Evaluation of hand hygiene compliance rates of five years in critical care unit of a tertiary hospital in Nepal

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ABSTRACT

Introduction

Hand hygiene (HH) has been proven as the most effective measure in controlling healthcare associated infections. However, HH compliance rates among health care workers in hospitals are often significantly low. There are no studies to address HH compliance and interventions to increase compliance in Nepal. We aimed to evaluate the compliance of hand hygiene in critical care setting in a tertiary care center in Nepal.

Methods

This is a descriptive cross-sectional study conducted from 1st January 2016 to 31st December 2021 among nurses and physicians working in critical care units of Grande International Hospital in Kathmandu. Data regarding the compliance to hand hygiene were collected. The rate missed opportunities among 'My five moments of hand hygiene' were also studied. Data was entered and analyzed in Microsoft Excel. Point estimate at 99% confidence interval was calculated along with frequency and percentage for binary data along with mean and standard deviation for continuous data.

Results

Out of 4908 hand hygiene opportunities observed, compliance rate was found to be 66% (64.26-67.74 at 99% Confidence Interval). Among different health care personnel working in Intensive Care Unit, consultant physicians were found to have highest compliance rate followed by nursing staff.

Conclusions

Systematically structured hand hygiene strategy along with education programs, continuous monitoring and evaluation, feedback and team approach could result in increased compliance rate but continuous effort is needed to sustain this improvement.

Keywords: **WHO guidelines, five moments for hand hygiene, quality improvement, critical care unit.**

Introduction

Monitoring 'My five moments for hand hygiene' during patient care is endorsed by the World Health Organization (WHO) and forms a principal component for the prevention of healthcare-associated infections (HAIs)[1]. Systematic hand hygiene practice is now considered as the most important aspect of infection prevention and control. Guidelines that promoted the use of alcohol-based hand hygiene agents have helped to decrease emergence and spread of multidrug resistant pathogens[2]. WHO recommends alcohol-

based hand sanitizers containing 70% (volume/ volume) alcohol for hand hygiene during patient care. The length of hand rubbing time recommended by WHO is 20 to 30 seconds, which needs about 1.6 or 3.2mL of hand sanitizer[3]. A systematic and user friendly approach to educate, monitor, evaluate and report hand hygiene compliance is needed for Standardization of hand hygiene practices[4].

The concept of "My five moments for hand hygiene" describes step-by-step approach for health care personnel in any hand hygiene observation program[4,5]. It can be relevant in large range of patient care activities with the five moments comprising of: Before patient contact (Moment 1); Before an aseptic task (Moment 2); After body fluid exposure risk (Moment 3); After patient contact (Moment 4); After contact with patient surroundings (Moment 5)[1,5]. Even though numerous literatures have shown hand hygiene as the most important factor for the control of healthcare associated infections and spread of multi-drug resistance organisms, hand hygiene compliance is yet to be improved significantly among health care providers[2-6]. Implementing hand hygiene practices and improving compliance needs proper identification of nature of barriers to compliance; especially in health care settings of underdeveloped countries like Nepal.

The objective of our study is to evaluate the hand hygiene compliance among health care workers in critical care setting, where hand hygiene compliance is of utmost importance for overall patient outcome.

Material and methods

A descriptive cross-sectional study was study was conducted at Grande International Hospital, a tertiary care center in Kathmandu, Nepal between January 2016 and December 2021. The study was conducted in critical care units comprising of Intensive Care Unit (ICU) and High Care Unit (HCU). The Intensive Care Unit, which included a total of 18 beds, is for all kind of medical and surgical cases requiring critical care. The High Care Unit which is a step down unit to ICU consisted of 12 beds. Health-care services were provided in both critical care units by same set of health personnel. All the health care workers working at the ICU and HCU during the study period were included. The sample size was calculated using the formula: $n= Z^2 \times p \times q / e^2 = 4161$

[Where, n= minimum required sample size; Z= 2.58 at 99% Confidence Interval; p= prevalence taken as 50% for maximum sample size; q= 1-p; e= margin of error, 2%}

Hence, the minimum required sample size was 4161. Sample size of 4908 was taken for the study. Hand hygiene compliance was assessed using the WHO Hand Hygiene Observation Form. Observation of hand hygiene compliance was performed by the "Hand Hygiene Observation Team" which is comprised of members of Infection Prevention and Control Department (IPCD). The members were already trained about monitoring, evaluation and reporting of observation findings.

