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INFECTION CONTROL IN POLISH MEDICAL WARDS – DATA FROM THE PROHIBIT PROJECT

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ABSTRACT

INTRODUCTION. Nosocomial infections and the problem of their surveillance concern all patients, including patients treated in medical wards.

The objective of the study was to evaluate selected infection control practices in Polish medical wards in comparison with wards of European hospitals.

MATERIAL AND METHODS. The study was conducted by means of a standardized questionnaire fulfilled by a total of 506 wards, including 10 Polish, in 24 European countries, as a part of the PROHIBIT project.

RESULTS. The median number of beds in Polish wards (PW) was 35 vs. 30 in European ones (EW), while the proportion of beds in single rooms in Poland were almost ten times lower than in Europe. The number of nurses employed in PW was similar to EW.

In all PW alcohol-based handrub solutions were available in more than 76% points of care and it was better situation than in EW. Similar situation in PW and EW was observed in case of existence of written procedure of UTI and CDI prevention.

Differences between PW and EW were observed in the manner of usage of close drainage system in catheterized patients and in consumption of alcohol-based handrubs.

CONCLUSIONS. In Poland, selected component of infection control is a challenge for the future and its implementation and realization require increasing the awareness of both medical staff and the management of hospitals.

Key-word: *Clostridium difficile*, hand hygiene, infection prevention, urinary tract infection

INTRODUCTION

Nosocomial infections are among the most common adverse events in health care (1). Nosocomial infections and the problem of their surveillance concern all patients, including patients treated in medical/ internal diseases wards. Of particular importance in these types of wards are urinary tract infections and *Clostridium difficile* infections (2, 3, 4). The majority, i.e. about 80%, of nosocomial urinary tract infections are associated with the use of urinary catheters and occur in patients with no symptoms from the urinary tract. The procedure of urinary bladder catheterization is applied in 12–16% of hospitalized patients (5). It is estimated that urinary catheter-associated bacteriuria constitutes 40% of nosocomial infections reported in the United States annually (5). Urinary catheter-associated bacteriuria leads to numerous cases of nosocomial bacteremia in hospitalized patients; one study even demonstrated a significant cor-

relation with increased mortality. Furthermore, urinary catheter-associated bacteriuria leads to an increased, and often improper, use of antibiotics, consequences of which are not only higher direct medication costs but also the development of a reservoir of drug-resistant bacteria, which represent a major problem in cross infection. Implementation of effective recommendations concerning the prevention of catheter-associated UTI also allows to achieve a significant reduction in costs related to treating these infections (6).

Clostridium difficile infections constitute another, frequently recorded, form of clinical infections among adult patients in developed countries. Annual costs of infections of this etiology in the United States are estimated at 496 million USD from the perspective of health care providers, 547 million USD from the perspective of payers and 796 million USD at the macroeconomic level for the society as a whole (7). It was demonstrated in European studies that the hospital stay of patients

with CD infections is prolonged at least another 7 days or even associated with attributable mortality ranging from 1% to as much as 23% (8).

Since UTI and CDI frequently occur in medical wards, it is difficult to omit these wards in hospital infection control and their characteristics make it vital for implementation and compliance with specific rules and procedures to minimize the risk of urinary tract infections, in particular the ones associated with the use of urinary catheters and transmission of spore-forming organisms.

The objective of the study was to evaluate selected infection control practices in Polish medical treatment wards in comparison with wards of European hospitals.

MATERIAL AND METHODS

The study was conducted in 2011 by means of a standardized questionnaire taking into account the organization of surveillance in hospitals, especially in three different types of wards: intensive care, surgical and non-surgical. The questionnaires were prepared at the Institute of Hygiene and Environmental Medicine, Charité – University Medicine in Berlin, in collaboration with the Chair of Microbiology, Jagiellonian University Medical College in Kraków. It was a part of the PROHIBIT project - “Prevention of Hospital Infections by Intervention and Training”. The questionnaires were

filled out by hospital staff: the section on the hospital by the infection control team, the remaining ones by the employees of wards or the Infection Control Team. 34 European countries were invited to participate in the study, of which 24 reported their data subsequently subjected to analysis. The section of the questionnaire devoted to medical treatment wards was filled out by a total of 506 wards in 294 hospitals.

