

MEDICAL SCIENCES

IMPLEMENTATION OF WHO HAND HYGIENE IMPROVEMENT STRATEGY IN TRNAVA UNIVERSITY HOSPITAL, SLOVAKIA

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Abstract. Hand hygiene is considered to be the most simple, effective and economic measure to prevent the spread of healthcare-associated infections and antimicrobial resistance. Based on the study, application of the World Health Organization's Multimodal Hand Hygiene Improvement Strategy can improve hand hygiene compliance in hospital settings and reduce these infections. Trnava University Hospital was included to World Health Organization (WHO) launched a worldwide campaign focused on hand hygiene in 2013, when infection control specialist has started working on daily basis. Our objective was to evaluate the impact of implementing the Multimodal Hand Hygiene Strategy according to WHO. We assessed alcohol-based hand rub consumption during the period 2013 and 2018 and hand hygiene compliance in 2018 as a baseline. During observed period alcohol-based hand rub consumptions significantly increased from 15.7 L/1000 patient days to 24.3 L/1000 patient days ($p < 0.05$). Overall compliance as per WHO guidelines were 38.9%.

Keywords: hand hygiene, multimodal strategy, compliance, alcohol-based hand rub consumption, healthcare-associated infections, antimicrobial resistance.

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Introduction

Healthcare-associated infections (HAIs) are infections that patients acquire while receiving health care and are the most frequent adverse event in health-care delivery worldwide. The dramatic increase of antimicrobial resistance (AMR) worldwide is associated with complications to treat HAIs as a failure of treatment or deaths (*Kritsotakis et al., 2017*). Approximately 4 131 000 patients are affected by app. 4544 100 episodes of HCAI in Europe each year. According to the European Centre for Disease Prevention and Control prevalence of HAIs was 7.1% in European countries and 4.5% in the United States of America (*WHO, 2011*). Based on European point prevalence surveys in acute care hospitals, the prevalence of

patients with at least one healthcare-associated infection varied between 4.4% to 7.1% in European Union and the European Economic Area (*Suetens et al., 2018*). Slovakia was a part of this study with an estimated prevalence of 5.5% (*Štefkovičová et al., 2019*). Consequences of healthcare-associated infection include increased morbidity, mortality, expenditure and a high financial burden (*WHO, 2013*).

Most healthcare-associated infections and antimicrobial resistance are spread by direct contact, especially by cross-contamination by the hands of healthcare workers. Several studies demonstrate that proper hand hygiene is the single most important and least expensive means of reducing HAIs and the spread of AMR. Microorganisms from the hands of healthcare workers are removed by using alcohol-based hand rub more effectively, saves time and the hand irritation is found just sparsely in comparison with handwashing with regular soap or other antiseptic agents and water (*Gould et al., 2017*). However, maintaining high compliance is a challenge. In 2002 the guidelines of Centers for Disease Control and Prevention Hand Hygiene were published and the overall hand hygiene compliance among 34 studies varied from 5% -81%, with average compliance of only 40% (*Sickbert-Bennet et al., 2016*).

In accordance to the first Global Patient Safety Challenge, the WHO published instructions including guidelines on hand hygiene in healthcare, implementation of the WHO Multimodal Hand Hygiene Improvement Strategy, and technical hand hygiene reference manual. The main objective of these guidelines is to improve hand hygiene practices worldwide. To fulfil this objective, a successful implementation and dissemination strategy is required to ensure that healthcare workers are aware of the guidelines and their use. The key components of the strategy are system change, training/education, evaluation and feedback, reminders in the workplace institutional safety climate (*WHO, 2009*). Change the infrastructure or distribution of educational posters or punctual health education is not enough to increase hand hygiene compliance. The planning and execution of Multimodal strategy is a very important element sustainability such as the involvement and commitment of management with security actions, individual and collective feedback and active education (*Valim et al., 2019*).

Based on a lack of hand hygiene observation and alcohol hand-rub consumptions (AHRs) in Slovakia, we implemented the WHO Multimodal hand hygiene Strategy in Trnava University Hospital to assess these indicators which are not yet mandatory in Slovakia.

