Original Article

Assessment of hand hygiene procedures during the pre- and post-pandemic period: a pre-post study

Valutazione delle procedure dell'igiene delle mani durante il periodo pre- e post-pandemico: uno studio pre-post

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Key words: hand hygiene, assessment, microbial transmission, disease, pandemic period.

ABSTRACT

Background: hospital infections affect about 6% of hospitalised patients in Europe; the hands of healthcare workers, who are front-line staff and frequently exposed to infected patients and contaminated surfaces, are the primary source of microbial transmission. Thus, hand washing procedures are essential to lowering the risk of occupational exposure to infectious diseases, hospital-acquired infections, and micro-organism cross-transmission. The aim of this study was to see if the COVID-19 pandemic had any effect on hand-washing adherence rates by conducting a pre-post pandemic wave study from the pre-pandemic year 2019 to the post-pandemic years 2020/2022.
Methods: an observational, retrospective, single-center study. The study considers hand hygiene observations of all personnel employed as healthcare staff from 2019, during the pre-pandemic period, and in the three years following the outbreak from 2020 to 2022, during the post-pandemic period and a specific study on hydroalcoholic gel consumption. The study will use the "Hand Hygiene Observation Form", to evaluate adherence to best practices.
Conclusions: a dedicated facility that promotes the application of the recommended hand hygiene behavior and ongoing improvement and training initiatives, is crucial to ensure and improve the compliance of all healthcare workers.

Background: le infezioni nosocomiali colpiscono in media il 6% dei pazienti ospedalizzati in Europa; la fonte primaria di diffusione patogena è riconducibile alle mani contaminate degli operatori sanitari, personale di prima linea e quindi frequentemente esposto a pazienti infetti e superfici contaminate; inoltre, l'uso sempre più frequente dei dispositivi digitali, ha moltiplicato le opportunità di contatto tra le mani e l'ambiente. Le pratiche di igiene delle mani sono fondamentali per ridurre la trasmissione crociata dei microrganismi, le infezioni acquisite in ospedale, e, il rischio di esposizione professionale a malattie infettive. L'obiettivo di questo studio è stato quello di verificare se la percentuale di aderenza al lavaggio delle mani sia stata influenzata dalla pandemia di COVID-19, attraverso uno studio pre-post ondate pandemiche, rispettivamente negli anni 2019 e nel triennio 2020/2022.
Metodi: uno studio osservazionale, retrospettivo, monocentrico. Lo studio prende in considerazione le osservazioni sull'igiene delle mani di tutti i dipendenti appartenenti al profilo sanitario raccolte nel 2019 (pre-pandemia) e nel triennio 2020-2022 (post-pandemia) e un'indagine specifica sul consumo del gel idroalcolico. Lo studio si avvale del "Hand Hygiene Observation Form" per valutare l'aderenza alle migliori pratiche.
Conclusioni: la presenza di una struttura dedicata che promuove l'esecuzione del comportamento raccomandato per l'igiene delle mani e le iniziative di miglioramento e formazione continua sono cruciali per garantire e migliorarne l'aderenza di tutto il personale sanitario operante nella struttura.

INTRODUCTION

Hospital infections affect about 6% of hospitalized patients in Europe;[1] the hands of healthcare workers, who are front-line staff and frequently exposed to infected patients and contaminated surfaces, are the primary source of microbial transmission and in addition, the increasing use of digital devices has raised the potential for hand-to-environment contact.[2] Thus, hand washing procedures are essential to lowering the risk of occupational exposure to infectious diseases, hospital-acquired infections, and micro-organism cross-transmission.[3-5]

The World Health Organization (WHO, with the document

"WHO Guidelines on Hand Hygiene in Health Care") and the United States Center for Disease Control and Prevention (with the document "Guidelines for Hand Hygiene in Health-Care Settings Recommendations of Healthcare Infection Control Practices") have developed guidelines that provide specific guidance and recommendations for improving hand hygiene practices to health care providers. Every year since 2009, WHO has run the "SAVE LIVES - clean your hands" campaign to raise awareness of the problem and support the enhancement of hand hygiene globally. The campaign offers useful tools and existing scientific evidence to implement multimodal strategies and interventions with the aim of improving and sustaining hand hygiene in healthcare.[6]

