

The Effects of the Hand Hygiene Initiative on Hand Hygiene Compliance and Nosocomial Infection Rate: an Experience in a Single Center Surgical ICU

Chang Sub Lee¹, Min Soo Kim², Young Joon Kang³

¹Department of Neurosurgery & ³Emergency Medicine, Jeju National University School of Medicine, Jeju, Korea

²Surgical Intensive Care Unit, National University Hospital, Jeju, Korea

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Abstract

Background: Between 5~10% of hospitalized patients in developed nations are affected with nosocomial infections (NCIs), the rates are even higher among intensive care unit (ICU) patients. Robust evidence suggests that proper hand hygiene has an essential role in the prevention of NCIs. However, in despite of the overwhelming evidence, hand hygiene compliance among health care providers (HCPs) was lower than expected. This study was performed to evaluate the impacts of the Hand Hygiene Initiative (HHI) on compliance of hand hygiene and the rate of NCI in a single center surgical ICU.

Methods: All HCPs (physicians, nurses, radiographers and physical therapists) who had accessed the Jeju National University Hospital (JNUH) Surgical ICU were the subjects of this study. The HHI composed of five activities: lectures, monitoring of hand hygiene compliance, complement facilities, encouraging handrubs use and abiding by the rules concerning isolated patients. Surveillances of NCI rates and hand hygiene compliances before and during the activities were monitored by the "Infection Control Committee of JNUH".

Results: Hand hygiene compliance improved from 74.0% before the activities to 89.4% during the activities ($p < 0.0001$). Overall infection rate of JNUH-SICU decreased from 5.98 to 3.98 per 1,000 patient-days which was not statistically significant ($p = 0.38$).

Conclusions: Hand hygiene compliance was improved by HHI, but further efforts will be needed to maintain this impact. HHI diminished the NCI rate in a single institute surgical ICU, but following studies will be needed to assess whether the improvement was statistically significant. (*J Med Life Sci* 2014;11(2):95-99)

Key Words : hand hygiene initiative, nosocomial infection, surgical intensive care unit

Introduction

Nosocomial infection (NCI) is defined as: 1) a localized or systemic condition that results from adverse reaction to the presence of an infectious agent(s) or its toxin(s) and; 2) the infection was not present or incubating at the time of admission to the hospital¹. In 1995, the NCI rate in the USA was 9.8 per 1,000 patient-days; the estimated cost of NCI was US \$4.5 billion and contributed to more than 88,000 deaths². NCI is a more serious problem in the intensive care unit (ICU) than the general ward. As a result of patients' immunocompromised status, infection opportunities during invasive procedures and mechanical ventilation, ICU patients are prone to infection³. The European Prevalence of Infection in Intensive Care Study (EPIC) revealed that 4,501

(44.9%) patients had infections among the 10,038 patients who were treated in ICU⁴. Strikingly, 2,064 patients (20.6% of ICU stayed patients) had an ICU-acquired infection⁴.

Since the 19th century, appropriate hand hygiene has been emphasized to decrease NCI rate. After the 1960's, several guidelines were published and has been adopted by the majority of hospitals. But hand hygiene compliance among health care providers (HCPs) is still low⁵. This study was performed to elucidate the effects of Hand Hygiene Initiative (HHI) on compliance of hand hygiene of HCPs and the rate of NCI in a single center surgical ICU.

Materials and Methods

Hospital

The Jeju National University Hospital (JNUH) is a 600 bed teaching facility and the only national university hospital in the Jeju Special Self-Governing Province on Jeju-island. The surgical ICU in the JNUH (JNUH-SICU) is a Nursing

Correspondence to : Chang Sub Lee
Department of Neurology, Jeju National University School of Medicine, Aran 13gil 15, Jeju-si, Jeju Special Self-governing Province, Republic of Korea, 690-767
E-mail : manschangsub@jejunu.ac.kr

Service Administration Grade III facility (rated by Health Insurance Review and Assessment Service) with a total of 14 beds. According to the "Korean Nosocomial Infection Surveillance System (KONIS) 2010 ICU Manual", JNUH-SICU is characterized as a surgical combined ICU.

Hand Hygiene Initiative

HHI related activities were conducted from July to December 2011 to improve hand hygiene compliance in the JNUH-SICU. The HHI was composed of five activities: lectures, monitoring of hand hygiene compliance, complement of facilities, encouraging handrubs use and abiding by the rules concerning isolated patients. Lecture activities included formal lectures, the printing and distribution of "customized infection control manual in the JNUH-SICU" and ward conferences. Monitoring results were reflected on the selection process of the "Best Staff of the Month Award". The complementing of existing facilities included equipping an additional sink and furnishing more handrubs to facilitate access. A survey was conducted to evaluate the "Level of Perception on NCI Control" to encourage handrubs use. Disposable gowns, aprons and suction tips were introduced during handling of isolated patients. Team activity of the JNUH-SICU executed the activities, along with support from members of "Infection Control Committee of the JNUH (JNUH-ICC)". All HCPs (physicians, nurses, radiographers and physical therapists) who had accessed to the surgical ICU were considered to be the subjects of this study.

