Original Article

Hand hygiene practices in a neonatal intensive care unit in Ghana

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Abstract

Background: Compliance with hand hygiene recommendations is the most important measure in preventing health care-associated infections. The objective of this study was to assess the nature of patient contact and the hand hygiene practices of nurses and physicians in the neonatal intensive care unit in a tertiary hospital in Ghana.

Methodology: Unobtrusive observation of patient contact, hand hygiene practices, and hand washing technique among nurses and physicians attending randomly selected newborns for five hours daily for two weeks. Patient contact categorized as low-risk or high-risk. Hand hygiene practice before and after patient contact categorized as clean uncontaminated, clean recontaminated, new gloves, unchanged gloves. Compliance to alcohol rub use assessed.

Results: The patient to nurse/physician ratio varied from 9:1 to 12:1. There were 97 patient contacts of which 49 were high-risk and 48 low-risk. Most (73%) patient contacts were from nurses. Compliance to hand hygiene recommendations before versus after patient contact was 15.4% versus 38.5% for physicians and 14.1% versus 9.9% for nurses. Gloves were used for 60.8% patient contacts (85.7% high-risk, 35.4% low-risk); however, compliance to recommended procedure occurred in only 12.2% of high-risk contacts and none of the low-risk contacts. Gloves were not changed between patients in 43.7% of high-risk contacts and 88.2% of low-risk contacts. Hand washing protocol was generally followed. Alcohol hand rub was always available but was not used for hand hygiene.

Conclusions: Hand hygiene compliance of physicians and nurses was low. Gloves and alcohol rub were not used according to recommended guidelines. Incorporating effective education programs that improve adherence to hand hygiene guidelines into the continuing education curriculum of health professionals is recommended.

Keywords: hand hygiene, gloves, nurses, physicians

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Introduction

Infections are a major cause of neonatal mortality in developing countries. Most affected newborns die at home without medical care [1,2]. The current concerted global effort to reduce neonatal mortality and morbidity has placed strong emphasis on improving referral pathways and institutional care of the sick newborns [3,4]; however, these efforts may be subverted by the high rates of health care associated infections (HCAI) in the neonatal units of these countries [5].

Adherence to hand hygiene recommendations is the most important means to prevent and control the spread of HCAI (6); however, adherence to hand hygiene practices is poor worldwide [7,8]. Newborns admitted to neonatal units in poor-resource countries are at an especially high risk of acquiring HCAI because several factors known to facilitate the transfer of pathogenic organisms from patient to patient are common in these units. These factors include inadequate water and hospital supplies, invasive procedures, inappropriate use of antibiotics, lack of knowledge on infection control practices, overcrowding, and high patient to nurse ratios.

Many factors contribute to the adherence of recommended hand hygiene guidelines [9]; therefore, it is crucial to understand the current practices and behaviors of health care workers in order to develop appropriate and targeted interventions that might improve their hand hygiene practices. The purpose of this study was to assess the nature and frequency of patient contacts, and compliance of health care professionals (HP), specifically physicians and nurses, to recommended hand hygiene guidelines.

Materials and Methods

Setting

The neonatal intensive care unit (NICU) of Korle Bu Teaching Hospital is a 47-bed tertiary unit with total staff strength of twenty-nine nurses and nine physicians. On average, there are four nurses per eight-

hour shift and five doctors during daytime working hours. The unit's bed occupancy is usually about 100%, and on average, five newborns are admitted daily. The NICU is comprised of four glass-walled wards with eight to twelve incubators or bassinets per ward. Each ward has two hand washing sinks designed for closing the taps with forearms; antiseptic soap and disposable cotton towels are provided at each sink. A central workstation with 70% alcohol solution for hand rub and ubiquitously pasted notices reminding everyone to wash hands are available in each ward. There was always running water in the NICU during the study. The hand hygiene policy for the unit includes hand washing with soap and water before and after patient contact, use of alcohol hand rub on unsoiled hands during emergencies; use of gloves on clean hands; and disposal of gloves after each patient contact.

Procedure

The observer (A.A) underwent one week of training in the NICU to familiarize himself with the NICU setting and procedures under the guise of a medical student assigned to document general activities in the NICU. This was followed by a two-week period of observation and documentation during daytime shifts (0800 hours to 1300 hours daily) when most clinical activities occurred. On each observational visit, two target patients were randomly selected and all physicians' and nurses' contacts with the patient were observed. Each observed contact with the target patient provided two (before and after) hand hygiene opportunities and these were recorded separately. Complex or interrupted care procedures where the HP contaminated his hands by touching objects outside the incubator or bassinet provided a separate hand hygiene opportunity. Failure to adhere with recommended guidelines in these situations was counted as non-compliance.

