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Anesthesiologists' Compliance with Institutional Hand Hygiene Policies

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Abstract

Objective: To determine the frequency of adequate Hand Hygiene (HH) practice during routine anesthetic care and HH amongst Anesthesiologists working in a tertiary care hospital.

Introduction: Anesthesia as a field is fraught with a high bulk of invasive and infection-prone techniques. Hand mediated conduction is the chief causal factor to Health Care Associated Infections (HCAI's). In addition, the intra operative environment assists as a reason for the expansion of infections. Ineffective hand washing and gloving during patient contact are common factors whenever there is a prevalence of contact with patient blood and saliva. This study was conducted to observe the adherence of anesthesia personal with institutional guidelines.

Methodology: 6 months. It was a cross-sectional descriptive study. Data on Hand Hygiene (HH) in relation to anesthesia care was collected from residents and consultants during 225 surgical and non-surgical procedures. A total of 1300 HH moments were recorded. During anesthetic care opportunities and in other indicated scenarios, practice of HH was examined. Observations were carried out randomly, data was collected anonymously. Hand Hygiene was considered adequate when all 5 moments of an observed opportunity were performed. It was collected at different points in time and from different sites and recorded on the attached performa made in accordance with the institutional guidelines.

Results: Statistics on HH relative to anesthesia care were collected from residents and consultants during 225 surgical and non-surgical procedures mostly during the day and at times during the night. A total of 1300 HH moments were recorded. Among these 103 (45.78%) female and 122 (54.22%) observations out of 225 were recorded. The general adherence to HH guidelines recorded (53.9%). HH was considered adequate when it was followed in all the 5 moments of an observed opportunity on a particular participant. Only 8% of the total sample performed HH adequately.

Conclusion: It is evidently clear that current rates of HH compliance are below acceptable levels. Thus we can conclude that dynamic application of robust infection control guidelines and intentional actions are compulsory to attain advanced level of HH.

Keywords: Hand hygiene; Anesthesia; Health care associated infections

Introduction

It has been proven beyond reasonable doubt that practicing proper hand hygiene is the surest way to prevent the spread of infections in health care settings [1]. Guidelines for Hand Hygiene in Healthcare Settings were published ten years ago while World Health Organization's guidelines on hand hygiene for health care came out five year ago [2]. Multiple recent reports have established that better hand hygiene results in less health care-associated infections [3-5]. Within the framework of the World Health Organization's (WHO) First Global Patient Safety Challenge called "Clean Care is Safer Care," a documented, user-centered concept, "My five moments for hand hygiene," has been developed for quantifying, illuminating, and delineating hand disinfection adherence [2].

Following WHO's recommendations, Department of Infectious Disease, Aga Khan University Hospital (AKUH) has developed a policy for Hand Hygiene in 2008 and revised it in February 2015. The purpose is to prevent cross transmission, reduce incidence of Health Care Associated Infections (HCAI) and to remove microorganisms that cause disease. Guidelines are available on the AKUH website. These guidelines are prominently placed on various sites within the hospital, disseminated in Infection Control department's seminars, conferences and CME programs and are a regular feature of HCW's education programs. Hand sanitizers are placed at every patient's bedside, preoperative areas, recovery rooms, outside the clinics and in the wards. Washbasins are available in all patient care areas. Regular audits to evaluate the health workers' practices about HH are being carried out and improvement measures implemented after the audits. All the members of the health care team are expected to follow the policy.

HH compliance has not been adequately studied in anesthesia contributors. Compliance achieved (adequate hand Hygiene) of through standard hand washing remained stable at around 30%, that associated with hand disinfection substantially increased from 13.6% to 37.0% ($p<0.001$) [6]. We are performing this study to evaluate the frequency of hand hygiene practice during routine anesthetic care and quality of HH amongst Anesthesiologists working in our hospital. If

the practices are not according to the standard we will implement and arrange education sessions for improving hand hygiene.

Gross evaluation signifies that more than 1.4 million patients universally in developed and developing countries are afflicted at any time [5]. Worldwide, no health-care setup can claim to be free of Hospital-Acquired Infections (HAI), though there is a wide difference between developed and developing countries. In developed world, with all the best measures available, Health Care Associated Infections (HCAI) account for complications in 5%-10% of admissions to acute-care units. For instance, in the United States, there are at least 80,000 fatalities each year (about 200 deaths/day) from HAI. However, the burden of HCAI is much greater in the developing countries, with the risk being two- to twenty-folds higher than the developed world. In third world countries, over 4000 children die of HCAI each day, equals to a plane crashing every hour. 50% of the patients admitted to neonatal intensive care units acquire an infection, and approximately half of them die [2]. There is high rated evidence that HAI are mostly acquired between patients through health care worker's hands [2].