Methods

Study setting

An observation study was conducted in Trnava University Hospital in Slovakia from January 2018 to December 2018. Trnava University Hospital is a 638-bed facility and it is the largest provider of health care for 559 697 inhabitants in the region. The hospital consists of 18 departments which are located in separate buildings. Every year is hospitalized here app. 25 000 patients, it means 160 000 patient days. The incidence of HAIs based on active surveillance was 6.5 in 2018.

Intervention

Trnava University Hospital is participating in the WHO Hand Hygiene campaign since 2013 when WHO Multimodal Hand Hygiene Improvement Strategy has started. Interventions

were adopted to meet local needs and available resources. The multimodal intervention included system change, education/training, evaluation, monitoring and feedback, reminders in the workplace, institutional security environment.

The main components of the change were infrastructure. New disinfection program was established, and new alcohol dispensers were strategically distributed to all departments of the hospital, inside the patient room and outside of the patient room in the corridor. We have placed posters and signs for healthcare workers and visitors on visible places to remind them to use alcohol disinfections. When conditions for hand hygiene were completed, education activities of healthcare workers have started and each employer (1000 healthcare workers) was educated about hand hygiene. We provide education activity every year and for every new employee. In 2015, new hand hygiene national decrees was implemented in Slovak legislative, 192/2015 Hand hygiene procedures in health care settings, and it brought us support from the director and management of the hospital. In 2017 Department of Hospital Hygiene and Epidemiology was established and we enriched by the other infection control practitioners. Based on a personal capacity, we have started to observe hand hygiene compliance and gave regular feedback to healthcare workers and leaders since 2018.

Data collection

Direct observation is considered to be the gold standard in hand hygiene compliance monitoring. Hand hygiene compliance data were collected using standardized WHO hand hygiene observation tool for direct observation, with validated observers. Observers were trained by an infection control professional about the concept of the “5 Moments for Hand Hygiene” and to check the understanding of these concepts by the observers, we used videos and other WHO tools, available free on WHO Web site. The healthcare workers were unaware of being observed and observation time was limited to 30 minutes to minimize the “Hawthorne effect”. The timings of the observation sessions were randomly distributed throughout the day.

We observed five healthcare workers groups: physicians, nurses, physiotherapeutic, students (nurse students) and nursing assistants. Healthcare workers (HCWs) were observed during recommended hand hygiene opportunities: 1) hand hygiene before touching a patient, 2) hand hygiene before clean/aseptic procedures, 3) hand hygiene after body fluid exposure risk, 4) hand hygiene after touching a patient, 5) hand hygiene after touching patient surroundings (Table 1).

Table 1

5 moments of hand hygiene defined by WHO (WHO, 2009)

Before patient contact:	shaking hands, helping a patient to move, taking the pulse, blood pressure
Before clean/aseptic procedures:	oral/dental care, skin lesion care, catheter insertion, subcutaneous infection
After body fluid exposure risk:	wound dressing, drawing and manipulation any fluid sample, cleaning up urines, faces, vomit
After touching a patient:	getting washed, chest auscultation, abdominal palpation
After touching patient surroundings:	changing bed linen, perfusion speed adjustment, monitoring alarm, holding bed rail

Observations were performed at 6 ICU and 11 non-ICU departments. Alcohol-based hand rub procedures were defined using official definitions: hand rub is applying an aseptic hand rub to reduce or inhibit the growth of microorganisms. We also observed handwashing, which was defined as washing hands with plain, non-antimicrobial, soap and water (Boyce, Pittet, 2009).

According to the WHO alcohol-based hand rub consumption at the point of care is defined as AHRs at the place where the patient, the healthcare worker, and care or treatment come together, and at which AHRs should be easily accessible. WHO objective of AHR's is 25 L per 1000 patient-days (WHO, 2009). Data of AHRs consumption was analysed retrospectively from January 2013 to December 2017 and prospectively from January 2018 to December 2018. The total volume of product (alcohol disinfection) used in milliliters have been calculated using data on acute bed-days. The number of bed-days used includes acute beds and does not include day care beds. The volume of the product was measured by storing empty dispenser bags in a box that was collected regularly.