Study setting

The definition of hand hygiene opportunity was adopted from the World Health Organization's (WHO) "My five moments for hand hygiene", i.e., before touching a patient, before clean/aseptic procedure, after body fluid exposure risk, after touching a patient and after touching patient surroundings⁶). Hand hygiene compliance was defined as "actual hand hygiene number by HCPs per total number of hand hygiene opportunities". Hand hygiene compliance was monitored by a dispatched staff from JNUH-ICC in an uncloned fashion. Monitoring was conducted both before HHI (27 June 2011 to 3 July 2011) and during HHI (26 September 2011 to 30 September 2011) during daytime period, respectively. Adequate hand washings with water and soap exceeding 40 seconds and hand rubbings with waterless handrubs over 20 seconds were counted as hand hygiene.

The overall infection rate was defined as "numbers of

infections per thousand numbers of patient-days", which was adopted from the "KONIS 2010 ICU manual"⁷). JNUH-SICU's NCI rate was defined as "numbers of NCIs per thousand numbers of patient-days in JNUH-SICU". Other parameters were also adopted from the same book.

The JNUH-ICC monitored surveillance of NCI rates and hand hygiene compliance before and during the activities.

Statistical analyses

The authors compared hand hygiene compliance before and during the HHI. The NCI rate of JNUH-SICU during the second half of the year 2011 was also compared with year on year data from 2010. Fisher's exact test or χ^2 test was used to compare differences. A p value of <0.05 was considered statistically significant. Data was analyzed with STATA/MP statistical software (version13, StataCorp, Texas, USA).

Results

Hand hygiene compliance

The primary goal of this study is a comparison of hand hygiene compliances among HCPs before and during the HHI. Hand hygiene compliance improved from 74.0% (before HHI, 4,992 hand hygiene actions per 6,748 opportunities) to 89.4% (during HHI, 3,597 hand hygiene actions per 4,024 opportunities) (Fig. 1). The improvement in hand hygiene compliance was statistically significant ($p < 0.0001, \chi^2$ test).

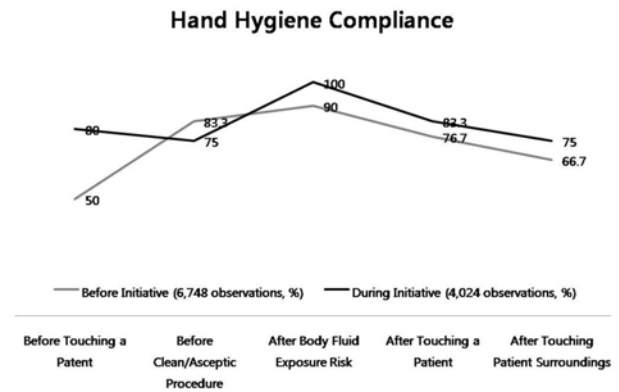


Figure 1. Hand hygiene compliance improved from 74.0% (before Hand Hygiene Initiative) to 89.4% (during Hand Hygiene Initiative), ($p < 0.0001, \chi^2$ test).

Nosocomial infections rate

The NCI rate of JNUH-SICU during the second half of the year 2011 was 3.98, it was 5.98 during the same period of 2010 (Table 1). The NCI rate decreased, however, the difference was not statistically significant ($p=0.38, \chi^2$ test).

The severity of SICU admitted patients during second half of the year 2011 was group 6 (0.5 %), group 5 (40.8 %), group 4 (51.9 %) and others (6.8%). That of the year 2010 during the same period was group 6 (0.8 %), group 5 (36.0 %), group 4 (53.8 %) and others (9.4 %). The severity during the second half of the year 2011 was higher than that of the same period of the year 2010 ($p=0.0028, \chi^2$ test, uncorrected for continuity, group 6 & 5 were considered as more severe, group 4 or below were considered as less severe). The severity classification system was adopted from "Critical Patients' Severity Classification System" which was developed by the Korean Association of Critical Care Nurses.

Table 1. Nosocomial infection rate of the Jeju National University Hospital Surgical Intensive Care Unit was decreased from 5.98 (after Hand Hygiene Initiative) to 3.98 (before Hand Hygiene Initiative), but it was statistically not significant ($p=0.38, \chi^2$ test).