Observation was done at designated times during the day time. The staff in both ICU and HCU were unaware that monitoring of hand hygiene compliance was being carried out during the designated times. The nursing in-charge in each unit was responsible for the implementation of hand hygiene practices in their respective unit. The IPCD provided monthly feedback reports to the director of IPCD and the hospital director. Regular discussion on compliance rates were held during the hospital infection control committee meetings held by the IPCD. Alcohol based hand sanitizer was regularly supplied throughout study period.

Point estimate at 99% Confidence Interval was calculated along with frequency and percentage for binary data.

Results

There were 580 participants in the first year of the study, 724 in the second, 862 in the third, 744 in the fourth, 1012 in the fifth year and 986 in the sixth year of the study. Out of 4908 hand hygiene opportunities observed, hand hygiene compliance rate was found to be 66% (64.26-67.74 at 99% Confidence Interval). The overall hand hygiene compliance rate in ICU (table 1) was 61% in the first year of the study which decreased to 60% in the second year followed by remarkable increase in the following years.

When comparing the compliance rate among different professions, nurses had the highest rate of 84% in the first year of the study but then decreased significantly reaching 60% in the second year. However, it increased again over next years of the study increasing to 69% in third and fourth year, 74% in fifth and 75% in the sixth year. Intra

Table 1. Comparison of hand hygiene compliance rates among various health care workers

Staff/Years	2016	2017	2018	2019	2020	2021
Nursing staff	84%	60%	69%	69%	74%	75%
Medical officers	47%	47%	62%	69%	62%	63%
Critical care physicians	57%	62%	79%	67%	91%	78%
Other physicians	30%	42%	54%	57%	52%	72%
Physiotherapists	-	-	70%	63%	83%	89%
Housekeeping staff	48%	57%	78%	66%	71%	87%
Overall	61%	60%	68%	66%	66%	77%

departmental physicians showed low hand hygiene compliance rate of 57% during first year of the study. Hand hygiene compliance later increased over next two years (62% in second and 79% in third year) and decreased slightly during fourth year of the study. We can also notice sharp rise in compliance (91%) in the year of 2021 among physicians. In sixth year compliance rate was 75% showing sharp fall compared to previous year. Non departmental physicians showed very low compliance rate of 30% in first year of the study. Compliance rate showed significant increase, reaching up to 42% in second year. In third, fourth and fifth year compliance rates were 54%, 57% and 52% respectively. In sixth year compliance rate increased sharply to 72%. So the study showed that non departmental physicians had consistently low compliance rate compared to other health care workers working in critical care units. We can also observe increase in compliance of other health care workers like physiotherapists, housekeeping staff as the study years passed by with few ups and downs. They show greater compliance rate compared to non-departmental physician but lesser compliance rate compared to intradepartmental physician and nursing staff (Figure 1 &2).

The median annual hand-rubbing time ranged from 15 seconds to 20 seconds. The hand hygiene moments in the critical care units were divided into five categories in accordance with the WHO SAVE LIVES- Clean your hands annual global campaign.