Patient characteristics and the type of indwelling catheter each patient had were recorded. The nature of patient contact was categorized as low-risk or high-risk (Table 1) based on the presumed risk of contamination or transmission of microorganisms. Hand washing compliance was defined as hand washing with antiseptic soap and water before and after each patient contact. Recontamination of washed hands by touching objects outside the incubator or bassinet before patient contact during a set procedure was counted as non-compliance. Hand decontamination opportunities with alcohol rub before contact was observed and recorded separately. Hand washing technique was recorded using the essential steps of hand washing as shown in Table 2. Hand hygiene was required regardless of whether gloves were used. Appropriate glove use was defined as wearing new gloves on clean hands before patient contact and removal of the gloves without contaminating the environment after patient contact. Contacts with instruments were not recorded separately but the procedure for which the instrument was used was categorized as low-risk or high-risk.

Statistical analysis

Statistical Package for Social Sciences (SPSS) (version 13) software was used to analyze the data. χ^2 analysis was used to compare hand hygiene compliance before and after patient contact and between the nurses and physicians.

Results

The patient to HP ratio during the study period varied from 9:1 to 12:1. There were 97 patient contacts, of which 49 were high-risk and 48 low-risk. The majority 71/97 (73%) of the patient contacts were by nurses. The hand hygiene practices of HP are shown in Table 3.

Table 1. Nature of patient contacts for hand hygiene opportunities

High risk	Low risk
• Invasive procedures: vascular cannulation, endotracheal intubation or suction • Other procedures involving body fluids: wound dressing, passing nasogastric feeding tube, changing diaper • Administering intravenous and intramuscular medications	• Cup/tube feeding • Giving oral medications • Skin contact such as stimulation, padding, holding hands, touching, bathing • Attachment of pulse oximeter and ECG leads • Physical examination and vital signs assessment

Table 2: Checklist for hand washing

1. Remove all accessories (bracelet, watches, and if possible, rings)
2. Turn on water, wet hands, and apply antimicrobial soap
3. Rubbing palm to palm
4. Rubbing palm over dorsum
5. Rubbing fingers interlaced
6. Rubbing back of fingers
7. Rotational rubbing of thumbs
8. Rubbing wrists
9. Rubbing forearms
10. Rinse under running water
11. Keep hands higher than elbows while rinsing
12. Wipe hands dry with paper towel or air-dry
13. Wipe hands in fingertip to wrist direction
14. Turn off water without contamination

Few nurses 15/71 (21.1%) and physicians 6/26 (23.1%) washed their hands before patient contact and 1:3 of those who did (5/15 of nurses and 2/6 of physicians) contaminated their hands before patient contact. There was no significant difference (p = 0.94) in the pre-contact hand washing behavior of the two groups. Washed hands were contaminated with patients' hospital files and staff body parts. Physicians 10/26 (38.5%) were more likely (p = 0.002) to wash their hands after patient contact than nurses 7/71 (9.9%). When hands were washed, the hand washing procedure lasted 17.3 ± 1.4 seconds (range: 7-35 seconds) before contact and 21.8 ± 2.1 seconds (range: 10-45 seconds) after contact. Hand washing technique steps were generally followed, but rotational rubbing of thumbs (36%), rubbing of forearms (35%), rubbing of wrists (20%), and rubbing fingers interlaced (9%) were sometimes omitted.

Alcohol hand rub was always available in the unit but was not used for hand hygiene by both nurses and physicians. The overall glove use for high-risk patient contacts was 85.7% (42/49), and gloves were used appropriately in 14.3% (6/42) of these contacts, specifically 10.5% (4/38) for nurses and 18.2% (2/11) for physicians. Nurses did not change gloves between patients in 43.7% (14/32) of high-risk contacts and 88.2% (15/17) of low-risk contacts.

