

Selected aspects of epidemiological surveillance in the intensive care unit of the Centre of Pulmonology and Thoracic Surgery in Bystra

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Sir,

Intensive care units (ICU) have been witnessing increasing antibiotic resistance and its related problems. The large consumption of antibiotics facilitates the selection of resistant bacterial strains which, in turn, make rational choices of empirical antibiotic courses much more difficult and treatment outcomes much more uncertain. Indeed, such departments are even perceived as “epicentres” of nosocomial infections, with the particular selection of multiresistant microorganism strains [1, 2]. Efficient epidemiological surveillance permits early identification and facilitates problem solving in the ICU and which must not be underestimated in the era of globally increasing antibiotic resistance.

A five-bed intensive care unit at the Centre of Pulmonology and Thoracic Surgery was created in 2014, and in July of the same year was awarded a contract with the Polish National Health Fund. The unit participates in the programme of active infection surveillance lead by the Polish Society of Nosocomial Infections, as well as in the PPS programme under the National Programme for the Protection of Antibiotics. Moreover, a pilot study of the standardized versions of active infection surveillance is being carried out at the unit according to the guidelines issued by the European Centre for Disease Control and Prevention (ECDC). Participation in the above-mentioned programs facilitated the gathering of the epidemiological data presented herein.

One hundred and nine patients, aged 21–92 years (mean age of 63.5 years), were hospitalized at the unit during its first year in service, and comprised 67.9% men. The mean APACHE II score was 18.5, and median score 18. On admission, 62 patients (59%) had signs of infection. Twenty-eight patients (25.7%) were admitted due to perioperative complications after thoraco-surgical procedures. The mean duration of patient hospitalization at the ICU was 12.7 days, while the mortality rate was 17.4% (19 patients). The mean ICU bed occupation rate was 76%. The calculated “density” of most common invasive procedures was the following: artificial ventilation, 52.7/100 patient-days; central vein cath-

eterization, 84.85/100 patient-days; arterial cannulation, 66.7/100 patient-days; bladder catheterization, 87.2/100 patient-days; and body cavity drainage, 15.4/100 patient-days. During the analysed period, 1,092 microbiological analyses were performed (218 tests/bed/year, mean of 10 tests/patient). The usage of hand disinfectants varied over time between 129 and 297 mL person day⁻¹ (mean of 208.3 mL person day⁻¹), which gives 69 episodes of hand disinfection per day during the care of a single patient.

Nosocomial infections at this ICU are registered according to the ECDC criteria [3]. During the analysed period, 38 nosocomial infections were registered (2.75/100 patient-days) in a total of 31 patients (28.4% of all hospitalizations). Patients with diagnosed nosocomial infection had had a significantly higher APACHE II score on admission (21 vs. 17.7 points; $P = 0.03$); no differences were observed as to patient age or sex. Although hospitalizations in patients with diagnosed nosocomial infections were significantly longer than in other subjects (23 vs. 8.6 days), no significant difference in mortality was observed between the groups. Bloodstream infections (BSI) as a cause of nosocomial disease involved 7.9/1,000 patient-days. When considering cases compatible with the laboratory definition of vascular catheter-related bacteraemia [4], the prevalence ratio was 2.6/1,000 patient-days of catheter usage. Respiratory tract infections occurred at the rate of 26.1/1,000 days of artificial ventilation. The respective rate of urinary tract infections was 2.5/1,000 days with a bladder catheter.

Colonisation with alarm pathogens on admission to the ICU was detected in 28 patients (25.7%). These patients had higher APACHE II scores on admission (21.3 vs. 17.7; $P = 0.02$), more often acquired nosocomial infections during hospitalisation in the ICU (35.7 vs. 25.9%; $P = 0.3$), while the mortality rate was higher in this group (32.1 vs. 12.3%; $P = 0.01$). Antibiotics were administered in 83 patients (76.1%). The monthly consumption of antibiotics was in a range of between 80.18 and 257 DDD/100 patient-days of hospitalisation (mean of 135.6 DDD/100 patient-days). The greatest consumption rates involved fluoroquinolones (17.7%), colistin (12.3%), third generation cephalosporins (12.1%), carbapenems (11.6%), and penicillins with beta-lactamase inhibitors (10%). Patients receiving antibiotics demonstrated a higher mortality rate (21.7 vs. 3.8%; $P = 0.03$), were hospitalised for longer periods (mean hospitalization of 14.3 vs. 7.3 days; $P = 0.005$), and more often experienced colonisation by alert pathogens (51.2 vs. 20%; $P = 0.18$).

Every hospital department is a unique entity characterized by a specific patient population, pathogenic microflora, and distinct diagnostic and therapeutic algorithms. A unified system of epidemiological surveillance may, in this context,

permit evaluation of preventive measures aimed at infection control and facilitate the comparison of outcomes between units of similar profiles. Indeed, a couple years ago the Polish Society of Nosocomial Infections introduced a program of active infection surveillance in intensive care units, this scheme being a simplified version of the ECDC protocol. Moreover, a pilot study on the standard version of the ECDC surveillance protocol is also being carried out currently. In addition, the Section for Microbiology and Infections of the Polish Society of Anaesthesiology and Intensive Therapy collects unified data on antibiotic consumption in ICUs. Thanks to the introduction of a unified program of infection surveillance and control, reliable epidemiological data from intensive care units in Poland could be collected, while experience in this area gathered in other countries could be used [5].

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References:

1. *Brusselsaers N, Vogelaers D, Blot S*: The rising problem of antimicrobial resistance in the intensive care unit. *Ann Intensive Care* 2011; 1: 1–7. doi: 10.1186/2110-5820-1-47.
2. *Vasudevan A, Memon BI, Mukhopadhyay A, Li J, Tambyah PA*: The costs of nosocomial resistant gram negative intensive care unit infections among patients with the systemic inflammatory response syndrome — a propensity matched case control study. *Antimicrob Resist Infect Control* 2015; 4: 3. doi: 10.1186/s13756-015-0045-8.
3. Badanie punktowe występowania zakażeń związanych z opieką zdrowotną i stosowania antybiotyków w europejskich szpitalach pracujących w trybie ostrodyżurowym. Protokół wersja 4.2 PL1. http://www.antybiotyki.edu.pl/pdf/ECDCksiazka_kodow_ost.pdf
4. *Mermel LA, Allon M, Bouza E et al.*: Clinical practice guidelines for the diagnosis and management of intravascular catheter-related infection: 2009 update by the Infectious Diseases Society of America. *CID* 2009; 49: 1–45. doi: 10.1086/599376.
5. Sprawozdanie z realizacji Narodowego Programu Ochrony Antybiotyków. Analiza danych ze szpitali pilotażowych. <http://www.antybiotyki.edu.pl/pdf/sprawozdanie-NPOA.pdf>.

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