HCAI is a crucial issue for patient wellbeing and its scrutiny and prevention must get preference for institutions devoted to making health care sound and secure. The influence of HCAI involve extended hospital stay, disability, prolonged resilience of microorganisms to antimicrobials, extra financial burden for patients and their families, and unnecessary deaths. Whilst the probability of acquiring HCAI is global and extend through every health-care organization throughout the world, the universal responsibility is undisclosed because of the pitfall of assembling authentic characteristic details. One of the identified reasons of HCAI is deficient Hand Hygiene (HH) in the health care setting.

Straight surveillance of Health Care Workers (HCWs) during patient management by competent and authenticated observers is accepted as the gold standard for hand hygiene survey. Supervision makes it possible to measure the definitive demand for hand hygiene and evaluate the quality of practice [3]. Reasons for ignoring hand hygiene have been evaluated and include carelessness, concern of skin damage, scarcity of time due to other patient care preferences, and scant or insufficient approach to hand rub and sinks [3,4]. Concentrating on hand hygiene can refine patient care over the entire organization as hand hygiene is one of the major factors affecting patient care and safety. Compliance with hand hygiene can effectively and largely decrease a significant burden from HCAI.

Health Care-Associated Infection (HCAI), also known as nosocomial infection is a significant cause of morbidity and mortality in hospitalized patients [7]. The World Health Organization (WHO) estimates that at any time, over 1.4 million people worldwide suffer from infections acquired in health-care settings [8]. Neonates are particularly vulnerable for acquiring HCAIs as well as experiencing more severe illness due to their intrinsic susceptibility to infections.

Nightingale worked throughout the war, for basic public health in a military hospital in Scutari in 1854. Her interventions to improve personal hygiene, cleanliness in the hospital environment, living conditions and food, led to a decrease in the number of deaths. She was one of the first who identified the relationship between nursing and infection control [9]. Hand hygiene was thought to be a key factor in reducing hospital acquired infection [10]. The battle with HAI started once the Hungarian medical specialist, Semmelweis, observed that puerperal fever was more common on a maternity ward, where physicians and medical students provided care to women in labor, than it was on the ward where midwives assisted deliveries. He noted that physicians and medical students were contaminating their hands while performing autopsies and later attending the examination of ladies [11]. The WHO World Alliance for Patient Safety was launched in October 2005 to tackle the problem of HCAIs worldwide. Given the critical nature of this problem, the project was launched as the First Global Patient Safety Challenge "Clean Care is Safer Care" [12]. It aims at reducing HCAI worldwide and the cornerstone of the entire initiative focuses on the promotion of hand hygiene in Health Care. In May 2009, WHO issued a new global guideline on hand hygiene in health care, "WHO Guideline on Hand Hygiene in Health Care" [13].

The WHO also developed a multimodal implementation strategy (Figure 1) to turn the scientific evidence included in the guidelines into practice and to suggest feasible ways to induce changes that will ultimately result in improved hand hygiene compliance and reduce morbidity and mortality due to HCAIs. In the proposed implementation schedule, baseline evaluation of the current hand hygiene practices, knowledge and perceptions of the HCWs and infrastructure availability is essential prior to introduction of the improvement activities (Figures 2) [14].

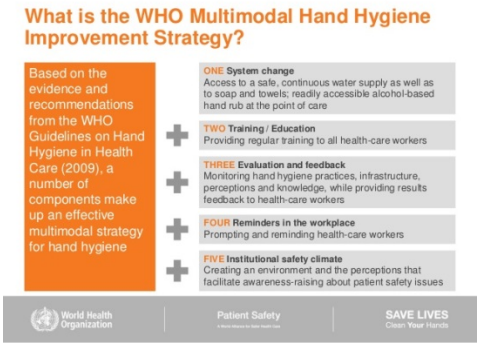

Figure 1: WHO Multimodal Hand Hygiene.