In Poland, questionnaires were sent to 30 hospitals and completed ones were returned from 10 medical treatment wards in 9 hospitals (the average for individual European countries in the study was 12,25), including three small ones (up to 199 beds), 2 medium ones (200–499 beds) and 4 big ones (over 500 beds); they were mainly public (6 hospitals). Detailed characteristics of Polish hospitals taking part in the project was presented in previous publication (9).

Questions in the section of the questionnaire regarding medical wards concerned:

1. ward structure and organization, i.e. size and profile of the ward, number of admissions, employment of nurses in the ward, and availability of alcohol-based handrub,
2. organization of infection control programs operating in the ward, including the scope and basics of developing specific procedures, the scope and recipients of trainings in this respect,
3. control and prevention of urinary tract infections and infections caused by *Clostridium difficile*

Table I. Basic characteristic of the study wards

Selected elements of ward organization	European wards median	Polish wards median
The ward size		
•Beds in the medical ward (MW)	30	35.0
•Single bed rooms in the MW	2	0.5
•Percent single room beds on MW	7.3	0.8
The number of admissions and patient-days in 2010		
•Number of admissions in 2010	1246	1318.5
•Patient-days in 2010	9570	8556.5
•Length of stay on medical ward	7.85	6.3
•Bed occupation on medical ward (patient-day/bed-days,%)	84.31	65.6
The number of full-time-equivalent (FTE) certified nurses and nurses in training working on the ward per working day?		
•FTE certified nurses and nurses in training per working day	8.00	7.0
•FTE certified nurses and nurses in training per morning shift	4.25	4.5
•FTE certified nurses and nurses in training per night shift	2.00	2.0
•FTE certified nurses on MW per working day per bed	0.27	0.2
•FTE certified nurses on MW per morning shift per bed	0.15	0.1
•FTE certified nurses on MW per night shift per bed	0.07	0.1
The number of certified nurses working part- or full-time in the ward and since when?		
•Nurses working part- or full-time	17	17.0
•Nurses working part- or full-time for <= 3 yrs	3	1.0
•Nurses working part- or full-time for > 3 yrs	12	15,5
•Nurses on MW working part- or full-time per bed	0.56	0.5
•Nurses on MW working part- or full-time for <= 3 yrs per bed	0.10	0.0
•Nurses on MW working part- or full-time for > 3 yrs per bed	0.40	0.4
•Ratio nurses on MW working part- or full-time for > 3 yrs / <=3 yrs	3.00	8.5

Table II. Availability of alcohol-based hand-rub in the study wards

Alcohol-based handrub (liquid, gel, or foam) dispensers (wall- or bedmounted) available at the point of care for an individual patient	All European wards [%]	Polish wards [%]	p-value
•Available in 0-25% at the point of care	17.13	0.0	0.0767
•Available in 26-50% at the point of care	8.07	0.0	0.0219
•Available in 51-75% at the point of care	8.47	0.0	0.2045
•Available in 76-100% at the point of care	66.34	100.0	0.3662
Individual pocket/belt bottles or dispensers available for healthcareworkers (HCWs) in the ward			
•Yes, for \geq 50 % of staff	19.45	10.0	0.4906
•Yes, for <50 % of staff	10.41	0.0	0.1612
•No	70.14	90.0	0.2211

4. process and outcome indicators for the year 2010, precisely alcohol-based handrub consumption.

Chi-squared test was used for analyzing statistical importance of differences between Polish vs. all European medical wards participating in the study.

RESULTS

The median number of beds in Polish medical wards was 35, meaning that it was a little higher than the one in the group of all European hospitals. The median number of single rooms in Polish hospitals was 0.5 compared with 2 in all hospitals (median value in Polish hospitals was lower than the value of the first quartile in all hospitals of the studied group). The proportion of beds in single rooms of the Polish wards amounted to 0.8 and was lower than the corresponding median values – 7.3 and the first quartile – 1.4 of all wards. General medicine wards in the Polish group made up 30%, cardiology wards – 20%, others – 50% were wards of various profiles and this was a different distribution than for the entire group of hospitals. Both the median annual number of admissions – 1,318.5 as well as person-days

of stay – 8,556.5 in the Polish hospitals were lower than the respective values for the entire group, i.e. 1,246 and 9,570. The Polish wards, as compared with the whole group, also had shorter average length of stay – 6.3 days, in comparison with 8.9, and bed occupancy – 65.6% vs. 84.3%. Detailed data regarding characteristics of the wards are presented in Table I.