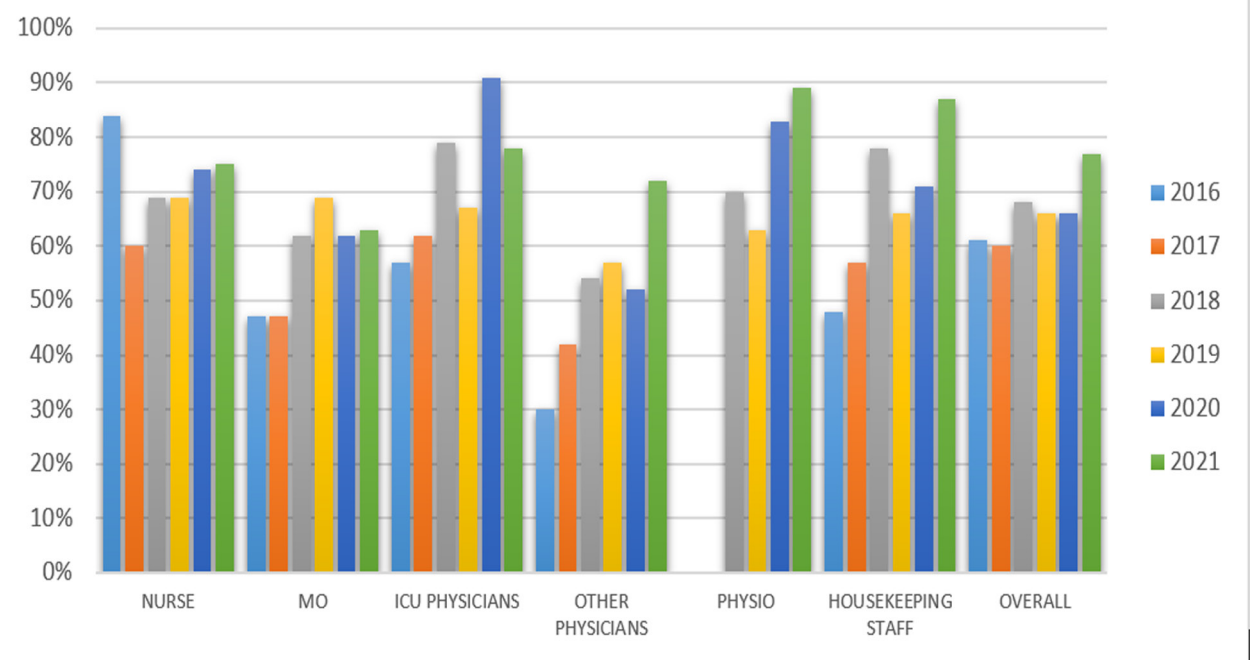

Figure 1. *Chart showing the hand hygiene among various health care workers*

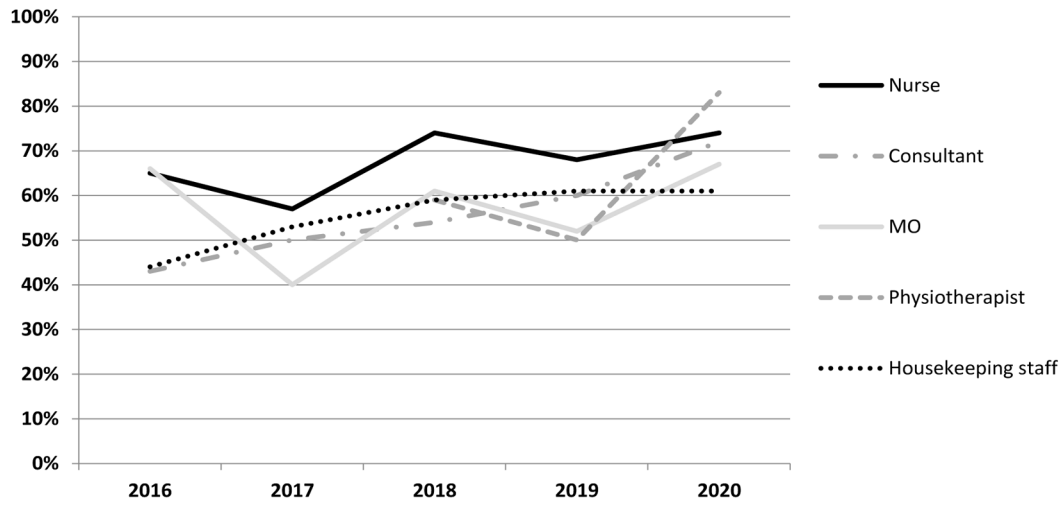

Figure 2. *Chart showing the hand hygiene compliance among various health care workers over 5 years.*