Compliance with hand hygiene requirements ranges from 5% to 89% worldwide, with an average of around 38%.[7] According to the study "Hand Hygiene Compliance Study at a Major Central Hospital in Vietnam". Low compliance is associated with the following characteristics and includes inadequate availability of hand hygiene products, improper/uncomfortable placement of hand hygiene products, work overload, skin sensitivities, reduced risk perception, the practice of not hand-washing and forgetfulness, whereas the importance of social influence, motivation, supervision and training are important promoters.[8]

Several studies throughout the critical phases of the COVID-19 pandemic highlighted an increase in the use of hand sanitizers.[9] Indeed, hand hygiene is the most basic health intervention for both healthcare workers and the general public, in addition to the use of personal protective equipment. According to two studies, healthcare professionals' hand hygiene compliance increased during the pandemic compared to previously;[10,11] in fact, hand hygiene research studies undertaken in the aftermath of earlier influenza pandemics provided mixed results in terms of the healthcare professional's compliance. According to Labarca *et al*., during the 2009 H1N1 influenza pandemic, healthcare workers considerably increased their hand hygiene compliance (62%) than in previous years (48%), but that dropped to 35% in the following year.[10]

According to the WHO, monitoring hydroalcoholic solution consumption and hand hygiene are the most accurate and commonly available indicators for assessing healthcare workers' behavior when completing healthcare procedures, thus the National Plan to Combat Antimicrobial Resistance (PNCAR) has made it mandatory for monitoring nationwide, of alcohol-based hand hygiene products.

The Hospital Infection Prevention Control and Antimicrobial Stewardship Simple Structure (SS PCIO), within the SS. Antonio e Biagio e Cesare Arrigo, public hospital of Alessandria (AOAL), aims to improve care-related infectious risk control by establishing a network of referring doctors and nurses. The SS PCIO, as part of several company-training courses on good practice, provides a course on the theoretical and practical activities of handwashing, aimed at all existing staff, new personnel and trainees of the different health profiles that refer to AOAL. The aim of this investigation was to see if the COVID-19 pandemic had any effect on hand-washing adherence rates by conducting a pre-post pandemic wave study from the pre-pandemic year 2019 to the post-pandemic years 2020/2022.

MATERIALS AND METHODS

The purpose of this investigation was to see if the COVID-19 pandemic had any effect on hand washing adherence rates by conducting a pre-post pandemic wave study from the pre-pandemic year 2019 to the post-pandemic years 2020/2022. The study considers hand hygiene observations of all personnel employed as healthcare staff from 2019, during the pre-pandemic period, and in the three years following the outbreak from 2020-2022, during the post-pandemic period.

The SS PCIO, a hospital facility on the staff of the Medical Directorate, conducted this study. In addition to monitoring handwashing practices, a targeted survey of hydro-alcoholic gel consumption was also conducted, in response to regional requests, whilst the Ministry of Health's circular from December 2, 2021, further promoted and distributed this monitoring, which is still in progress nationwide.

Tools

According to WHO guidelines, the "Hand Hygiene Observation Form", is used to assess adherence to good practice and is divided into two sections: the observational grid and the computational form.

The observational grid is divided into four columns, each of which is assigned to a specific occupational group based on a special code so that it can be distinguished from the others.

As a result, the order in which data is reported differs for each column and is determined by the number of opportunities observed for the occupational category and the total number of opportunities observed and actions performed for each session and the professional category are reported (friction or washing with soap and water).

The formula for calculating good practise compliance is: Hand hygiene adherence (%) = actions performed (positive) / opportunities × 100, it provides the ratio of positive activities to all observed opportunities, multiplied by 100. Whereas, all observation results are anonymous and help identify the most appropriate interventions for hand hygiene promotion, education and training.

Data collection

The indicator of hand hygiene compliance was collected directly from the SS PCIO staff in the pre-pandemic period (2019) and from healthcare referents identified at each hospital facility in the post-pandemic period (2020-2022). The SS PCIO staff was in charge of collecting and entering data from the datasheets on a monthly basis, whilst the database was then processed and evaluated every six months. According to WHO, the "minimum usage of 20 liters of product associated to 1,000 inpatient days", or roughly 20 mL/die/patient, should be considered as a benchmark to measure the use of alcohol-based hand hygiene products. The SS PCIO provides this indicator, using consumption data provided by the SS. Antonio and Biagio and Cesare Arrigo Public Hospital's Pharmacy Facility and data on the number of inpatient days received from the Corporate Management Committee.