The number of nurses employed in the Polish wards, as compared with European wards, was similar – the median value in both cases amounted to 17. Variation in nurse employment was recorded considering the period the nurses had worked in the ward – in the Polish hospitals, more nurses had worked for more than three years compared with the entire group of hospitals – Table I.

In all Polish wards, alcohol-based handrub preparations were available in more than 76% of points of care and this constituted a better situation than in the entire group, where their availability was less than 25% of points of care in 17.1% of wards, and availability in over 76% of points of care was declared by 66.3% of wards (Table II).

However, availability of pocket dispensers of handrub was declared by only one of ten Polish wards, while in the whole studied group, such preparations were available in almost 30% of wards (Table II).

Table III. Ward personnel training in infection control

Regular infection control (IC) training sessions for healthcare workers (HCWs) established in the ward	All European wards [%]	Polish wards [%]	p-value
•No	9.43	0.0	0.6703
•Regular IC training sessions: new HCWs	72.10	40.0	0.3053
•Regular IC training sessions: existing HCWs	81.14	60.0	0.5580
What are the topics for IC training of newHCWs, if the trainings are performed?			
•bloodstream infections	60.22	50.0	0.7349
•hospital-acquired pneumonia	37.60	40.0	0.9183
•urinary tract infections	56.95	50.0	0.8133
•others hospital-acquired infections	64.03	50.0	0.6513
•multi-drug resistant organisms	67.03	50.0	0.5915
•Hand hygiene	95.91	50.0	0.2258
Mandatory training of IC for existing HCWs and / or for new HCWs			
•IC training of new HCWs is mandatory	77.11	50.0	0.4245
•Continuous training for existing HCWs is mandatory	60.53	60.0	0.9865
•Continuous training for existing HCWs is mandatory upon infection control incidents	33.76	60.0	0.2865
•No mandatory training	15.48	0.0	0.0913
Existence any campaigns for HAI prevention in the ward during the last 12 months			
•Campaigns for HAI prevention implemented in this MW during the last 12 month	71.26	60.0	0.7397

Table IV. Prevention measures for urinary tract infection

Urinary tract infections	All European wards [%]	Polish wards [%]	p-value
Existence of internal written policies on preventing urinary tract infections			
•Internal written policies on preventing urinary tract infections	80.75	90.0	
The use of closed drainage systems in catheterized patients in the ward (except for single or perioperative catheterization)			
•Always	82.54	30.0	0.0198
•Sometimes	5.56	10.0	0.6089
•Rarely	5.36	30.0	0.0307
•Never	6.55	30.0	0.0500
Existence of a system for daily assessment of catheter necessity?			
•System for daily assessment of catheter necessity	55.62	50.0	0.8463
The use of impregnated (antiseptic or antibiotic) urinary catheters in the ward			
•Yes, in $\geq 50\%$ of the patients	5.16	0.0	0.3183
•Yes, in $< 50\%$ of the patients	3.97	0.0	0.3800
•No	90.87	100.0	0.9018

The scope and recipients of trainings on infection control are shown in Table III.

The majority, i.e. 90% of the Polish wards, kept written procedures on the prevention of urinary tract infections, although only half of them operated a system of daily assessment of whether there was still need to further maintain urinary catheters in patients, and this was a situation similar to the one in the entire group, in which the respective proportions are 80.8% and 55.6%. In the Polish wards, less frequently than in Europe, closed drainage system in catheterized patients was used (except for single or perioperative catheterization): always only in 30% vs. 82.%. Urinary catheters impregnated with antiseptics or antibiotics were not used in any of the Polish wards, while in Europe such catheters were used in less than 10% of wards (Table IV).

The majority, being 80% of the Polish wards, compared with 65.6% of the European ones, had written procedures for the prevention of CD infections. In the case of care for patients with symptomatic infections, 100% of staff used protective gloves, and in the European group it was 97%. Patients with symptomatic CD infection (*Clostridium difficile*-associated infection, CDI) were always placed in single rooms in 20% of the Polish wards and in 50% of the wards depending on the availability of such rooms. It was a smaller percentage compared with the total for the studied wards in Europe, amounting to 43% and 30%, respectively. 20% of the Polish and 18.7% of the European wards implemented contact isolation in shared rooms, and 10% of the Polish and approximately 9% of European wards did not use isolation. For patients with CDI, the routinely used

