

EVALUATION OF NURSING STUDENTS' PREPARATION FOR THEIR FIRST CONTACT WITH THE PATIENT IN TERMS OF HAND HYGIENE

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ABSTRACT

Introduction: Proper hand hygiene is an essential skill which allows nursing staff to provide health services of good quality.

Aim of the study: The subject of the study was the knowledge of hand hygiene procedures among Polish students of nursing who were starting their internship in health care centers.

Material and methods: The study was carried out in June 2017 with the application of a self-designed questionnaire. A group of 322 nursing students who completed their first year of Bachelor of Arts (BA) studies participated in the research which was carried out in four medical schools providing education to nurses and situated in the south of Poland.

Results: As many as 22 of nursing students after their first year of vocational education could not correctly identify any moment of '5 moments for hand hygiene', 29 of students managed to name only one moment, 23 – three moments, 11 – four moments and only 3 succeeded in identifying all five moments. Only 32 of the respondents knew that HH should be performed before clean/aseptic procedures, 23 were aware that it should be performed before touching a patient and the same percentage saw such a need after touching a patient, 14 knew that HH was necessary after body fluid exposure and only 7 claimed hand hygiene should be performed after touching patient surroundings. The level of nursing students' knowledge varied between particular medical schools taking part in the study ($p < 0.001$). Only in 13 of cases students' knowledge of '5 moments for hand hygiene' was checked by an academic teacher before they started their first internship.

Conclusions: As far as '5 moments for hand hygiene' are concerned, deficient knowledge and skills were observed among nursing students during their first internship. The curriculum for the first year of nursing studies seems to be lacking in proper education towards prevention of healthcare-associated infections (HAIs) by means of hand hygiene procedures. What was also detected was a low level of academic nursing teachers' control concerning '5 moments for hand hygiene'.

Key words: hand hygiene, nursing students, healthcare-associated infections, 5 moments for hand hygiene.

INTRODUCTION

The incidence of healthcare-associated infections is strongly influenced by hand hygiene procedures. The prominent role of hand hygiene in healthcare-associated infections (HAI) prevention was proved in the 19th century by Ignatz Semmelweis, who pointed out a relationship between perinatal mortality and the medical staff's behaviour. But it was not until the second half of the 20th century that European Center

for Disease Prevention and Control (ECDC) produced first recommendations on hand hygiene in health care units. In 2002 Healthcare Infection Control Practices Advisory Committee (HICPAC) published guidelines recommending the application of hand disinfectants as a standard procedure during patient contact. In 2009 these guidelines were published by World Health Organization (WHO) in the form of recommendations [1].

One of the elements of the WHO campaign is the education of healthcare workers (HCWs), which is carried out in Poland as well. The basic knowledge of hand hygiene consists in employing the technique of Ayliffe hand hygiene also known as a 6-step technique and '5 Moments for hand hygiene', which refer to situations (moments) in which performing hand hygiene procedures during the patient contact is recommended [1-3]. However, '5 moments for hand hygiene' recommendations are not always followed and it is estimated that hand hygiene needs are met only in 40 [4]. The research conducted in 19 countries with limited resources (including Poland) showed that the compliance with hand hygiene recommendations ranges from 48 to 71 [5].

In Poland the system of infection control has a short, only 25-year, history and the efficiency of this system is still far from being perfect [6]. One of the most common problems of this system is a low level of knowledge and skills in the area of hand hygiene [7-9]. The factors which influence the quality of hand hygiene include inefficiency of educational programs and marginalizing this issue in the curriculums of various medical studies [10-12].

In Poland nursing education has an academic character and consists of 3-year BA studies ending with a nursing diploma. Hand hygiene is taught during the first four classes of the course called 'the rudiments of nursing', on which mainly the Ayliffe technique is taught and the efficiency of learning is not tested. It is possible to combine the theory with practice on the 'hospital infections' course, which is a part of 'rudiments of nursing care' bloc, however, it is an optional course. Therefore, only some students (those who have chosen the course) are trained in these skills. Although Polish legal acts defining the standards of education for nurses require that nurses should learn the skills which allow them to ensure proper standards of behaviour within HAI prevention [13] it is difficult to say to what extent a student who has not been trained on a proper course has acquired these skills and what they include. An academic teacher's knowledge, skills and awareness concerning HAI prevention determine obtaining (or not obtaining) required educational results. It seems that knowledge and skills concerning hand hygiene procedures should be emphasised during nursing workshops in order to eliminate the differences in these skills between various students. First year nursing students before their first internship are likely to lack knowledge and skills as far as HAI prevention, including hand hygiene, is concerned.