Statistical investigation

An Excel spreadsheet, using the software Microsoft, Office 365 software was created to record the total number of observed opportunities and observed hand hygiene behavior (*e.g*., alcohol-based hand rub, soap and water, antiseptic, or none at all). On the excel spreadsheet data were aggregated, and a descriptive analysis was performed on continuous variables using the mean, standard deviation, and percentages. All 95% Confidence Intervals (CIs) were calculated exactly.

RESULTS

In 2019, data on hand washing compliance and hydro-alcoholic gel consumption were collected. Figure 1 illustrates the trend: handwashing compliance expressed as a percentage and the number of opportunities in the reporting year.

Hand hygiene observations were conducted on a sample of healthcare workers assigned to the AOAL Hospital's inpatient wards. During the whole observation period, healthcare workers had a total of 15528 hand hygiene opportunities, with an overall average compliance of 93.2%. Following the first year of monitoring, the adherence rate increased by 0.3%, whereas in 2021 the trend slightly deflected by 1.4% from the previous year, then increased again by 0.6%. Additionally, hydroalcoholic gel consumption monitoring was also introduced, to monitor handwashing procedures compliance.

Figure 2 shows the annual consumption as defined by WHO guidelines (L/day hospital stay/year).

The AOAL inpatient wards were included in the hydroalcoholic gel consumption survey for the years 2020 and 2021-2022, and the investigation showed a considerable rise in hydroalcoholic gel consumption in 2020 compared to 2019, which was probably caused by the unusual circumstances brought on by the COVID-19 pandemic. Yet, despite being slightly lower than in 2021, consumption remained strong in 2022 as well.

In Italy, the prevalence study on Healthcare-Associated Infections (HAIs) for acute hospitals published in 2018 used the Hydro-Alcoholic Solution Consumption Indicator (HACI) as a diagnostic and infection control indicator, measuring liters of hydroalcoholic solution consumed per year, the number of beds with hydroalcoholic solution dispensers, and the percentage of staff with hydroalcoholic solution dispensers in their pockets.

The sampled hospitals consumed a median of 9.17 liters per 1000 patient days (data stratified by hospital size), which was lower than the European median of 18.7 L/1000 patient days, higher than the Italian median from the 2011-2012 prevalence study (7.2 L/1000 patient days), but still far below the WHO standard of an average of 20 L/1000 patient days.

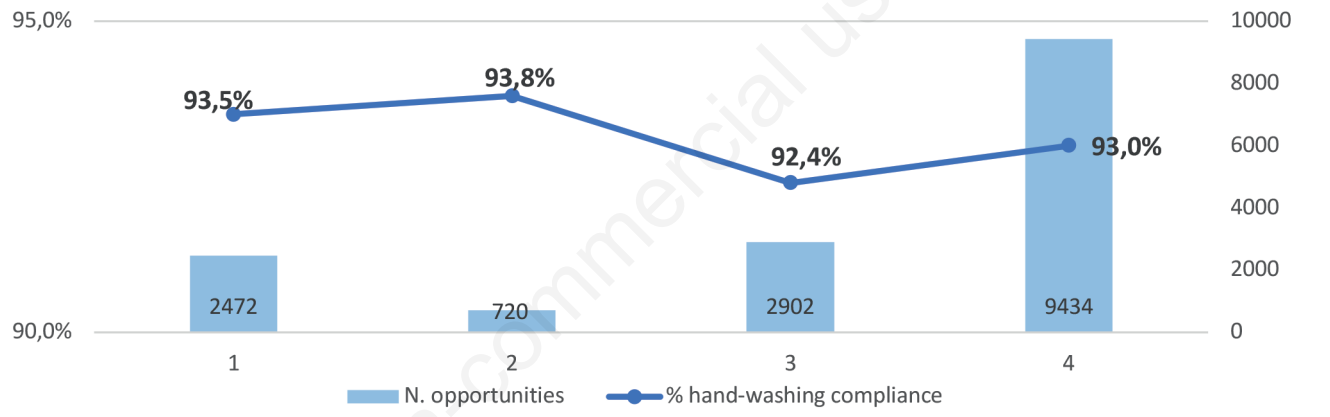

Figure 1. Handwashing compliance expressed as a percentage and the number of opportunities in the reporting year.