Table V. Prevention measures for *Clostridium difficile* associated infections

<i>Clostridium difficile</i> associated infections	All European wards	Polish wards [%]	p-value
Existence of internal written policies on preventing <i>C. difficile</i> infections?			
•Written policies on preventing <i>C. difficile</i> infections	65.61	80.0	0.6806
Do healthcare workers wear gloves to protect their hands from contamination when caring for symptomatic <i>C. difficile</i> patients?			
•Gloves for symptomatic <i>C. difficile</i> patients			0.9502
Are symptomatic <i>C. difficile</i> patients isolated in this ward?			
•Yes, always in a single room	43.06	20.0	0.2869
•Yes, always in single rooms if available	29.37	50.0	0.3569
•Yes, contact isolation in shared rooms	18.65	20.0	0.9294
•No isolation measures	8.93	10.0	0.9161
Do you change the surface disinfectant to a sporocidal agent (e.g. chlorine-containing agent) for cleaning the environment of symptomatic <i>C. difficile</i> patients?			
•Yes, for every symptomatic patient	61.83	70.0	0.8039
•Yes, in case a cluster of symptomatic patients is detected	17.50	10.0	0.5679
•No, since sporocidal agents are used in our ward on a routine basis	17.50	10.0	0.5976
•No change	11.73	10.0	0.0340
Are there fixed order criteria for routine laboratory testing of <i>C. difficile</i> on your ward?			
•Patient with loose stool	28.29	20.0	0.2567
•Loose stool and concurrent antibiotic treatment	12.18	20.0	0.8481
•Loose stools within 72 hours upon admission	7.07	0.0	0.2446
•Other selection criteria	9.04	10.0	0.9239
•No laboratory testing	53.44	70.0	0.5817

surface disinfectant was switched to a sporicidal agent in 70% of the Polish and in 61.8% of the European wards. In the majority of Polish – 70% and European – 53.4% wards, there were no established criteria for routine laboratory testing confirming CDI (Table V).

Written recommendations for UTI prevention functioning in Polish wards were mainly (90%) based on current literature reports, while in Europe they mostly relied on national recommendations (84.0%). The declared reason for the introduction of these recommendations in Polish wards was primarily a desire to improve patient safety – 70% (in the European group – 64.%), statutory obligation in this context was indicated by 30% of Polish (17.0% of European) wards. Analogous proportions in the case of the introduction of procedures for the prevention of CD infections was identified by, respectively, 60% and 20% of Polish wards (for the entire group, the percentages were 55.5% and 31.8%).

Data on the consumption of alcohol-based handrub preparations were reported by 80% of Polish wards and the median of this value was 20% lower than in the whole group of European wards, and these values amounted to, respectively, 9.7 and 12.2 ml/ person-day.

DISCUSSION

The studied Polish medical treatment wards are wards of similar structure of size to the other ones studied in Europe, though at the average number of beds (median: 35), their relatively weak occupancy was found: below I quartile. A significant problem of the Polish ward can be the dramatically small number of single rooms (the median below I quartile), which is also confirmed by their percentage share, which is 0.8% in Poland, with the European quartile at 1.6%. These differences mainly stem from the level of (under) financing of the Polish health care. According to OECD figures from 2009, the Polish expenditure per capita amounted to about 1,394 USD, while the average is 3,233, and was the lowest (except for Estonia) in the whole European Union (10).

Still, this is a very worrying situation, because it was declared in the studied wards that the patients with CDI were placed in separate rooms if available, which, in view of the absence of single rooms, was almost infeasible in practice. This fact also explains why in the case of CDI, in the few investigated Polish wards, a single room was always used, while in Europe it was a procedure applied more than 2 times more often (20% vs. 43.1%). It was also disturbing that in the vast majority of the studied wards (70%), diagnostic tests for *Clostridium difficile* were not routinely performed in the indicated situations. However, in this case, the situation was not so much better in other European wards, in

which more than 50% of wards also lack such solutions. Each of the raised issues (single rooms, diagnostic and disinfection with sporicidal agent) is recognized as an important component in the prevention and surveillance of CDI (11, 12).

Nurse staffing in the studied wards (median) corresponds to the situation in other wards, however, our attention is drawn to a much lower proportion of nurses with little work experience (less than 3 years). This is definitely a troublesome situation as it may be associated with projected lack of nursing staff in the future. This problem affects not only the investigated medical treatment wards: in Poland, nurses with little work experience, i.e. aged under 35, accounted for only 15.5% of all employees in this position in 2009 (13), while in Greece they constituted 24.7% (14), and in Finland over 25% (15). Curiously, the average age of professionally active Polish nurses (44.2 years) (12), is identical to the one in, for instance, the USA where it amounts to 44.8 years (16).