The objective of the study was to evaluate the level of knowledge concerning '5 moments for hand hygiene' among first year nursing students before they started their first internship in health care centres (that is before their first unassisted internship).

MATERIAL AND METHODS

The study was carried out by means of a diagnostic survey at the end of the academic year (in June and July 2017) in four medical schools providing education to nurses and situated in the south of Poland. A group of 322 nursing students who completed their first year of BA studies participated in the research. The study was carried out with the application of a self-designed questionnaire. The nursing students were interviewed on the day they started their internship, that is, after their first year of vocational training.

The basic evaluation criteria included the awareness of '5 moments for hand hygiene': (moment 1) before touching a patient, (moment 2) before clean/aseptic procedures, (moment 3) after body fluid exposure, (moment 4) after touching a patient, (moment 5) after touching patient surroundings [1-3].

The question: 'When should 5 moments for hand hygiene be performed?' was an open question in which respondents could give more than 5 answers. Then the answers were analysed taking into account the number of moments for hand hygiene which the respondent could point out. A further analysis took into account the answers which could meet the criteria of '5 moments for hand hygiene' (multiple response analysis). Other responses to the question, those which were not qualified as '5 moments for hand hygiene', were also analysed statistically (multiple response analysis). The next questions referred to academic teachers' control over their students' abilities to apply hand hygiene Ayliffe technique and '5 moments for hand hygiene'. The students were asked the following questions: 'Has your medical school teacher ever inspected your Ayliffe hand hygiene technique?' and 'Has your medical school teacher ever inspected your 5 moments for hand hygiene?' These were yes/no questions, in which 'yes' meant the teacher's control and 'no' – lack of control.

In the statistical analysis of the research findings the following software was applied IBM SPSS (Statistical Package for the Social Sciences – SPSS) STATISTICS 24, Armonk, NY, USA and Microsoft Excel Microsoft Office 2016 Redmond, WA, USA. The outcome of the statistical analysis included data expressed in figures and percentages. Open questions were analysed taking into account multiple responses. Pearson's χ^2 test of independence (p) was used to compare the frequency of incidence of quality variables in the groups examined. The significance level was assumed as $p < 0.05$.

The study was carried out under ethical recommendations stated in the Helsinki Declaration and participation in the study was voluntary and anonymous. Students were allowed to discontinue the research at any time and the research results did not influence students' further nursing education.

RESULTS

As many as 21.7 ($n = 70$) of the first BA year nursing students could not correctly identify any of '5 Moments for Hand Hygiene', 28.6 ($n = 92$) of them identified only one moment, 23.0 ($n = 74$) – two moments, 12.7 ($n = 41$) – three moments, 10.6 ($n = 34$) – four moments and only 3.4 ($n = 11$) succeeded in identifying all five moments. Statistically significant differences in the level of students' knowledge about '5 moments for hand hygiene' were found between particular medical schools ($dc < 0.001$) (Table 1).

Only 31.6 ($n = 175$) of the nursing students knew that hand hygiene should be performed before clean/aseptic procedures, 23.8 ($n = 132$) – after touching a patient, 23.6 ($n = 131$) – before touching a patient, 14.4 ($n = 80$) – after body fluid exposure and only 6.5 ($n = 36$) of the students were aware that hand hygiene should be performed after touching patient surroundings (Table 2).

The situation was different as far as the control over Ayliffe hand hygiene was concerned. As many as 73.5 ($n = 228$) of the nursing students had their hand hygiene technique inspected and only 26.4 ($n = 82$) did not have such a control. Statistically significant differences were detected in this form of control between particular medical schools providing education to nurses ($p < 0.001$) (Table 3).