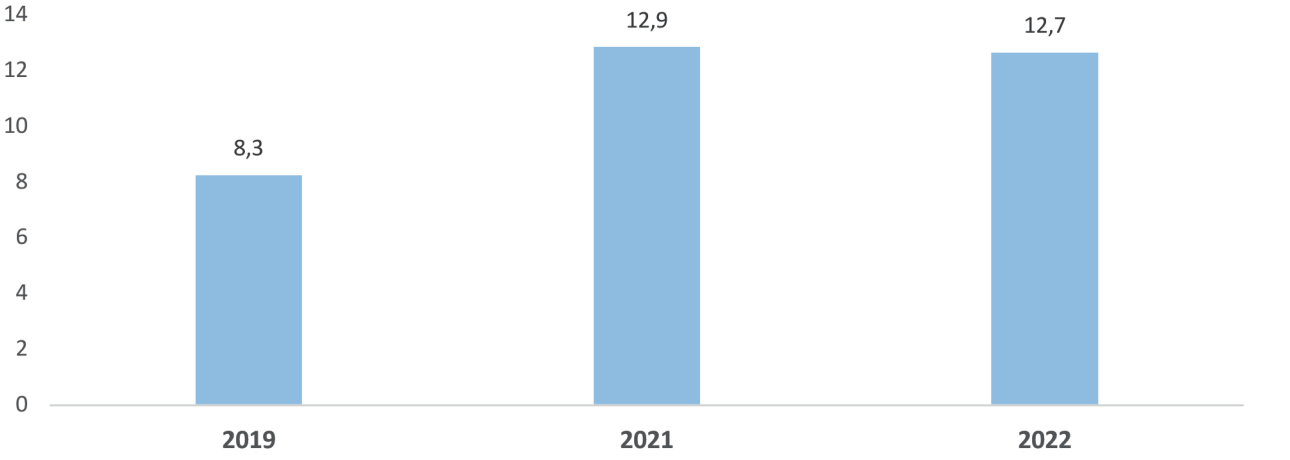

Figure 2. The annual consumption as defined by WHO guidelines (L/day hospital stay/year).

DISCUSSION

The study's objective was to compare health care workers' handwashing behaviour before and after the COVID-19 outbreak and highlight any differences, in the considered periods. Monitoring infection prevention practices in health care settings produce important data which can be used to evaluate the success of specific interventions, give feedback to healthcare professionals, and identify areas for improvement. According to WHO recommendations, direct observation is the gold standard for monitoring hand hygiene compliance since it provides assessment of regular practice performance during all phases of the practice. However, direct observation is time-consuming and resource intensive so it can only be performed only in a small proportion of hand hygiene opportunities. The findings of this study indicate that both medical and nonmedical health care staff consistently adhered to the recommended frequency of annual hand hygiene, and as a result of increased public and political attention to communicable diseases, as well as increased awareness of the value of hand hygiene as a preventive measure, and increased personal risk perception among healthcare workers, recent studies have found a significant increase in hand hygiene compliance rates during the pandemic period.[12,13]

Previous reports have emphasized the need for multidisciplinary approaches to achieve and sustain permanent improvements in hand hygiene compliance.[13] Furthermore, this study demonstrates a significant increase in the use of hydroalcoholic gel, which is consistent with the findings of earlier investigations.[14] In 2020, WHO recommended hand sanitizers as an alternative to hand hygiene since they are products that, when applied to the hands and rubbed in, are capable of killing harmful bacteria. These solutions dry rapidly after use, eliminating the need for soap, water, and drying aids such as towels, and their portability and simplicity have contributed to their widespread use.[15]

Our research has some limitations that must be addressed. It is a single-center survey, the analysis does not take into account the period of execution of the procedure under consideration, and the data is not broken down by professional category. Whereas its strength is the systematic and ongoing assessment of healthcare professionals' hand hygiene compliance over time in a real-life setting.