Measurement

Hand hygiene compliance is calculated by dividing the number of observed hand hygiene opportunities where proper hand hygiene was practiced, by the total number of observed hand hygiene opportunities, and multiplying by 100.

Alcohol-based hand rubs (AHRs) consumption is a valuable surrogate parameter for hand hygiene performance, and it can be easily tracked in the healthcare setting. The total volumes of AHR used (liters/1,000 patient-days) were determined. We provided retrospective data on AHR consumption from 2013 to 2018. Data were analyzed descriptively from pharmacy data in all wards.

The number of disinfection moment per patient day (DMPPD) was calculated as an alcohol-based hand rub consumption/ volume per application. The volume of AHR per disinfection moment was set at 3.0 ml pre use.

Statistical analysis

The analysis was performed with Microsoft Excel and R project version 3.6.1. For compliance, a 95% confidence interval (CI) was calculated. Compliance rates for the different professional categories, and for different hand hygiene indications were compared using the Chi-squared test. Differences between disinfection moment per patient day during the study period were compared using the Kruskal-Wallis test.

Results

Alcohol-based hand rub consumption

The use of alcohol-based hand rubs is the reference standard for effective hand hygiene. Overall AHRs in Trnava University Hospital was growing continually through 6 years from 15.7 L per 1000 patient-days in 2013 to 24.3 L per 1000 patient-days in 2018. In comparing with AHRs include only beds departments, AHRs increased from 7.8 L per 1000 patient-days to 17.3 L per 1000 patient-days (Fig. 1.)

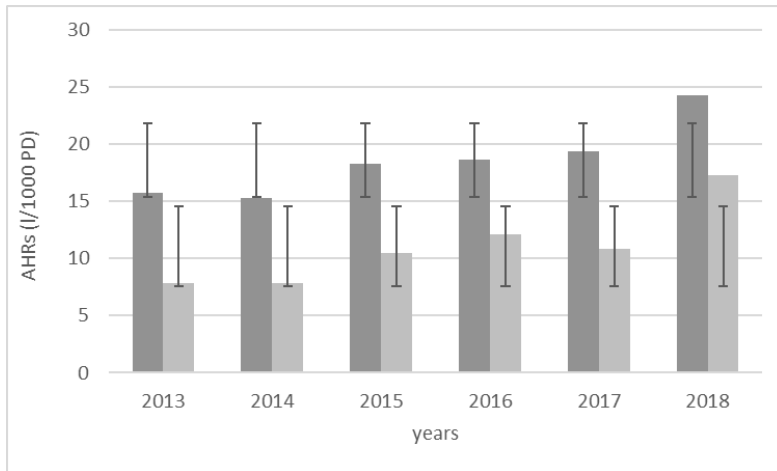


Figure 1. Trend of alcohol hand-rub consumption in period 2013-2018

To get more insight into the consumption of alcohol-based hand rub in FH Trnava, we have calculated the number of disinfection moment per patient day (DMPPD). DMPPD substantially increased from 2.6 to 5.8 (HCW performed hand hygiene 2.6 times in 1 patient per 1 patient day in 2013 and at the end of the study period 5.8). The median of DMPPD in 2013 was 2.4 and at the end of study period 6.1. The highest number of DMPPD was found in ICU, 3.8 in 2013 to 10.6 times in 1 patient per 1 patient day in 2018 (Fig. 2.)