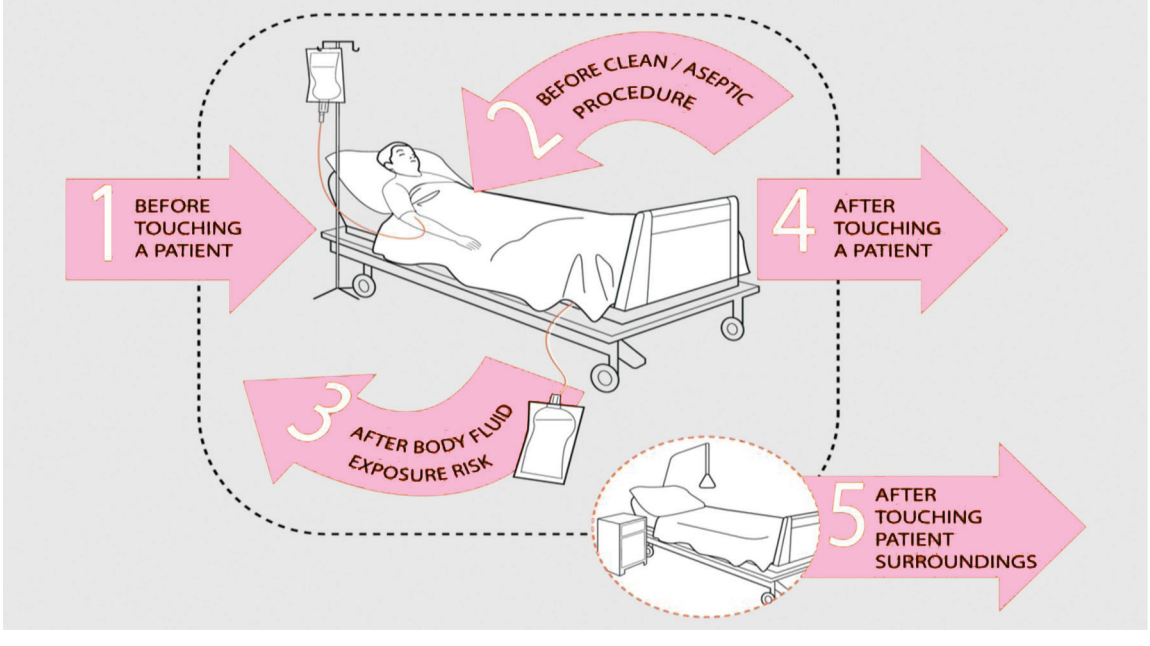

Figure 3: *WHO: Five moments of Hand Hygiene*

The instant when proper hand washing was missed mostly were in order of decreasing magnitude: Moment 1: Before patient contact (with/without donning gloves), Moment 3: After body fluid exposure risk and Moment 2: before aseptic techniques. The hand hygiene awareness efforts resulted in enhanced hand hygiene compliance in all the health personnel throughout the study period.

How often the individual hand hygiene opportunities are missed during patient care in our critical care units during 2021 are tabulated below (Table 2) and the pattern is shown in the figure below (Figure 4).

Table 2. Hand hygiene missed moments 2021

Hand hygiene moments	Study year 2021
Before handling patient	73%
Before procedure	45%
After procedure/body fluid exposure	65%
After touching a patient	88%
After touching a patient's surrounding	82%