Selected studied elements for the prevention of nosocomial infections, i.e. education of personnel on the indicated subjects was not deviate substantially from that applied in other European countries. The exception was hand hygiene, which was the subject of trainings two times less frequently (50% vs. 95.9%) in Polish hospitals, and additionally Polish staff less often made use of individual pocket/belt bottles or dispensers. The median of the consumption of alcohol-based handrub for hand hygiene in the wards which reported such data (50%) was also lower by one-fifth than that for the European wards (9.7 vs. 12.2 ml/ person-day). On the other hand, almost in each point of care there were dispensers with alcohol-based handrub, which, possibly, made individual dispensers unnecessary. This does not change the fact that proper hand hygiene, which is, among others, the effect of intensive training courses, remains one of the key elements of prophylaxis, therefore, education in this respect is absolutely imperative. The rank of this component of surveillance of infections is confirmed by numerous studies, the results of which are published in specialist literature, and a global education campaign coordinated by WHO and entitled “*Save lives. Clean your hands*” (17, 18, 19, 20). Intensive educational activities in the framework of this campaign have been conducted worldwide for over a decade, whereas in Poland for over a year. Individual Polish (compared with numerous global) studies on hand hygiene practices among medical staff of Polish hospitals indicate an extremely low percentage of compliance of practice with theoretical recommendations in this field. *Garus-Pakowska* conducted research on a group of 188 medical workers in six Polish hospitals which demonstrated compliance of hand hygiene practices with theoretical requirements in a fraction oscillating

only around 5% (21, 22). The proportion of compliance of hand hygiene practices with recommendations in the study by Garus-Pakowska is considerably lower even than the corresponding values reported by other authors for periods prior to the implementation of education campaigns and programs aimed at improving compliance with basic principles by medical personnel. *Seto et al.* observed the output proportion of HH practices compliance with the procedures at 41% and its growth in the five-year period of intensive educational activities to a level of 83% (23). *Tromp et al.* reported an increase in the average percentage of HH practices compliance with theoretical recommendations from 27% to 75% (24).

The implementation and employees' compliance with the concept of "my five moments of hand-hygiene" described by *Sax et al.* showed that hand hygiene and educational programs were related to a significant reduction in infection rates (25).

Surveillance of UTI in the analyzed study was described only in terms of selected, yet key, elements. And unfortunately, even though Polish wards generally keep written procedures on the prevention of UTI, in practice what draws our attention to them is the absence of preference for closed systems, which makes them differ significantly from other European wards (30% vs. 82.5%). It is an enormous problem since, although there are no scientific reports from Polish wards that would confirm the high risk of UTI in Polish medical patients, for a long time it has been believed that the closed system is one of the most important factors in UTI prophylaxis (26). Another crucial element in preventing UTI is to recommend the use of urinary catheters only in situations in which they are strictly indispensable and their removal as early as possible (27). For this purpose, it is essential to have a system for daily assessment of catheter necessity, the possession of which was declared only by half of the surveyed Polish wards. American experiences show that it is possible to achieve a reduction of up to 50% in the use of urinary catheters (3.3% reduction in a month) and in UTI associated with their use. The critical component of such initiative must be the nurse-directed catheter removal protocol (27, 28).

All Polish wards have recommendations regarding UTI, but it is worth noting that these documents had been developed in most of them on the basis of literature reports (90%), while in European wards they were primarily based on national instructions (84%). The primary reason for the introduction of recommendations in Polish wards was the desire to improve patient safety, which would indicate appreciation of the value of infection surveillance, but on the other hand, comprehensive infection control also refers to systematic recording of infections and analysis of epidemiological

data, including credible benchmarking with other units of similar characteristics.

Currently, in Poland, this component of infection control is a challenge for the future and its implementation and realization require increasing the awareness of both medical staff and the management of hospitals.

CONCLUSIONS

Presented analysis showed that the organization of health care in Polish hospitals in some respects is different from that in European hospitals.

Despite of many years of activity in the area of infection control in Poland, the scope of which is regulated by law, there is still a need for intensive staff education and management staff commitment in this area.

It seems that the thorough studies on the actual organization of infection control in health care Polish carried out on a larger sample of would be reasonable.

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