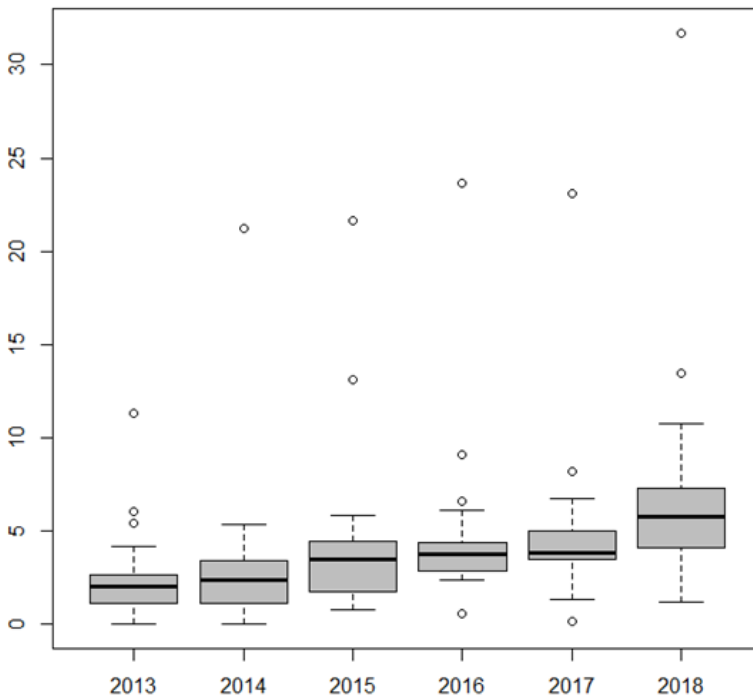


Figure 2. The number of disinfection moment per patient day in period 2013-2018

Hand hygiene compliance

During the 12-months study period, there were a total of 166 931 patient-days. There were 3409 opportunities for hand hygiene assessed by direct observation in 6 healthcare workers group. Among these, 52% (1949) were nurses, 16% (555) were physicians, 16% (536) were students, 6% (219) nursing assistance and 4% (153) of observation included physiotherapeutic. Considering the overall results, we found that compliance rates with hand hygiene were 38.9% (95% CI: 37.2 – 40.5). Nursing assistants had the lowest rate of compliance at 14.6% (95% CI: 9.9-19.3), while students, especially nurse students, had the highest rate of compliance 46.3% (95% CI: 42.6-50.5) follow physicians with compliance rate 43.8% (95% CI: 39.6-48.0). We have found significantly different hand hygiene compliance among HCWs ($p < 0.05$). From 3409 observations 366 handwashing performance were recorded. The highest handwashing performance were among nursing assistants, 15.1% (95% CI: 10.3-18.1) and the lowest rate was seen in students, 6.9% (95% CI: 4.6-8.9), $p < 0.05$ (Table 2).

Table 2

Hand hygiene and handwashing compliance among healthcare workers

	Number of observations	AHRs	Compliance %	Washing hands	Compliance %
nurses	1 946	771	39.6%	234	12.0%
students	555	257	46.3%	38	6.9%
physicians	536	235	43.8%	39	7.3%
nursing assistant	219	32	14.6%	33	15.1%
physiotherapeutic	153	30	19.6%	22	14.4%
OVERALL	3409	1325	38.9%	366	10.7%

Maximum compliance was seen after touching patient surroundings (53.6%; 95% CI: 49.7 – 57.6) and after body fluid exposure risk (49.7%; 95% CI: 44.2 – 55.2), that was perceived important for self-protection. The lowest compliance of hand hygiene of HCWs was seen before clean/aseptic procedures, only 18.4% (95% CI: 15.0-21.8). Trust in water and soap of HCWs we can see in moment 3, after body fluid exposure risk. HCWs still prefer washing hands instead of using AHRs and the highest number of handwashing performance with soap and water was seen after body fluid exposure risk, 28.9% (95% CI: 24.0 – 33.9) when the compliance hand hygiene was found to be the lowest (Table 3).

Hand hygiene compliance of healthcare workers varied depending on the WHO indication. Nurses had the highest compliance after touching patient surroundings (59.0; 95% CI: 53.9-67.0). The leaders in hand hygiene compliance were students in 3rd moment, after body fluid exposure risk (82.2%; 95% CI: 71.1-93.4). Compliance of hand hygiene in doctors was highest also after body fluid exposure risk (70.2%; 95% CI: 53.6-86.4). Nursing assistants and physiotherapeutic had the highest hand hygiene compliance after touching patient surroundings (21.3%; 95% CI: 9.6-32.9 and 33.3%; 95% CI: 20.0-86.7). In healthcare group physiotherapeutic we did not note any observation before and after body fluid exposure risk.