Discussion

We found a very high patient to HP ratio for intensive care services. About 15% of patient contacts

Table 3. Pattern of hand washing and glove use for hand hygiene

	Nurse contacts		**Physician contacts**	
	High risk 38 (%)	**Low risk 33 (%)**	**High risk 11 (%)**	**Low risk 15 (%)**
Hand Washing				
Hands washed only before contact	**6 (15.8)**	**8 (24.2)**	**1(9.0)**	**2(13.3)**
Hands washed before and after contact	**0**	**1 (3.0)**	**2(18.2)**	**1(6.7)**
Hands washed only after contact	**5 (13.2)**	**1(3.0)**	**4(36.4)**	**3(20.0)**
Glove Use				
Gloves used	**32 (84.2)**	**17 (51.5)**	**10 (90.9)**	**0**
Appropriate glove use	**4 (10.5)**	**0**	**2 (18.2)**	**N/A**
Gloves worn on contaminated hands but changed after contact	**14 (36.8)**	**2 (6.1)**	**8 (72.7)**	**N/A**
Gloves not changed between patients	**14 (36.8)**	**15 (45.4)**	**0**	**N/A**

were made with clean uncontaminated hands. Gloves were used appropriately in 12% of contacts; however, gloves were not changed between patients in many high- and low-risk contacts. The alcohol rub was not used by both physicians and nurses. The hand hygiene practices in many intensive care units have been shown to be suboptimal [10], ranging from 30% to 48%; however, the compliance rate in this study is lower than data from developed countries where most published work on hand hygiene compliance emanates.

The low compliance of hand hygiene practices in this study could be attributed to the high patient to HP ratio and lack of knowledge about good hand hygiene practices. Appropriate hand hygiene practice is a great challenge to an HP who has to look after 10 or more sick newborn patients. Pittet *et al*. [11] showed that high workload and high demand for strict adherence to hand hygiene are the most significant risk factors for noncompliance. We did not assess the knowledge that HP have about hand hygiene practices but presume that this may have been adequate in some aspects because the hand washing duration was within the recommended time limit and compliance to hand washing techniques was fairly good and comparable to other studies [12]; however, the high rate of inappropriate use of gloves and lack of use of the alcohol solution provided may have been due to lack of knowledge.

Other workers have shown high rates of inappropriate glove use in intensive care units [13] and have attributed this to the behavior of HP. This may well apply to HP in this study. Another factor that may have contributed to the high frequency of unchanged gloves could be the availability of gloves. A limited number of gloves was available at any time and it is feasible that nurses were conserving the gloves available per shift; however, lack of knowledge and attitude to infection control may have contributed to the high rate (88.2%) of unchanged glove use for low-risk contacts by nurses. The plain 70% alcohol solution available had no emollient. We did not find out why the alcohol solution was not used because of the nature of the study. It is feasible that the unpleasant effects of the alcohol solution on the hands of HP (14, 15) and lack of knowledge regarding its benefits in infection control could have contributed to noncompliance.

This study has some strengths and limitations. The direct observations were conducted unobtrusively under the guise of documenting NICU activities and none of the HP was aware that hand hygiene practice was being observed. The findings of this study may therefore represent the accurate status of hand hygiene practices in the NICU because the method we used is regarded as the gold standard for measuring adherence rate (16, 17). The small number of observations and the short duration of the study are limitations for a good statistical analysis of the data. The data collection was limited to the peak time of clinical work in NICU and the patients for observation were randomly selected to ensure that the hand hygiene practices of several HP were observed.

Hand hygiene practices vary between institutions and different strategies are needed to improve the practices among health care workers [18]. We envisage that HP education targeted to the following procedures will improve the hand hygiene practices in the NICU: (a) improve attitude to hand washing before and after patient contact; (b) increase awareness of the implications of hand recontamination practices and the benefits of clustering nursing care; (c) improve knowledge and attitude to appropriate use of gloves; (d) improve knowledge about alcohol rub use and its benefits in settings with high workloads. Improving the provision of basic hospital supplies, especially gloves and alcohol rub with emollient, is recommended. In the long term, we recommend a revision of current medical and nursing training curricula to include preventive practices, such as hand hygiene, that reduce the risk of health care associated infections.

Non-adherence to infection control practices, such as hand hygiene, is the single most potentially modifiable cause of health care-associated neonatal infections [19]. The burden of HCAI is high in poor-resource countries because overcrowding, lack of infrastructure, high patient to HP ratio, and inappropriate use of antimicrobial drugs are common. Institutional care of the sick newborn has been advocated as a means to reducing neonatal mortality. The benefits of such institutional care may be eroded by high infection rates and the resulting increase in morbidity, mortality, and health care funds. Focused and feasible educational programs that improve hand hygiene practices in these settings are crucial for improving the outcome of hospitalized newborns.

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