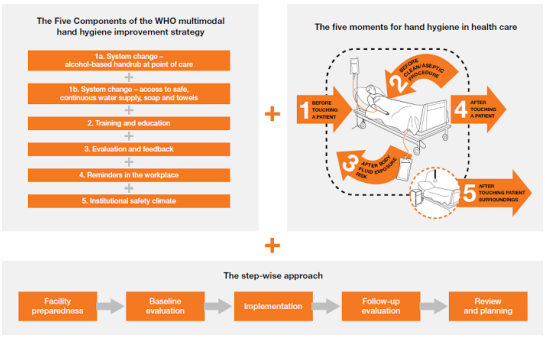

Figure 2: Five step implementation schedule.

Despite high importance of HAI and the significance of adherence to infection control policies, proper hand hygiene practice has remained exceptionably low [15]. Hand hygiene compliance rates in different developed countries rarely exceed 50% [16]. For instance, figures show that in the USA it is 50%, in Switzerland 42% and in the UK 32% [17]. Hence, poor compliance has resulted in high morbidity and mortality. In the USA, there are between one 7 and 2 million

people who contract HAI and 88 to 99 thousand deaths are attributed to HAI annually.

Furthermore, HAI affects nearly 10% of hospitalized patients and presents major challenges in healthcare facilities. Consequently, annual medical expenses have increased in the USA to approximately $4.5 billion [18]. In North American country some eight thousand patients die from HAI annually. Canadian hospitals spend up to $100 million per year treating patients with HAI [19]. European countries also have a high percentage of HAI: in the UK, for example, each year approximately 9% of people admitted to hospital contract HAI; this is one of the highest percentages in Europe [20]. The estimated number of deaths due to HAI among hospitalized patients in the UK is 500 patients annually [21]. The situation is even worse in developing countries including Ethiopia, where resources and facilities are limited.

A number of factors have been reported to contribute to poor hand hygiene compliance including limited availability and accessibility of hand hygiene facilities such as sinks, time required to perform hand hygiene, patient's condition, effects of hand hygiene products on the skin and inadequate knowledge of the guidelines heavy workloads, performing activities with cross-transmission, glove use, discourage. In developing settings, inadequate access to soap and water, and limited provision of sinks are hindrance to perform hand hygiene at the points of care [22].

Experimental

In an experimental study, that measured the rates of compliance of hand hygiene before and through implementation of a program of hand hygiene improvement in Geneva, Switzerland; resulted in an increase in the rate of compliance from 48% to 66% over a three-year period and significant decreases in the number of hospital acquired infections from 29% to 17% and Meticillin Resistance *Staphylococcus aureus* (MRSA) carrier or attack rate of MRSA [23].

According to researchers the results from a survey conducted across 14 developing countries to evaluate the problem and size of HAI, showed a wide range of nosocomial infection, from 3%-13.4% in different hospitals. However, another study conducted in developing countries, have reported a higher rate of HAI, 6%-27% [24]. In developed countries, HCAI concerns 5%-15% of hospitalized patients and can affect 9%-37% of those admitted to intensive care units (ICUs) [25]. Recent studies conducted in Europe reported hospital-wide prevalence rates of patients affected by HCAI that ranged from 4.6%-9.3%. An estimated five million HCAI at least occur in acute care hospitals in Europe annually, contributing to 135000 deaths per year [26].

The estimated HCAI incidence rate in the United States of America (USA) was 4.5% in 2002, corresponding to 9.3 infections per 1000 patient-days and 1.7 million affected patients and an annual economic impact of US$ 6.5 billion in 2004 [10]. Approximately 99 000 deaths were attributed to HCAI [27]. Prevalence rates of infection acquired in ICUs vary from 9% to 37% when assessed in Europe [12] and the USA, with crude mortality rates ranging from 12% to 80%. In ICU settings particularly, the use of various invasive devices (e.g. central venous catheter, mechanical ventilation or urinary catheter) is one of the most important risk factors for acquiring HCAI [28]. Device-associated infection rates per 1000 device-days detected through the National Healthcare Safety Network (NHSN) in the USA. Device-associated infections have a great economic impact; for example catheter-related bloodstream infection caused by methicillin-resistant *Staphylococcus aureus* (MRSA) may cost as much as US$ 38 000 per episode [29].

To the usual difficulties of diagnosing HCAI, in developing countries the paucity and unreliability of laboratory data, limited access to diagnostic facilities like radiology and poor medical record keeping must be added as obstacles to reliable HCAI burden estimates. Therefore, limited data on HCAI from these settings are available from the literature. In addition, basic infection control measures are virtually non-existent in most settings as a result of a combination of numerous unfavorable factors such as understaffing, poor hygiene and sanitation, lack or shortage of basic equipment, inadequate structures and overcrowding, almost all of which can be attributed to limited financial resources. Furthermore, populations largely affected by malnutrition and a variety of diseases increase the risk of HCAI in developing countries [30].