Table 3

Hand hygiene and handwashing compliance based on “5 moments” according to WHO guideline

	Number of observations	AHRs	Compliance %	Washing hands	Compliance %
1.before patient contact	1090	326	29.9%	37	3.4%
2.before clean/aseptic procedures	500	92	18.4%	16	3.2%
3.after body fluid exposure risk	318	158	49.7%	92	28.9%
4.after touching a patient	899	426	47.4%	160	17.8%
5.after touching patient surroundings	602	323	53.7%	61	10.1%
OVERALL	3409	1325	38.8%	366	10.7%

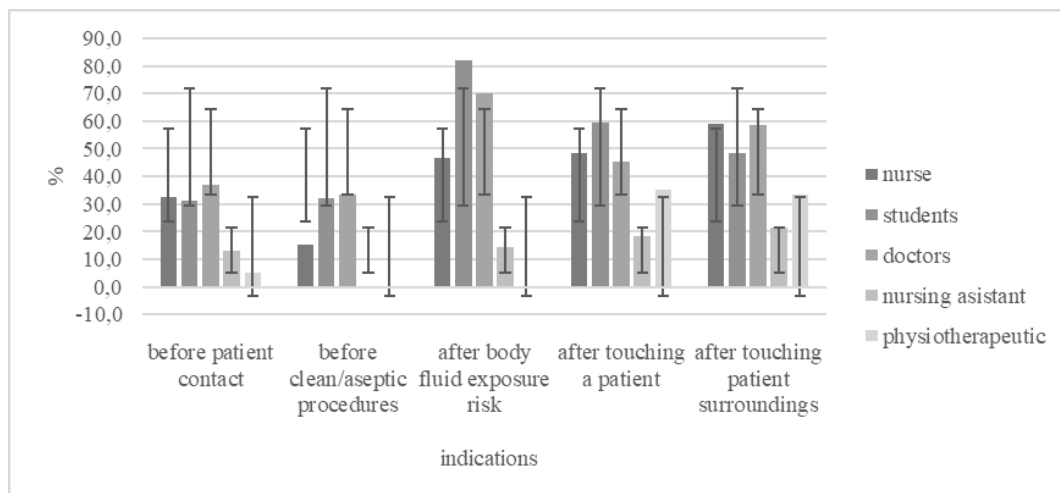


Figure 3. Hand hygiene compliance among healthcare workers and indications

Conclusion

Implementation of the Hand Hygiene program at Trnava University Hospital is a very important component of prevention HAIs and AMR in our hospital settings. This study demonstrates success in AHRs following WHO guidelines, but compliance hand hygiene was found to be very low at the baseline. Median of DMPPD in the study period increased from 2.4 to 6.1 moment in 1 patient per 1 patient day. Results of our study show that the highest number handwashing process with water and soap is among nursing assistant, whose using of alcohol-based had rub was found to be the lowest.

Collect consumption data of alcohol-based hand rub consumption and information about the number of disinfection moment per patient day can gain objective hand hygiene

information. Standardized direct observation of hand hygiene compliance is essential tool to monitor healthcare workers as it can identify areas of strengths and weaknesses in hand hygiene behavior (Ryan *et al*, 2012). In our hospital, we observed disappointing levels of hand hygiene compliance and identified several risk factors for non-compliance such as lack of knowledge, lack of healthcare workers, distrust in alcohol products and skin irritation. The biggest challenge in Trnava University Hospital is the lack of HCWs and the change of behavior.

Significant improvement in compliance with hand hygiene can be achieved through a systemic, Multidimensional Intervention approach involving all categories of healthcare workers, which may result in a decrease of the healthcare-associated infections and antimicrobial resistance. Based on the results of hand hygiene compliance, we need to continue with activities, provide systematic education, monitoring, feedback and do active communications and identify risk areas.

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