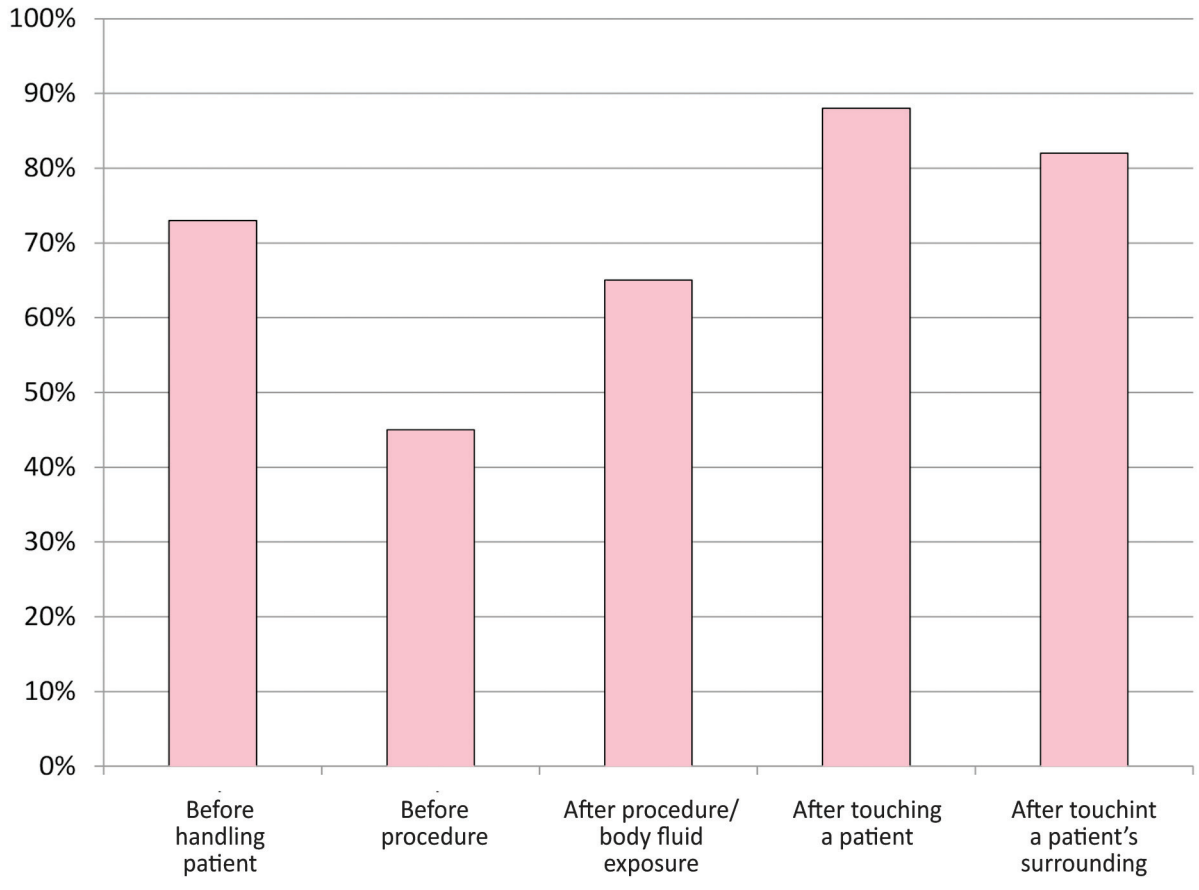

Figure 4. *Chart showing the missed hand hygiene moments*

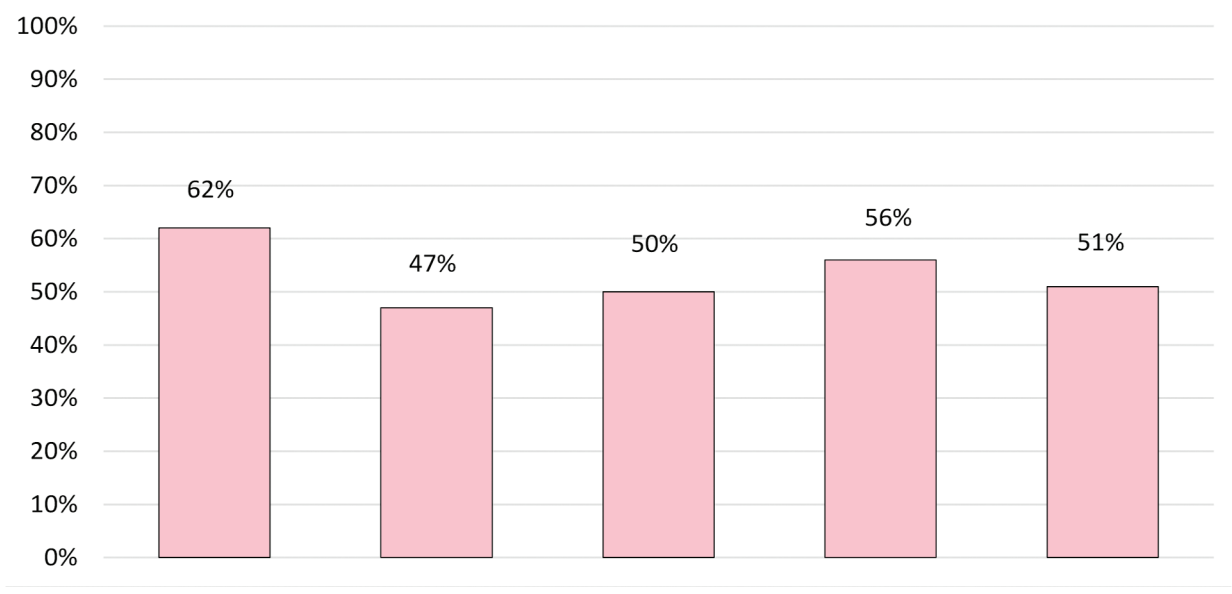

Figure 5. *Chart showing overall hand hygiene compliance over 5 years amongst various healthcare personnel.*

Discussion

Multiple factors are responsible for suboptimal hand hygiene compliance depending on the type of health care setting and availability of resources. Detection of the factors responsible for suboptimal compliance and particular missed opportunities while patient care is vital so that these can be utilized for more effective compliance strategies[7-9]. With this consideration, the key moments of missed opportunity during patient care in our critical care units were found to be Moments 2: Before an aseptic task; Moment 3: After body fluid exposure risk and Moment 1: Before patient contact. HHC rates are usually lowest before aseptic/ clean procedures (moment 2)[10]. During the study period, the median hand rubbing time was found to be 15 to 20 seconds. As there was no increase in the incidence of HAIs during the study period, our finding indicates that a hand-rubbing time of 15 to 20 seconds may be adequate for controlling HAIs; this finding is in accord with other recent reports[11,12].

A study conducted in a teaching hospital in China suggests that direct observations and immediate feedback increased doctors' hand hygiene compliance to levels as high as 92.2%[13]. This suggests, continuous observations and feedback may reduce unwillingness among doctors and change their HH behavior. Overall hand hygiene compliance in our critical care units showed gradual and sustained increasing pattern. Our study found that nurse's compliance was initially notably high that is 84% in the first year of the study period but then decreased