Original Article

Hand hygiene practices and resources in a teaching hospital in Ghana

Alfred E. Yawson[1] and Afua A. J. Hesse[2]

[1]*Public Health Unit, Korle-Bu Teaching Hospital, Korle-Bu, Accra, Ghana*
[2]*Medical Affairs Directorate, Korle-Bu Teaching Hospital, Accra, Ghana*

Abstract

Introduction: Nosocomial infections have long been neglected in Sub-Saharan Africa, and hand hygiene (HH) is usually neglected in hospital settings. This study aimed to provide baseline data on HH compliance among health workers and HH resources in a large West African teaching hospital.

Methodology: A cross-sectional, unobtrusive observational study assessed personal and care-related HH compliance among doctors and nurses and HH resources in 15 service provision centres of the Korle-Bu Teaching Hospital (KBTH), Ghana, in 2011. Data was collected with an infection prevention checklist and health worker HH compliance form, based on World Health Organization guidelines.

Results: Care-related HH compliance of doctors and nurses was low and basic HH resources were deficient in all 15 service centres. Care-related HH compliance among doctors ranged from 9.2% to 57% and 9.6% to 54% among nurses. HH compliance was higher when risk was perceived to be higher (*i.e.*, in the emergency and wound dressing/treatment rooms and labour wards). The neonatal intensive care unit (NICU) showed the highest level of compliance among health workers. Facilities for HH, particularly alcohol hand rub and liquid soap dispensers were shown to be deficient.

Conclusion: Care-related HH compliance among doctors and nurses in this large West African hospital is low; however, the NICU, which had implemented HH interventions, had better HH compliance. HH intervention programs should be designed and promoted in all service centres. Also, the introduction of alcohol-based hand rubs as an accessible and effective HH alternative in Korle-Bu Teaching Hospital is recommended.

Key words: hand hygiene; nosocomial infections; alcohol hand rub; health workers; teaching hospital; Ghana

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Introduction

Hand hygiene is universally acknowledged to be the single most important measure to prevent cross-transmission of microorganisms from one patient to another [1]. The transfer of microorganisms by the hands of hospital staff has been identified as a major factor in the transmission of hospital-acquired infections [2-4]. Hand hygiene is the cornerstone measure of prevention of health care-associated infection and to ensure safe client care. However, health care workers' compliance with good practice is low in most settings [5,6]. Multiple factors influence hand hygiene performance, and its promotion is particularly complex in developing countries where limited resources and culture-specific issues can strongly influence practices [6-9].

In Ghana, a cross-sectional observational study at the Komfo Anokye Teaching Hospital in Kumasi [10] indicated that the most commonly identified barriers to hand hygiene by health workers were limited resources and lack of knowledge on appropriate times to perform hand washing or rubbing. In the Korle-Bu Teaching Hospital (KBTH), the largest Teaching Hospital in Ghana [11], no baseline survey involving the major clinical departments has been undertaken. A study conducted in 2009, at the Neonatal Intensive Care Unit (NICU) of the Department of Child Health in the Korle-Bu Teaching Hospital [12], indicated that hand hygiene compliance of physicians and nurses in that unit was low.

The objective of this study was to provide baseline survey data on hand hygiene practices among health workers in the Korle-Bu Teaching Hospital and to determine the resources available for hand hygiene in all the major clinical service provision centres. The information generated from this study will provide the basis for health educational interventions and technical training of health workers with the aim of significantly improving health workers' compliance with hospital infection prevention standards.

Methodology

This cross-sectional, observational study of health workers at the Korle-Bu Teaching Hospital took place over a three-week period in September 2011. Health workers were unobtrusively observed performing their usual duties caring for clinical patients. Details regarding patient contact, hand hygiene compliance, and hand washing technique among the health workers were noted.

Study site

The Korle-Bu Teaching Hospital, a tertiary health care facility in Ghana, was the survey site. Four main clinical departments, *i.e.*, Internal Medicine, Surgery, Child Health, and Obstetrics and Gynaecology (OBGYN) as well as the main laboratory of the hospital (the Central Laboratory) were used as the survey centres.