Grade	2010		2011	
	Patient-days	Infections	Patient-days	Infections
July	322	3	356	1
Aug	234	2	396	2
Sep	240	2	364	3
Oct	330	1	320	1
Nov	368	1	258	0
Dec	347	2	314	1
Sum	1841	11	2,008	8
NCI rate		5.98		3.98

Discussion

NCI is a major threat to patient safety. In developed countries, 5 to 10% of patients who are admitted to the hospital acquire infection; in developing countries, the rate can even exceed 25%⁸⁾. Patients currently are becoming more susceptible to NCI. This is for myriad reasons: patients are generally older (increasing elderly population) and more vulnerable (increasing long-term survivors who have cancer or have received organ transplantation). Furthermore, more invasive procedures are currently performed in hospitals. From the patient's perspective, NCI increases the patient's total number of days in the hospital and medical cost.

Prolonged hospitalization due to a NCI may lead to another NCI and ruin the patient's quality of life. NCIs may result in an overflow of ICU hospitalization and increase the overall economic burden of society.

HCPs hands are the most common route for transmission of pathogens causing NCIs in the health care environment⁹⁾. Therefore, hand hygiene is the one very simple action that could greatly reduce NCI and its risks¹⁰⁾. In spite of the importance of hand hygiene, the actual hand hygiene compliance in clinical field is rather low than expected⁵⁾. Many factors such as low behavioral perception rate to hand hygiene guideline, insufficient facilities, overloading of HCPs and skin irritation due to soap or handrubs are considered to explain this paradox^{9,11,12)}. However, to prevent infection associated with health care, WHO's first Global Patient Safety Challenge entitled "Clean Care is Safer Care" is launched at year 2005. The core message of this Campaign is "simple measures save lives"¹⁰⁾. Hand hygiene is one of the five elements of this Campaign. WHO called on every country, every hospital and every health clinic around the world for support this Campaign.

JNUH moved to a new building in 2009, and the number of beds was increased by 80%. Hence JNUH hired new staff. Because many new staff did not have clinical experiences, the additions were a big challenge for the hospital management and quality control. After this, HHI was launched as one of the quality improvement activities to lower the NCI rate, and in order to participate in the WHO's Global Challenge. Currently nearly all hospitals in Korea have strengthened hand hygiene compliance as a focus of quality improvement program. This new emphasis may also be due to increased attention on hospital accreditation aspects by Korean Institute for Healthcare Accreditation.

However, it is hard to find articles that systematically analyzed the result of these activities. Indeed, upon foreign data, we know the fact that hand hygiene can reduce NCI rate, but Korean data is rare. Surely, Korean's cultural behavior, demographics and bacterial flora are different from Westerns. NCI rate is influenced by those factors. The significance of this article lies in evaluating the results of the program on a surgical ICU in a single center in Korea.

First, the authors survey the "level of perception on NCI control" among hospital staff and customized the "Infection Control Manual". Next, the education of manual-related items and providing complementary of facilities were addressed. As a result of HHI, hand hygiene compliance dramatically increased. Many articles have proved that hand hygiene compliance could be improved through education and

complementary policies^{13,14}. The result of this study is in line with previous studies. But the high baseline hand hygiene compliance differs from the previous studies. Baseline hand hygiene compliance was 74 percent. On the other hand, previous studies showed much lower compliances as about 50 percent¹⁵. This may result from announcement of monitoring time ahead and uncloaked fashion of monitoring. Interestingly, in spite of the high baseline compliance, the inter-intervention compliance was markedly increased. It means that even in well educated group, the hand hygiene compliance can be increase by education and other activities. Think inside out, in spite of the HHI, HCPs didn't wash their hand in more than 10% of opportunity. Not only the educational programs but also the programs to improve HCPs' behavioral, normative and control belief about hand hygiene is needed to overcome HCPs' resistance¹⁶. According to the literature, the temporary improvement in hand hygiene compliance may be short-term¹². Therefore, continued reinforcement is needed to maintain hand hygiene compliance.

Another major issue addressed by this study is the impact of the HHI on the NCI rate. In this study, the NCI rate dropped during the HHI. However, the finding was not statistically significant. The data was collected from a single hospital' s surgical ICU, thus, the sample size was not calibrated to find a statistical difference. Furthermore, the NCI rate of the JNUH-SICU during the second half of the year 2010 was 5.98. This rate was already lower than the national average. According to the KONIS, the NCI rate of ICU (beds between over 400 and lesser than 699) during the second half of the year 2010 was 6.86. JNUH moved to a new building in the previous year, it may be the cause of this low baseline NCI rate. Low baseline NCI rate means that it would have been difficult to measure a small effect from the overall average to lower the NCI rate in JNUH-SICU by HHI.

As conclusions, hand hygiene compliance was improved by HHI, but further efforts will be needed to maintain the increased hand hygiene compliance. HHI diminished NCI rate in a single institute surgical ICU, but following studies will be needed to be conducted in order to acquire statistical significance.

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