Our aim is to continue this monitoring in order to determine whether continued promotion and education initiatives result in a gradual development of this practise to gold standard levels, with hand hygiene being one of the most effective and simple practises to avoid HCIs. For future AOAL research studies, it could be reasonable to investigate and highlight how the proper practice of hand hygiene affects care-related infections.

CONCLUSIONS

The present study confirmed compliance with hand hygiene practice among the company's health workers and that the trend of compliance is consistent with data available in the literature and that the presence of a dedicated facility that promotes the application of the recommended hand hygiene behavior as well as ongoing improvement and training initiatives is crucial to ensure and improve the compliance of all healthcare workers.

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pandemic period.

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REFERENCES

1. Suetens C, Latour K, Kärki T, et al. Prevalence of healthcare-associated infections, estimated incidence and composite antimicrobial resistance index in acute care hospitals and long-term care facilities: results from two European point prevalence surveys, 2016 to 2017. Euro Surveill Bull Eur Sur Mal Transm Eur Commun Dis Bull. 2018;23:1800516.
2. Koscova J, Hurnikova Z, Pistl J. Degree of Bacterial Contamination of Mobile Phone and Computer Keyboard Surfaces and Efficacy of Disinfection with Chlorhexidine Digluconate and Triclosan to Its Reduction. Int J Environ Res Public Health. 2018;15:2238.
3. Gammon J, Hunt J. The neglected element of hand hygiene - significance of hand drying, efficiency of different methods and clinical implication: A review. J Infect Prev. 2019;20:66-74.
4. Gold NA, Mirza TM, Avva U. Alcohol Sanitizer. StatPearls. Available from: http://www.ncbi.nlm.nih.gov/books/NBK513254/

5. Toney-Butler TJ, Gasner A, Carver N. Hand Hygiene. StatPearls. Available from: http://www.ncbi.nlm.nih.gov/books/NBK470254/
6. World Health Organization, WHO Patient Safety. Hand hygiene technical reference manual: to be used by health-care workers, trainers and observers of hand hygiene practices. 2009. Available from: https://apps.who.int/iris/handle/10665/44196
7. Lambe KA, Lydon S, Madden C, et al. Hand Hygiene Compliance in the ICU: A Systematic Review. Crit Care Med. 2019;47:1251.
8. Lambe KA, Lydon S, Madden C, et al. Hand Hygiene Compliance in the ICU: A Systematic Review. Crit Care Med. 2019;47:1251-7.
9. Le CD, Lehman EB, Nguyen TH, Craig TJ. Hand Hygiene Compliance Study at a Large Central Hospital in Vietnam. Int J Environ Res Public Health. 2019;16:607.
10. Roshan R, Feroz AS, Rafique Z, Virani N. Rigorous Hand Hygiene Practices Among Health Care Workers Reduce Hospital-Associated Infections During the COVID-19 Pandemic. J Prim Care Community Health. 2020;11:2150132720943331.
11. Israel S, Harpaz K, Radvogin E, et al. Dramatically improved hand hygiene performance rates at time of coronavirus pandemic. Clin Microbiol Infect Off Publ Eur Soc Clin Microbiol Infect Dis. 2020;26:1566-8.
12. Labarca J, Zambrano A, Niklitschek S, et al. H1N1 pandemic influenza impact on hand hygiene and specific precautions compliance among healthcare workers. J Hosp Infect. 2011;79:177-9.
13. WHO Guidelines on Hand Hygiene in Health Care: First Global Patient Safety Challenge Clean Care Is Safer Care. Geneva: World Health Organization; 2009. (WHO Guidelines Approved by the Guidelines Review Committee). Available from: http://www.ncbi.nlm.nih.gov/books/NBK144013/
14. Yoo E, Ursua L, Clark R, et al. The effect of incorporating covert observation into established overt observation-based hand hygiene promotion programs. Am J Infect Control. 2019;47:482-6.
15. Furmenti MF, Zotti M. L'igiene delle mani nel nostro Paese: i dati del PPS. 2019. Available from: https://www.salute.gov.it/imgs/C_17_EventiStampa_550_intervisteRelatori_itemInterviste_15_fileAllegatoIntervista.pdf