Under these circumstances, numerous viral and bacterial HCAI are transmitted and the burden due to such infections seems likely to be several times higher than what is observed in developed countries. For example, in one-day prevalence surveys recently carried out in single hospitals in Albania, Morocco, Tunisia and the United Republic of Tanzania, HCAI prevalence rates varied between 19.1% and 14.8% [31,32].

Patients and Methods

Non-probability consecutive sampling method

All doctors (residents, fellows, instructors, consultant) working in the Department of Anesthesiology, Aga Khan University Hospital were included.

Opportunities and indications for and practice of HH during anesthetic care will be monitored. Observations will be carried out randomly and without prior information. Data will be collected anonymously, without identifying the anesthesiologists. Data will be collected at different points in time and from different sites and recorded on the attached Performa. All statistical analysis will be performed using statistical packages for social science version 19 (SPSS Inc., Chicago, IL). Frequency and percentage will compute for categorical Gender, Prof. Category, specialty, Number of Hand hygiene moment, adequate hand hygiene. Mean and standard deviation will be computed for age. Stratification analysis will be performed with respect to gender, prof. category and specialty to observe adequate hand hygiene. After stratification, chi-square test will be applied to observe the outcome difference among stratified group of variables. $p<0.05$ will be considered as significant.

Results

Data on hand hygiene in relation to anesthesia care was collected from residents and consultants during 225 surgical and non-surgical procedures mostly during the day and at times at night. A total of 1300 hand hygiene moments were recorded. Among these 103 (45.78%) female and 122 (54.22%) observations out of 225 were recorded as shown in Figure 3.

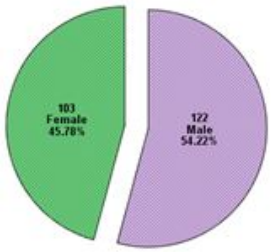

Figure 3: Gender distribution of the patient's n=225 hand hygiene moment.

Among the total observations 104 residents participated and rest 121 were consultants (Figure 4).

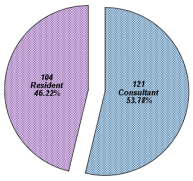

Figure 4: Category in term of residence and consultant.

The overall adherence to hand hygiene guidelines was 53.9% Table 1 illustrates the adherence to HH, total opportunity and moments as well as average length of observed session.

Hand hygiene parameter	Statistics
Total hand hygiene moment	225
Total number of observed indication of hand hygiene per opportunity	1300
Total number of performed indication per opportunity	701
Overall adherence to HH guidelines	53.90%
	(701/1300)
Duration of observation (Minutes)	9.98 ± 5.87
	[Min=5, Max=40]
n: 225 hand Hygiene Moment	

Table 1: Overall anesthesiologist's hand hygiene performance.

Figure 5 illustrates observed opportunities per type of surgery and anesthesia adherence to hand hygiene guidelines.

HH was considered adequate when HH was followed in all the 5 moments of an observed opportunity on a particular participant. Only 8% of the total sample performed HH adequately (Figure 5).

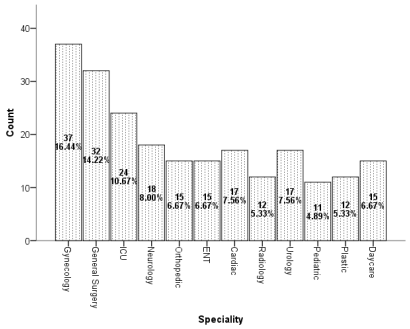

Figure 5: Specialty of the participant's n=225 hand hygiene moment.

HH was considered adequate when HH was followed in all the 5 moments of an observed opportunity on a particular participant. Only 8% of the total sample performed HH adequately (Figure 6).

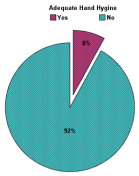

Figure 6: Frequency of adequate hand hygiene practice during routine anesthetic care n=225 hand hygiene moment.

The distribution of adequate (%) Hand Hygiene moments in relation to gender and professional category is shown in Tables 2 and 3.