While asked to identify '5 moments for hand hygiene' nursing students pointed out various situations, which they considered appropriate for hand hygiene. Frequently their answers included sanitary indications for hand hygiene such as washing hands before starting work 22.9 ($n = 110$) and after finishing work 19.5 ($n = 94$) as well as after leaving the toilet 9.4 ($n = 45$). They also gave examples of situations, such as after removing diagnostic gloves 16.4 ($n = 79$) and before putting them on 6.2 ($n = 30$), which are considered crucial in providing proper care to a patient but which are not specified in '5 moments for hand hygiene' (Table 4).

Table 1. The frequency of performing particular 5 moments for hand hygiene among students of 4 medical schools

5 moments for hand hygiene	Medical school 1	Medical school 2	Medical school 3	Medical school 4	Total
Indicating 0 out of 5 moments for HH	8 (8.5)	16 (22.9)	28 (23.1)	18 (48.6)	70 (21.7)
Indicating 1 out of 5 moments for HH	14 (14.9)	27 (38.6)	42 (34.7)	9 (24.3)	92 (28.6)
Indicating 2 out of 5 moments for HH	17 (18.1)	16 (22.9)	34 (28.1)	7 (18.9)	74 (23.0)
Indicating 3 out of 5 moments for HH	16 (17.0)	10 (14.3)	12 (9.9)	3 (8.1)	41 (12.7)
Indicating 4 out of 5 moments for HH	28 (29.8)	1 (1.4)	5 (4.1)	0 (0.0)	34 (10.6)
Indicating 5 out of 5 moments for HH	11 (11.9)	0 (0.0)	0 (0.0)	1 (0.0)	11 (3.4)
Total	94 (100)	70 (100)	121 (100)	37 (100)	322 (100)

HH – hand hygiene; Pearson's χ^2 ($p < 0.001$), R Pearson (-0.455)

Table 2. Students' opinion on the necessity to perform hand hygiene procedures in particular situations connected with patient's care

Situation	N = 332	Medical school 1	Medical school 2	Medical school 3	Medical school 4	Total
Before patient contact	N/	58 (44.3)	29 (22.1)	36 (27.5)	8 (6.1)	131 (100.0)
	of all responses (n)	10.5	5.2	6.5	1.4	23.6
Before clean/aseptic procedures	N/	63 (36.0)	36 (20.6)	61 (34.9)	15 (8.6)	175 (100.0)
	of all responses (n)	11.4	6.5	11.0	2.7	31.6
After body fluid exposure risk	N/	54 (67.5)	6 (7.5)	17 (21.3)	3 (3.8)	80 (100.0)
	of all responses (n)	9.7	1.1	3.1	0.5	14.4
After patient contact	N/	58 (43.9)	21 (15.9)	47 (35.60)	6 (4.5)	132 (100.0)
	of all responses (n)	10.5	3.8	8.5	1.1	23.8
After contact with patient surroundings	N/	30 (83.3)	1 (2.8)	5 (13.9)	0 (0.0)	36 (100.0)
	of all responses (n)	5.4	0.2	0.9	0.0	6.5
Total	N/	263	93	166	32	554
	of all responses (n)	47.5	16.8	30.0	5.8	100.0

* Percentage and total values are based on the responses, number of responses ($N = 554$), number of respondents ($n = 332$)

DISCUSSION

Thanks to the study its authors were given answers to some burning questions about reluctance in obeying the rules of '5 moments for hand hygiene'

Table 3. Students' opinion on the frequency of teachers' control over their students' hand hygiene

Medical school	Has your academic teacher ever inspected your 'HH Ayliffe technique'?		Has your academic teacher ever inspected your 'HH Ayliffe technique'?	
	yes	no	yes	no
	N (%)	N (%)	N (%)	N (%)
Medical school 1	73 (89.0)	9 (10.9)	15 (19.5)	62 (80.5)
Medical school 2	33 (47.1)	37 (52.8)	13 (18.6)	57 (81.4)
Medical school 3	90 (74.3)	31 (25.6)	5 (4.1)	116 (95.9)
Medical school 4	32 (86.4)	5 (13.5)	8 (21.6)	29 (78.4)
Total	228 (73.5)	82 (26.4)	41 (13.4)	264 (86.6)
	No response (n = 12)		No response (n = 17)	
	Pearson's $\chi^2 p < 0.001$		Pearson's $\chi^2 p < 0.01$	

