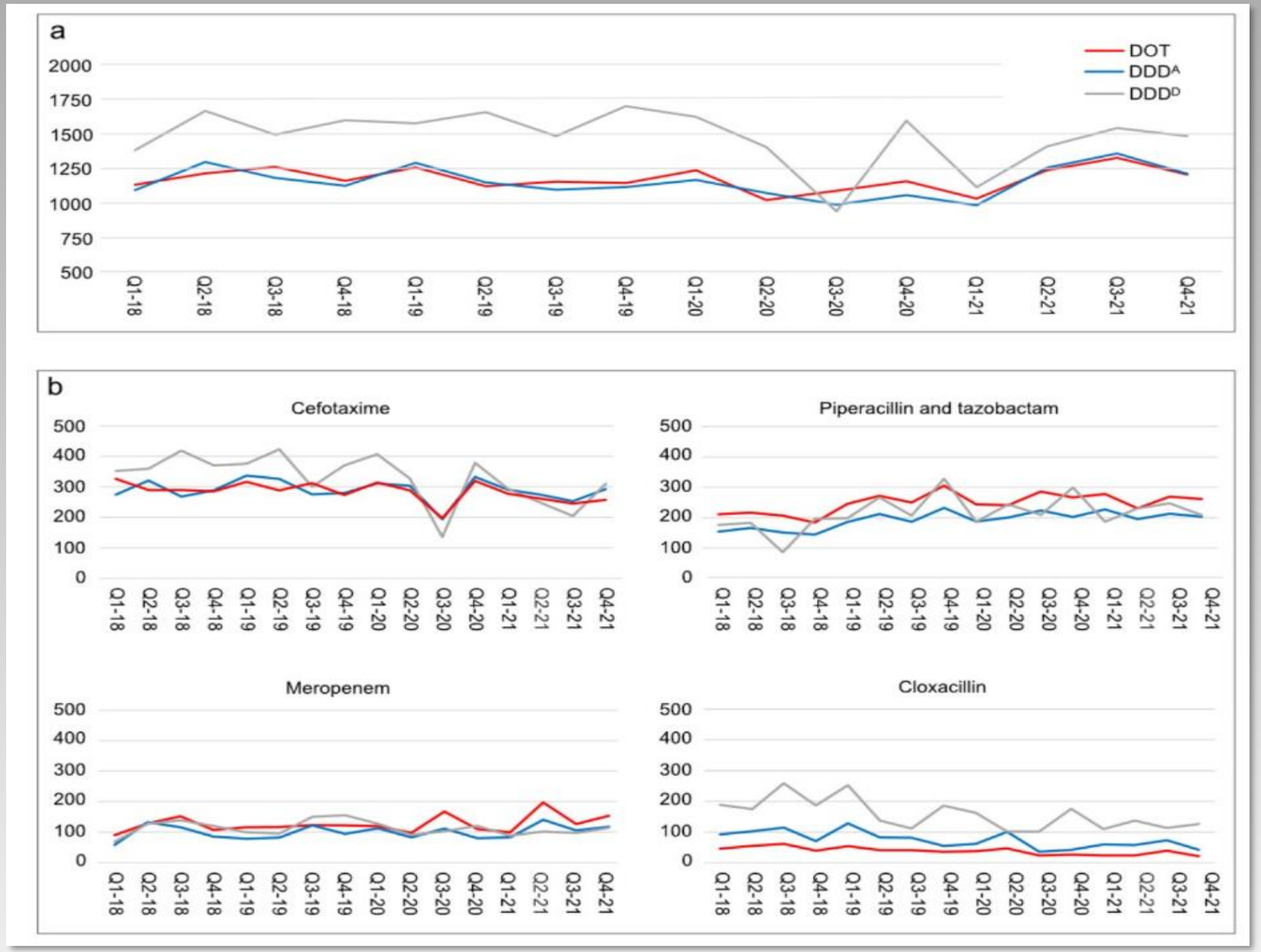
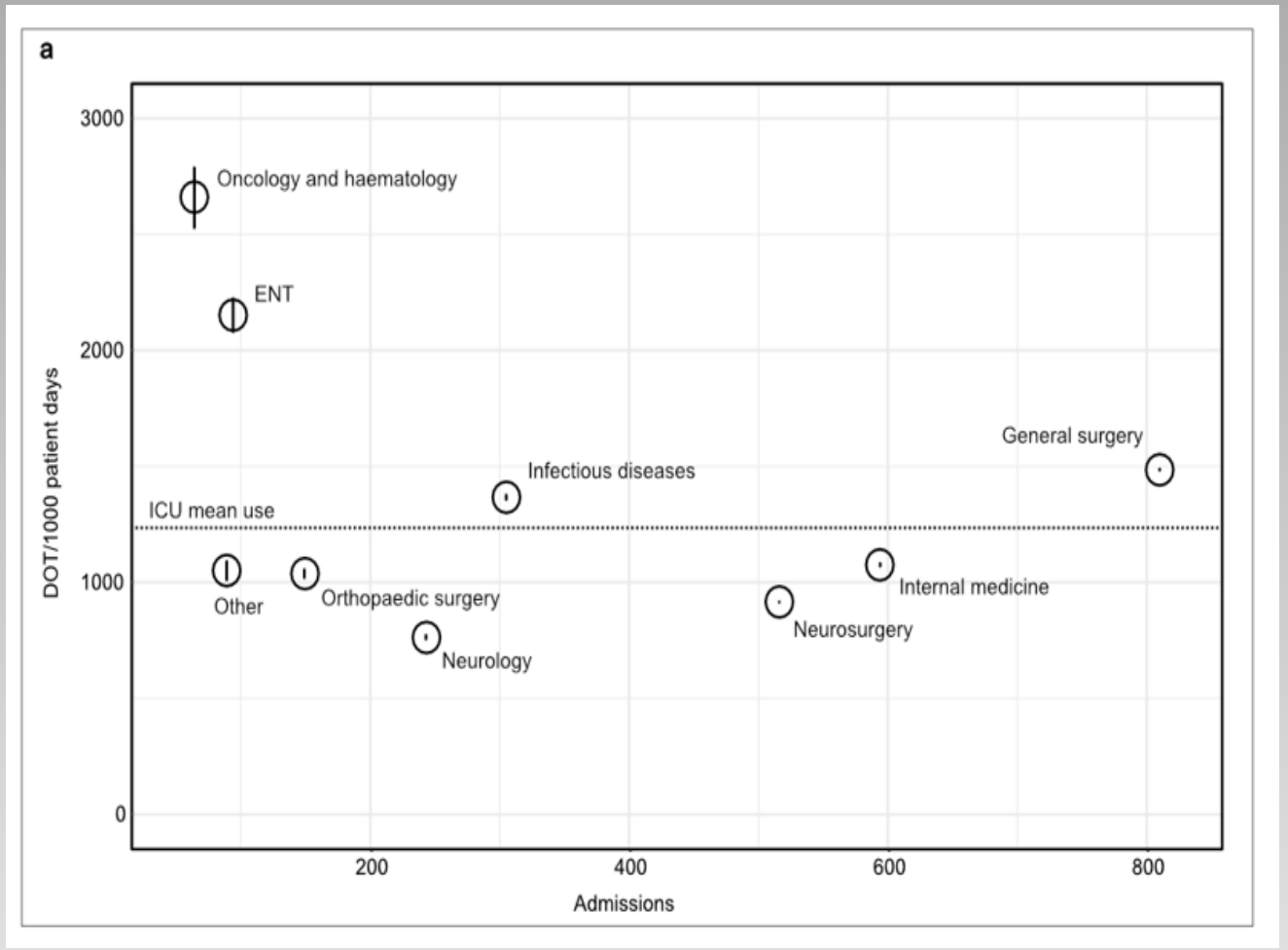
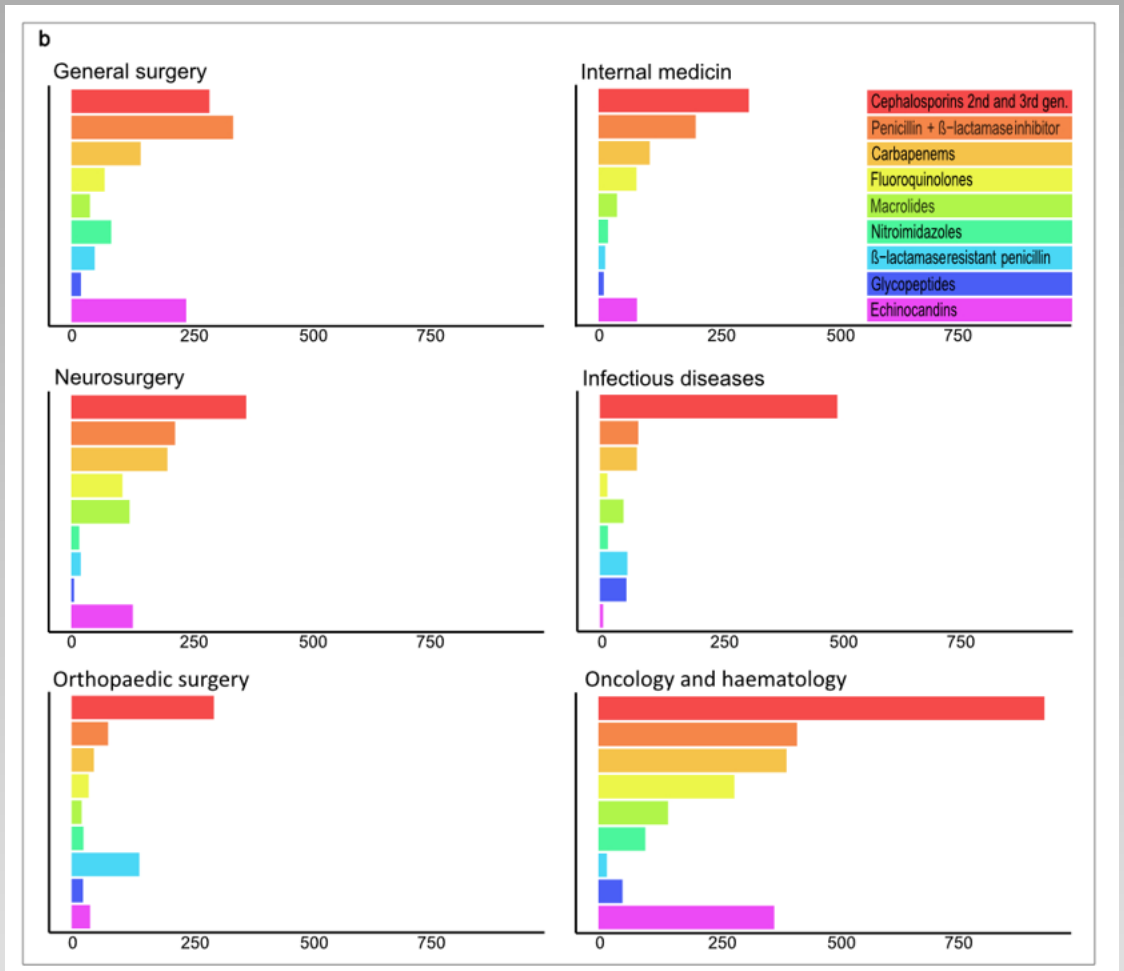
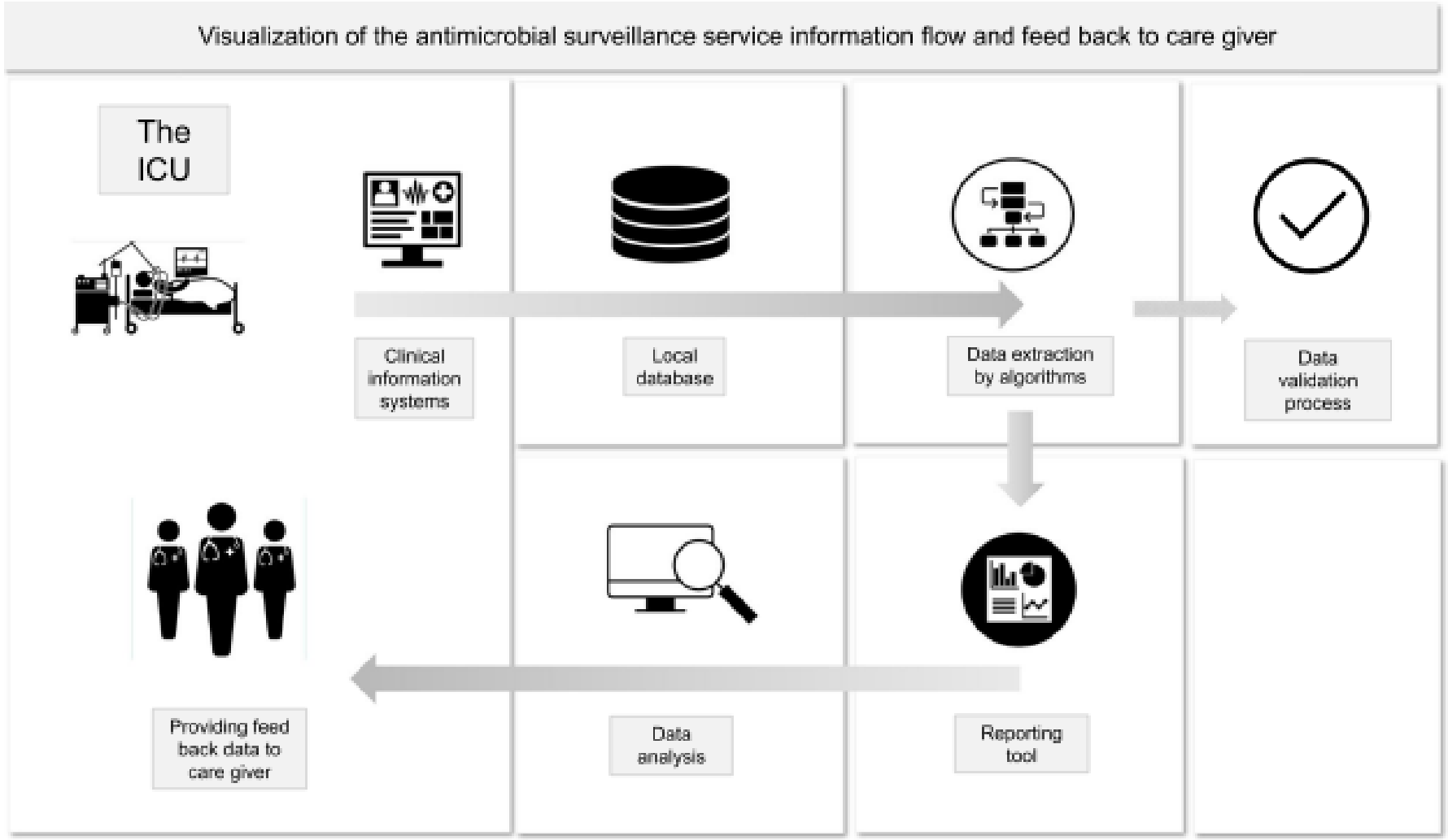


Fig. 3 Days of therapy (DOT) by antimicrobial class during the years 2018-2021 in a tertiary care ICU (dark blue) and in secondary care ICUs (light blue)


a
DOT
DDDA
DDDD
2000
1750
1500
1250
1000
750
500
Q1-18
Q2-18
Q3-18
Q4-18
Q1-19
Q2-19
Q3-19
Q4-19
Q1-20
Q2-20
Q3-20
Q4-20
Q1-21
Q2-21
Q3-21
Q4-21
b
Cefotaxime
Piperacillin and tazobactam
Meropenem
Cloxacillin
500
400
300
200
100
0


a
3000
2000
1000
0
DOT/1000 patient days
200
400
600
800
Admissions
Oncology and haematology
ENT
General surgery
Infectious diseases
ICU mean use
Other
Orthopaedic surgery
Neurology
Neurosurgery
Internal medicine


b
General surgery
Internal medicin
Neurosurgery
Infectious diseases
Orthopaedic surgery
Oncology and haematology
0
250
500
750
Cephalosporins 2nd and 3rd gen.
Penicillin + ß-lactamase inhibitor
Carbapenems
Fluoroquinolones
Macrolides
Nitroimidazoles
ß-lactamase resistant penicillin
Glycopeptides
Echinocandins



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