Gender	Adequate hand hygiene practice		Total	Chi-square	p value
	Yes	No			
Male	10 (8.2%)	112 (91.8%)	122	0.014	0.906
Female	8 (7.8%)	95 (92.2%)	103		

Table 2: Frequency of adequate hand hygiene practice during routine anesthetic care by gender n=225 hand Hygiene Moment.

Categories	Adequate hand hygiene practice		Total	Chi-Square	P-Value
	Yes	No			
Consultant	11 (9.1%)	110 (90.9%)	121	0.4.23	0.515
Resident	7 (6.7%)	97 (93.3%)	104		

Table 3: Frequency of adequate hand hygiene practice during routine anesthetic care by post of anesthesiology n=225 hand hygiene moment.

Table 4 shows frequency of adequate hand hygiene practice during routine anesthetic care by anesthesiologist in specific specialty.

Anesthesiologist In Specific Specialty	Adequate hand hygiene practice		Total	Chi-Square	P-Value
	Yes	No			
Gynecology	1 (2.7%)	36 (97.3%)	37	94.225	0.0005
Pediatric	0	11 (100%)	11		
Orthopedic	0	15 (100%)	15		
Neurology	0	18 (100%)	18		
ENT	0	15 (100%)	15		
ICU	14 (58.3%)	10 (41.7%)	24		
Cardiac	0	17 (100%)	17		
Radiology	1 (8.3%)	11 (91.7%)	12		
Urology	0	17 (100%)	17		
Plastic	0	12 (100%)	12		
General Surgery	1 (3.1%)	31(96.9%)	32		
Day care	1 (6.7%)	14 (93.3%)	15		

Table 4: Frequency of adequate hand hygiene practice during routine anesthetic care by anesthesiologist in specific specialty n=225 hand Hygiene Opportunity.

The observed indication are categorized according to the different specialty and there adherence according to my five moments of hand hygiene in Table 5.

Anesthesiologist in specific specialty	Total number of observed indication per opportunity	Adherence to HH guidelines	
		N	%
ICU	94	84	89.40%
Cardiac	114	72	63.20%
General Surgery	193	112	58.00%
Gynecology	217	119	54.80%
Orthopedic	80	41	51.30%
Plastic	67	33	49.30%
ENT	87	42	48.30%
Day Care	83	39	47.00%
Neurology	127	58	45.70%
Urology	109	49	45.00%
Pediatric	63	26	41.30%
Radiology	66	26	39.40%

Table 5: 1300 Hand hygiene opportunities per type of specialty and the adherence to hand hygiene guidelines.

The number of opportunities and adherence for HH stratified by professional category and gender is shown in Table 6.

Variables	Total number of observed indication per opportunity	Adherence to HH guidelines	
Anesthesiologist		N	%
Consultant	692	365	52.70%
Resident	608	336	55.30%
Gender			
Male	704	346	49.10%
Female	596	355	59.60%

Table 6: 1300 hand hygiene opportunities per post of anesthesiologist and gender the adherence to hand hygiene guidelines.

Hygiene opportunities (n) and adherence (%) during different observations, categorized by "My five moments for Hand Hygiene" shown in Figure 7.

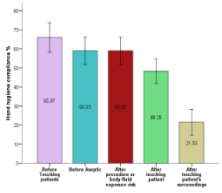

Figure 7: Hand hygiene compliance by moment.

The overall adherence to HH guidelines was 8.3%. Figure 8 illustrates the adherence to HH guidelines per observed type of surgery (Figure 8).

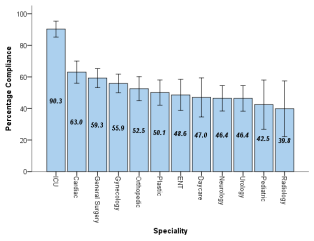

Figure 8: Hand hygiene compliance anesthesiologist in specific specialty n=225.

The distribution of HHO in relation to professional category and gender is shown in Figures 9 and 10.

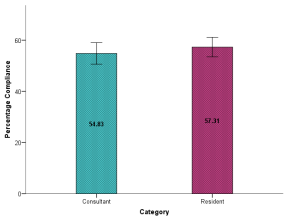

Figure 9: Hand hygiene compliance by categories n=225.

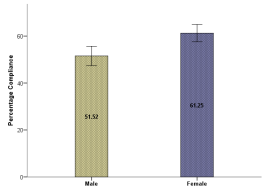

Figure 10: Hand hygiene compliance by gender n=225.