Hand hygiene (HH), Pearson's χ^2 ($p < 0.001$), R Pearson (-0.455)

Table 4. Students' opinion on the necessity to perform hand hygiene procedures in particular situations

Situations requiring hand hygiene procedures	N	Percentage (%)	Percentage of observation (%)
Before starting work	110	22.9	48.9
After leaving work	94	19.5	41.8
After removing gloves	79	16.4	35.1
After leaving the toilet	45	9.4	20.0
Before giving an injection	36	7.5	16.0
Before administering medicines	30	6.2	13.3
Before putting on gloves	30	6.2	13.3
Before feeding the patient	14	2.9	6.2
Before taking a blood sample	13	2.7	5.8
Before catheterizing	9	1.9	4.0
While changing the dressing	8	1.7	3.6
After using a tissue	7	1.5	3.1
After contact with dirty equipment	6	1.2	2.7
Total	481	100.0	213.8

among first year nursing students. The study also contributed to broadening the knowledge about the background of the examined phenomenon. Although hand hygiene has an established status of a basic tool in HAI prevention, numerous scientific publications point out the shortage of knowledge in this area [1, 5, 14-17]. The meta-analysis carried out by Labrague *et al.* proved low awareness and compliance with hand hygiene rules among nursing students [18].

As many as 22 of the students participating in the study could not identify any situation defined as '5 moments for hand hygiene'. Such high percentage of hand hygiene ignorance may mean substantial deficiencies in teaching hand hygiene skills. Other researches into medical students' hand hygiene knowledge and skills which were carried out in Poland confirm the observations of the authors of this study [10-12].

Following a detailed analysis of '5 moments for hand hygiene' carried out by the authors, it was observed that the percentage of correct answers was very low ranging from 32 for 'before clean/aseptic procedures' moment to only 7 for 'after touching patient surroundings' moment. In a similar study conducted by Kingston *et al.* among Irish nursing students the percentage of correct answers was definitely higher ranging from 99,8 for 'before clean/aseptic procedures' moment to 61 for 'after touching patient surroundings' moment [19]. Another study based on the compliance with '5 moments for hand hygiene' rules presented average results of 85 [20]. The comparison of the results of these two studies with the results of our study leads to a conclusion that the first year nursing students' hand hygiene skills are not properly developed. It might be caused by the fact that medical schools do not specify on which course hand hygiene should be taught and current educational standards do not define these skills as obligatory ones for the first degree of university education (BA).

The study showed that very few teachers controlled their students' hand hygiene technical skills and the frequency of these procedures. In our study only 13 of nursing students declared that their knowledge of '5 moments for hand hygiene' had been inspected. Checking students' level of knowledge and skills seems to be a duty of an academic teacher within the taught subject. This duty includes also increasing the importance of hand hygiene by frequent inspections of students' skills on this level of education and, subsequently, by improving (controlling) these skills on the next levels of education (mainly during students' internship). However, according to our study, only a small percentage of academic teachers controlled their students' hand hygiene skills. Numerous studies proved that control in this area brings positive

results [15, 21, 22]. Some publications emphasise also the importance of socialisation process, in which the leading role is played by an academic teacher and which helps to turn knowledge into practical skills [18, 23]. From another point of view Huis *et al.* emphasise that knowledge, awareness and control are not enough to change hand hygiene habits and it is important to reinforce them with a positive social attitude of medical staff [24]. Medical schools and hospitals should be perceived as partners in the process of socialisation and consolidation of knowledge, skills and positive attitude of nursing students and their cooperation is essential for producing proper educational effects. The attitude of healthcare workers towards hand hygiene might influence nursing students' behaviour in this respect. As it is shown by Kingston *et al.* healthcare workers should be positive role models for nursing students, which will ensure the continuity of the process of professional socialisation, develop students' skills and strengthen their positive habits [25]. According to Battistella *et al.* hand hygiene is a ritual behaviour driven by deep and subconscious patterns and, therefore, developing professional hand hygiene habits at an early stage of professional socialisation of nurses might be a key factor ensuring the conformity between these processes and the requirements [26]. It is essential to ensure conformity and continuity between acquired knowledge and clinical practice in the place of the internship. Internship supervisors (nurses) should be aware of their influence on the results of the process of education and encourage nursing students to follow appropriate hand hygiene procedures but also they should possess thorough knowledge and awareness of hand hygiene importance. The positive influence of nurses who run the internship is emphasised in publications [18, 20, 23]. However, a negative result of such a process of education might be the lack of positive feedback because HAI control in Poland has a relatively short history. For many years healthcare-associated infections were considered a taboo subject in Poland as they did not fit into the former political system and, therefore, they were kept hidden [6]. Only after the transformation of the system in 1989, there appeared proper conditions for progress in this area. Supposedly, some of the internship supervisors belong to the group of nurses who were educated in the pre-transformation period and their hand hygiene habits were not sufficiently internalised and they do not consider these procedures particularly important because the curriculums for nursing students in those times did not include the elements of HAI prevention. Unfortunately, no research into this area from that period is available in Poland, which might confirm the aforementioned speculations about lack of hand hygiene knowledge

