Hospital Acquired Infection is Inversely Related to Utilization of Isopropyl Alcohol and Tissue Paper Pulls – A Prospective Observational Study

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Abstract

Introduction: Healthcare associated infections not only cause morbidity and mortality, but also drain the resources in the hospitals across the globe. It has been shown repeatedly that practicing hand hygiene is a deterrent to hospital acquired infection. It is essential for the infection control committee and the hospital administrators to have a fair idea of the prevailing hand hygiene practice in the healthcare facility. This is commonly obtained direct observation, self-reporting by healthcare workers and indirect calculation based on hand hygiene disinfectant product usage.

Aims: This study was planned to assess the indirect surrogates of hand hygiene among healthcare workers in an Indian hospital.

Methods: We presumed that the tools used to perform hand hygiene, the alcoholic hand rub and the tissue paper towel may throw light on the prevailing hand hygiene practice. An analysis of the quantity of alcohol hand rub and the number of tissue paper towel usage against the incidence of hospital acquired infection was made.

Observation: The mean incidence of HAI during the period of study was 8.5 ±6.7 (range 2 to 27) per month. There was a decrease in the HAI rates with increasing of alcoholic hand rub and tissue paper towels. It was predicted using the regression graphs that if the quantity of alcoholic hand rub usage increased to 2620 Ltrs/month, the HAI would be ‘0’. Similarly if 427,000 tissue paper towel pulls were used, the HAI would be ‘0’.

Conclusion: Studying the incidence consumption of the quantity of tissue paper rolls and isopropyl alcohol may be used as a surrogate of hand hygiene practice among healthcare workers.

Introduction

Health care–associated infection (HAI) is the leading, preventable etiology causing considerable morbidity, mortality, and additional use of resources. Practicing hand hygiene (HH) by health care workers (HCWs), is one of the integral steps to prevent nosocomial infection. It is now well understood that improvement in HH practice decreases nosocomial infection. The 3 most frequently reported methods of measuring HH compliance are, direct observation, self-reporting by HCWs and indirect calculation based on HH disinfectant product usage. Recently, Scheithauer and coworkers showed 2.75 folds difference between the direct observed incidence of HH and that calculated using consumption of disinfectant. McCuick and coworkers have shown that rate of consumption of disinfectants may indicate compliance of HCWs to HH practice. This work was carried with the hypothesis that the consumption of alcoholic hand rub (AHR) and tissue paper towels (TPT) may indicate the compliance of the HCWs to HH which may alter the incidence of HAI. We studied if the rate of consumption of AHR and TPT in the hospital could be considered as surrogate markers of HH and therefore the incidence of HAI. We conducted this study under the presumption that a watch on the consumption would guide the concerned personnel about the prevalence of HH among their HCWs.

Methods

The study was conducted prospectively for a period of two years from May 2007 to May 2009. Monthly data of total HAI, incidence of catheter related blood stream infection (CRBSI), ventilator associated pneumonia (VAP), catheter associated urinary tract infection (CAUTI) and surgical site infection (SSI), consumption of AHR in litres and TPT in 1000s of pulls (each pull is a prefixed length of approximately 10 inches of TPT that may be torn off) were noted. The incidence of the HAI was measured by the infection control nurse as a part of her routine duties. The definitions for the various infections were as recommended by the centre for disease control, USA. The number of units of AHR and TPT supplied to various departments in the hospital during that period was obtained on monthly basis from the hospital stores. The usage was reconfirmed by counting the used dispensers of AHR and the empty cartridges of the TPT rolls. Total number of HH that was practiced for the month could be calculated by the total volume of AHR used in the particular month divided by 1.7 ml (the dispenser used in the author’s institute dispenses 1.7 ml for every push of the pedal of the dispenser). The data was collected for all departments in the hospital; 8 wards in two floors of the hospital, obstetric ward, six intensive care units (ICUs), dialysis unit and emergency room.

Statistical methods: The data obtained were subjected to statistical analysis using SPSS 10.0 software. Pearson’s correlation coefficient and linear regression were carried out to analyze
Table 1: Showing the bed strength of various units in the hospital

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Results

The prospective study consisted of studying the consumption of AHR and TPT for a period of twenty four months commencing May 2007 and their relationship with HAI. Table 1 shows the bed strength of various units in the hospital. Our institution is a 300 bedded tertiary referral unit, with sub specialties of surgery such as cardiac, neuro, minimal access gastrointestinal and orthopedic surgeries in addition to intensive care units of cardiology, cardiac surgery, neurosurgery, pediatric cardiac surgery and medicine departments. It is a new facility commissioned in July 2006. The mean incidence of HAI during the period of study was 8.5 ±6.7 (range 2 to 27) per month. Fig. 1 shows the incidence of HAI, rate of consumption of AHR and TPTs. There was a decrease in the HAI rates with increasing frequency of markers of HH – TPT and AHR usage. The regression graph of HAI and AHR is shown in Fig. 2. The regression equation for HAI and AHR is:

\[ y = 17.5535 - 0.06684x \]

where ‘y’ is the number of HAI per month and ‘x’ is the number of liters of AHR used. As per this equation, if the utilization of AHR increases to 2620 Ltrs/month, the HAI would be ‘0’. Similarly regression equation for HAI and TPT (Fig. 3) showed:

\[ y = 15.4560 - 0.03619x \]

Using this equation if the HCWs used 427,000 TPT the HAI would be ‘0’.

Discussion

HH is one of the most important practices among HCWs that has been shown to reduce the incidence of HAI. The correct method of assessment of the incidence of the practice of HH is to analyze the data from audit of direct observation of HH practice among HCW. HAI is the leading, preventable etiology causing considerable morbidity, mortality, and additional use of resources. Practicing HH by HCWs is one of the integral steps to prevent nosocomial infection and forms the pivot for prevention of HAI. It is now well understood that improvement in HH practice decreases nosocomial infection. The 3 most frequently reported methods of measuring HH compliance are, direct observation, self-reporting by HCWs and indirect calculation based on HH disinfectant product usage. Recently, Scheithauer and coworkers showed 2.75 folds difference between the direct observed incidence of HH and that calculated using
consumption of disinfectant.\textsuperscript{7} Mc Guckin and coworkers have shown that rate of consumption of disinfectants may indicate compliance of HCWs to HH practice.\textsuperscript{6} The present study has shown observations similar to other authors listed above. Increase in the incidence of use of markers of hand hygiene – AHR and TPT may be made surrogates of HH practice in healthcare facilities. It benefits the administrators and supply chain – provides them with an objective number to work on. The projected use of AHR and TPT to achieve the utopian ‘zero infection’ might be helped by using these numbers. One of the potential weakness of this study is that a few assumptions such as a) only the predetermined number/ amount of TPT pulls and AHR were used per use; b) there was no wastage during use and c) patient factors such as immune compromise, preexisting subclinical sepsis were not taken into consideration.

**Conclusion**

Extrapolating the frequency of use of instruments required to practice hand hygiene might be used as a tool to predict HAI. The objective number derived from linear regression may help the managers of infection control committee, hospital administration and the supply chain to keep a watch on the HAI.

**References**