Discussion

Researchers in other multiple facilities have shown a hand hygiene failure rate significantly among health care providers from observational studies. Our study is different as it quantified HH practices of anesthesia personal in a metropolitan medical teaching hospital with observer having an easy access of anesthesia providers throughout the course of surgeries. A high incidence of HH failure was seen among them.

Hospital acquired infections secondary to microbes in an evolving problem worldwide and is a cause of nosocomial infections in acute care settings. Infected hands of health care workers are one of the major transmission factors in health care settings. Increased bacterial counts on hands of health workers increases from clinical activity. Hence, good HH is vital prior to patient handling. For reducing nosocomial infections hand hygiene is considered inexpensive, simple, vital and effective tool. Adherence was observed at a poor level in anesthesia providers. Accessibility to hand hygiene supply is a pre requisite to compliance. Multiple opportunities for ongoing vertical and horizontal transmission of microorganisms is there as patients and providers are into contact with each other.

The inflexibility of anesthetist regarding hand hygiene shows work without much care and observation in comparison to others because they are usually at patient's head behind the surgical grips. It is vital to value the protection of patients from provider's flora and their own flora.

Currently data on hand hygiene providers is very limited, this study is done in AKUH is one of those few studies in which a comprehensive practice of hand hygiene i.e. indication and opportunities was observed during routine anesthesia care. Overall adherence was very low about 8.3% among both the residents and consultants in anesthesia compare to an average of 40% in general health care field. In addition Pittet et al. also documented a low compliance rate in anesthesiologist compared with physician belonging to other disciplines. Krediet et al. even observe a 100% lack of hand hygiene activity before patient contact in anesthesiologist and anesthesia nurses, thus illustrating that adherence to hand hygiene guideline in anesthesia working room setting was unacceptably low. However, why highly educated and trained health care workers performs hand rub to rarely be the question that still remained to be answered.

Our study recovered hand hygiene opportunities during all the three phases (Induction, maintenance and extubation) in different surgical specialties as well as in ICU. In comparison to previous study which shows adherence of 5.3% our study results were 8.3% higher than previous study.

Hand hygiene opportunities were observed in relation to aseptic tasks and the adherence rate were very low as per expected. Implementation of hand hygiene protocol before any clean task, use of recommended aseptic task help in protecting the patients from cross transmission of microorganism through contaminated hands.

The adherence of hand hygiene was found differ between surgical specialties. Highest rate was associated with ICU (89.4%) and lowest with radiology (39.4%) While in the other study highest was observed in orthopedics and lowest in pediatrics. Our pediatric adherence was 47% and orthopedic was 51%.

According to observations in contrast to other specialty intensive care generates extended infection preventive measures. It is surely a reflection of special safety and mainly the observations were done during invasive procedures (A*Line and CVP insertion).

During 5 moments of hand hygiene, HH adherence differs in all the 5 moments. HH was followed in most of the cases before the first indication i.e. before touching the patients (66%) and least was followed after touching patient surrounding (21.53%). The observers were negligent of their hygiene and care and mostly missed the aftercare hand hygiene.

Prior studies in the operating theatre have presented adherence rate between 2% to 18%. Some of them can't be compared with our study directly secondary to their differences in methodology. However, a common factor is consistent that reports low adherence to hand hygiene routine in OR.

We acknowledge that the present study has several limitations. It only documents observation from a single center. Moreover, because of the observational design (currently regarded as gold standard), we have to assume and over estimation of hand hygiene compliance because of the knowledge of being under direct observation (Hawthorne effect). However, we made efforts to minimize the impact of Hawthorne effect by implementing a pilot observation phase, performing an observation by an anesthetist rather than infection control nurse. Finally, we document the improvement in hand hygiene compliance as a widely accepted quality perimeter but not as in end point of definite interest, i.e. the infection rate.

Conclusion

A conversant proposal consisting of hand hygiene compliance campaign in conjunction with increased training on both general and individual levels as well as the availability of more disinfectant dispensers and increase direct observation are required. Implementation of such measures in the first multidimensional hospital-wide campaign lead to sustain hand hygiene improvements. In addition, teaching, audits with feedbacks, and positive reinforcement are known to measure that result in a long-term beneficial effects for hand hygiene compliance. Altogether, such study strongly imply the active implementation of stronger infection control guidelines and increased measures are required to achieve higher level of hand hygiene compliance. Finally, optimizing workflow practices and procedures also seem to be a promising way to improve hand hygiene compliance without increasing work load, and thus representing a cost-effective measure to improve the quality of patient care and outcome.

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