significantly in second year of the study. However it increased again over next few years of the study reaching 75% in the 6th year. During second year of the study there was significant turnover of nursing staff and new batch of nurses were yet to be trained on hand hygiene practices. The pick-up in hand hygiene compliance rate can be attributed to the hand hygiene intervention programs led by IPCD team. This emphasizes the importance of systematic educational campaign on hand hygiene compliance.

Intra departmental physicians showed low hand hygiene compliance of 57% during first year of the study. Hand hygiene compliance later increased significantly. We can also notice sharp rise in compliance (91%) in the year of 2021. Initial poor compliance among Intra departmental physician was due to less involvement of the physicians in hand hygiene improvement programs. As soon as poor compliance was noticed among physicians, their involvement was ensured in every educational programs endorsing hand hygiene compliance. Sharp increase in compliance rate among physician in 2021 seems to be due to intensified hand hygiene interventions during the spread of COVID-19 infection. Non departmental physicians also showed increase in compliance rate every year but the rate of increase in compliance and overall compliance remained significantly low compared to Intradepartmental physician and nursing staff over whole study period. This is due to the fact that doctors and nurses of critical care setting were given more preference over doctor and nurses of other departments in hand hygiene practices related programs. We can also observe small but gradual increase in compliance rate of other health care workers like physiotherapists and housekeeping staff as the study years pass by with few ups and downs.