among nurses who formerly developed bad hygiene habits. Therefore, nowadays in Poland internship supervisors (nurses) cannot be relied on as far as a positive reinforcement of hand hygiene procedures is concerned. Aforementioned lack of knowledge and proper hygiene habits might have a negative effect on the whole process of nursing students' education. An essential aspect of the study is the conclusion that at the beginning of their education nursing students are not provided with sufficient knowledge about hand hygiene. Such lack of knowledge and not developing proper habits in this area might account for further mistakes on the next level of education and, consequently, for perpetuating improper behaviour. This phenomenon seems particularly dangerous because numerous studies point out that professionally active medical staff in Poland does not undertake proper actions in this area and it is common for both doctors and nurses to have developed bad hygiene habits, which are hard to eradicate by education, staff training or prevention programs [9, 11, 27-28]. It seems that thorough knowledge provided to first year nursing students and reinforced by academic teachers can lead to increasing students' confidence in their decisions concerning hand hygiene especially when they are confronted with medical environment.

In our study a significant number of nursing students declared that they perform hand hygiene procedures in the situations which they consider appropriate for this action. However, they were not the situations defined as '5 moments for hand hygiene' and they included the moment before starting and after finishing work as well as after using the toilet. The findings of the study prove the existence of deeply rooted social influence on hand hygiene habits and might indicate insufficient promotion of hand hygiene procedures on the level of vocational education. Similar results were obtained by Battistella *et al.* in whose study hand hygiene procedures were introduced by nurses as a response to unconscious perception of 'dirt' usually before starting work [26]. This situation might also mean that hand hygiene as a professional skill required during any contact with the patient is perceived as a matter of low importance.

Therefore, the process of nursing education and socialisation may have an impact on nursing students' behaviour as far as hand hygiene rules are concerned. Academic teachers' involvement and their emphasising the importance of hand hygiene procedures at the early stage of education may raise the awareness of nursing students as far as HAI prevention is concerned. In Poland few studies aimed to identify the factors responsible for the level of nurses' knowledge and their compliance with hand hy-

giene procedures. The authors of this study believe that some improvement in this area can be achieved by means of changing curriculums for the first year of nursing studies. It can be observed as well that teaching nursing in Poland is based on old publications, in which the importance of hand hygiene is not emphasised. It must be admitted that this situation is slowly changing in newer versions of course books, however, it will take some time before the effects of this change become visible. In conclusion, the authors point out the necessity to introduce some changes in the process of education in the first year of nursing studies in order to emphasise the crucial importance of hand hygiene in HAI prevention.

CONCLUSIONS

1. Nursing students have a deficit of knowledge of '5 moments for hand hygiene'.
2. Hand hygiene is not sufficiently established in the curriculum for the first year of nursing studies.
3. Academic nursing teachers presented a low level of control over their students' performing '5 moments for hand hygiene' procedures.
4. First year nursing students display a strong tendency to follow socially accepted rules concerning hand hygiene.
5. Socially accepted rules concerning hand hygiene, which are deeply rooted in social conscience, and low awareness of medical recommendations do not help to build up professionalism in the nursing profession.

Disclosure

The authors declare no conflict of interest.

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