To boost compliance of hand hygiene practices, several strategic measures such as performance feedback, display of hand hygiene posters and promotion of alcohol-based hand rubs have been used[14,15]. Our study hospital also incorporated similar multimodal approach to enhance adherence to hand hygiene practices. There is a multi-dimensional intervention program which is based on WHO tools and includes education, reminders, feedback, interviews and the use of role models. Intervention campaigns are effective in short term behavior modification; however, for sustained hand hygiene compliance many other factors need to be taken into consideration[16]. We have examined the long term effects of educational efforts in the implementation of hand hygiene strategy. Like few other studies, the findings stipulate a poor baseline hand hygiene compliance with remarkable improvement noted in the immediate post intervention period[17,18]. Our study also reveals that this high level of compliance could not always be maintained as reflected by ups and downs in compliance rates in our study. The apparent inability to maintain compliance for longer time suggests complex nature of changing behavior. Many literatures have investigated the application of theory of planned behavior to investigate hand hygiene compliance[16,19]. Higher levels of compliance were found among doctors compared

to nursing staff in our study. This is opposite to the reports in the other literatures where physician compliance found to be very low and the absence of a proper leadership was identified as a barrier to improving compliance among doctors[20,21]. The difference seen may be due to the structure of team of physician in our critical care units. The team is appreciably organized and works under strong leadership. As the reporting is an essential element of multimodal strategies to upgrade hand hygiene compliance; monthly reporting as well as open discussions and regular feedback were carried out. This approach was shown to be operative in the critical care settings where the increase in hand hygiene compliance was attributed to team approach and having a team leader. A team work with the competent team leader has been proven as an effective modality for behavior change in sustaining hand hygiene compliance[22,23]. We strongly emphasized the participation of physicians and nursing staff supervisors in hand hygiene promotion activities, dissemination of feedback and evaluations. This approach has been proven as critical for any successful hand hygiene observation programs[21,23].

Our study has many limitations. As it was a descriptive cross-sectional study carried, associations and correlations could not be made. Also, the non-probability sampling technique and the single centric nature of the study site limit the generalizability of the findings. Further, a baseline HHC data before the study period was not available. Lastly, the patient data were not gathered individually, which made it unfeasible to detect any changes in status of patients.

Conclusion:

Systematically structured hand hygiene strategy along with education programs, continuous monitoring and evaluation, feedback and team approach could result in increased compliance rate but continuous effort is needed to sustain this improvement. We found that sustained hand hygiene intervention programs were necessary to maintain adequate hand hygiene compliance rate. Missed opportunities for hand hygiene were before aseptic techniques, before patient contact, and after touching patient's surrounding. Further studies are recommended to find out the associations between hand hygiene compliance and patient outcomes.

References

1. Pittet D, Allegranzi B, Boyce J; World Health Organization world alliance for patient safety first global patient safety challenge core group of experts. The World Health Organization guidelines on hand hygiene in health care and their consensus recommendations. Infect Control Hosp Epidemiol. 2009;30(7):611-22.
2. Bolon MK. Hand Hygiene: An update. Infect Dis Clin North Am. 2016;30(3):591-607.
3. Allegranzi B, Sax H, Pittet D. Hand hygiene and healthcare system change within multi-modal promotion: A narrative review. J Hosp Infect. 2013;83 Suppl 1:S3-10.
4. Sax H, Allegranzi B, Chraïti MN, Boyce J, Larson E, Pittet D. The World Health Organization hand hygiene observation method. Am J Infect Control. 2009;37(10):827-34.
5. Sax H, Allegranzi B, Uçkay I, Larson E, Boyce J, Pittet D. 'My five moments for hand hygiene': A user-centred design approach to understand, train, monitor and report hand hygiene. J Hosp Infect. 2007;67(1):9-21.
6. Randle J, Arthur A, Vaughan N. Twenty-four-hour observational study of hospital hand hygiene compliance. J Hosp Infect. 2010;76(3):252-5.
7. Basurrah MM, Madani TA. Handwashing and gloving practice among health care workers in medical and surgical wards in a tertiary care centre in Riyadh, Saudi Arabia. Scand J Infect Dis. 2006;38(8):620-4.
8. Bukhari SZ, Hussain WM, Banjar A, Almaimani WH, Karima TM, Fatani MI. Hand hygiene compliance rate among healthcare professionals. Saudi Med J. 2011;32(5):515-9.
9. Qushmaq IA, Heels-Ansdell D, Cook DJ, Loeb MB, Meade MO. Hand hygiene in the intensive care unit: Prospective observations of clinical practice. Pol Arch Med Wewn. 2008;118(10):543-7
10. Kramer TS, Bunte K, Schröder C, Behnke M, Clausmeyer J, Reichardt C, et al. No increase in compliance before aseptic procedures in German hospitals. A longitudinal study with data from the national surveillance system over four years. J Hosp Infect. 2020 ;106(1):71-5.
11. Harnoss JC, Dancer SJ, Kaden CF, Baguhl R, Kohlmann T, Papke R, et al. Hand antisepsis without decreasing efficacy by shortening the rub-in time of alcohol-based handrubs to 15 seconds. J Hosp Infect. 2020;104(4):419-24.
12. Pires D, Soule H, Bellissimo-Rodrigues F, Gayet-

Ageron A, Pittet D. Hand hygiene with alcohol-based hand rub: How long is long enough? Infect Control Hosp Epidemiol. 2017;38(5):547-52.

13. Han C, Song Q, Meng X, Lv Y, Hu D, Jiang X, et al. Effects of a 4-year intervention on hand hygiene compliance and incidence of healthcare associated infections: A longitudinal study. Infection. 2021;49(5):977-81.

14. Aragon D, Sole ML, Brown S. Outcomes of an infection prevention project focusing on hand hygiene and isolation practices. AACN Clin Issues. 2005;16(2):121-32.

15. Boyce JM, Pittet D; Healthcare infection control practices advisory committee; HICPAC/SHEA/APIC/IDSA hand hygiene task force. Guideline for hand hygiene in health-care settings. Recommendations of the healthcare infection control practices advisory committee and the HICPAC/SHEA/APIC/IDSA hand hygiene task force. Society for healthcare epidemiology of america/ association for professionals in infection control/ infectious diseases society of America. MMWR Recomm Rep. 2002;51(RR-16):1-45, quiz CE1-4.

16. Sax H, Uçkay I, Richet H, Allegranzi B, Pittet D. Determinants of good adherence to hand hygiene among healthcare workers who have extensive exposure to hand hygiene campaigns. Infect Control Hosp Epidemiol. 2007;28(11):1267-74.

17. Pittet D, Hugonnet S, Harbarth S, Mourouga P, Sauvan V, Touveneau S, et al. Effectiveness of a hospital-wide programme to improve compliance with hand hygiene. Infection control programme. Lancet. 2000 Oct;356(9238):1307-12.

18. Pittet D. Improving compliance with hand hygiene in hospitals. Infect Control Hosp Epidemiol. 2000;21(6):381-6.

19. Whitby M, McLaws ML. Hand hygiene: The behaviour is the solution. J Hosp Infect. 2007;67(3):291.

20. Scheithauer S, Oude-Aost J, Heimann K, Haefner H, Schwanz T, Waitschies B, et al. Hand hygiene in pediatric and neonatal intensive care unit patients: daily opportunities and indication- and profession-specific analyses of compliance. Am J Infect Control. 2011;39(9):732-7.

21. Pittet D, Simon A, Hugonnet S, Pessoa-Silva CL, Sauvan V, Perneger TV. Hand hygiene among physicians: Performance, beliefs, and perceptions. Ann Intern Med. 2004;141(1):1-8.

22. Novoa AM, Pi-Sunyer T, Sala M, Molins E, Castells X. Evaluation of hand hygiene adherence in a tertiary hospital. Am J Infect Control. 2007;35(10):676-83.

23. Pittet D. The Lowbury lecture: Behaviour in infection control. J Hosp Infect. 2004;58(1):1-13.