Sampling methods/selection of survey sites

These five centres were selected based on the clinical services they provide and the critical importance of hand hygiene in the prevention of nosocomial infections among health staff and patients. In each clinical department, high-risk patient contact centres (*i.e.*, emergency rooms, wound dressing/treatment units, and labour wards) and medium-risk patient contact centres (inpatient wards) were selected for the survey. The Neonatal Intensive Care Unit of the Child Health Department was included as a high risk patient contact centre. The main phlebotomy (bleeding) room was chosen as a high-risk patient contact centre in the Central Laboratory. Medium-risk patient contact centres in clinical departments with multiple inpatients wards were chosen by a simple random technique. In all, 15 service centres were chosen.

Study population

The population for the survey was comprised of health workers, including doctors, nurses, and laboratory personnel in the service centres that were selected. All personnel in the phlebotomy room of the Central Laboratory were classified simply as laboratory personnel.

Data collection

Technically competent health personnel collected the data using the standardized infection prevention checklist instituted by the Infection Prevention and Control Unit of Korle-Bu Teaching Hospital. The checklist is an adaptation of the World Health Organization's (WHO) Ward infrastructure survey document [13]. It contains information on personal and care-related HH practices of health workers and, availability and functionality of basic hand hygiene materials and equipment. A modified version of the WHO form for hand hygiene direct observation [14] was used to assess HH compliance among health workers.

Overall six health personnel who had prior training and experience in infection prevention procedures collected the data. These technical personnel included the Principal Nursing Officer in charge of infection prevention in the hospital, two biomedical scientists with public health backgrounds, and three infection control coordinators; all were nurses above the rank of Nursing Officer, specifically trained in infection control. The observers worked in pairs to note the hand hygiene practices of health workers unobtrusively; *i.e.*, their presence did not influence or interrupt the schedules of the health workers as they provided care for patients, and the health workers in these service centres were not aware of being observed.

A representative mix of service provision centres (emergency units, wards, and phlebotomy room) and time of observation was used. Observers conducted their activity at times and in locations with a high density of care, to allow them to gather a greater number of opportunities more quickly. Each service centre was observed at a different time of day for two days, starting at 8:00 a.m. and ending at 5:00 p.m. each day. To limit intra-observer bias, each unit was observed by a different pair of technical personnel each day. Data was collected on health workers' hand hygiene practices. These were classified as "personal" and "care-related". Personal HH practices included HH routine upon arrival at work, when visiting the washroom, when eating any food while at work, and also before leaving work at the end of the day or duty shift. Care-related HH practices included hand hygiene routine before and after examining a patient or a clinical procedure, before and after touching any instrument/object contaminated with blood or body fluids, or after touching mucus membranes.

Personal and care-related HH practices were assessed and recorded, based on the World Health Organization hand hygiene observation method [15,16]. In addition, data was collected on the availability and state of function of materials/equipment needed for hand hygiene. Hand hygiene compliance (defined as the proportion of times that health-care workers performed hand

hygiene of all observed moments when this was required) was calculated for doctors and nurses in the service provision centres, and reported as a percentage [15,16].

Five care-related HH practices were used to assess HH compliance: before touching a patient, before performing an aseptic/clean procedure, after body fluid exposure risk, after touching a patient, and after touching patient surroundings. Also, within each service centre, HH was deemed to be practiced effectively if 50% or more of the health staff observed during the period followed the recommended procedures. Similarly, HH material/equipment was rated to be present if it was functional during the period of observation.

Effective hand hygiene for this survey was based on recommendations from the WHO Hand Hygiene Technical Reference Manual and included the use of alcohol hand rub and washing hands with soap and water. For the use of alcohol hand rub, application of a palmful of alcohol-based hand rub to cover all surfaces of the hands and hands rubbed until dry was considered to be effective. When washing hands with soap and water, wetting hands with water and applying enough product (soap) to cover all surfaces, then rinsing hands with water (for 40 to 60 seconds) and drying thoroughly was considered to be effective in clinical settings [15,16].

Data analysis

Overall, 15 service centres were surveyed and data were analyzed by simple descriptive statistics (*i.e.*, proportions, ratios and percentages). Hand hygiene compliance was calculated for doctors and nurses in all 15 service centres, and reported as a percentage of the estimated opportunities observed for the specific HH procedure. Data from the checklist were entered into Microsoft Excel 2007 (Microsoft, Redmond, WA, USA) and imported into SPSS version 19 (IBM SPSS Statistics, Chicago, USA), and analyzed.

Ethical issues

Clearance was obtained from the Management of the Korle-Bu Teaching Hospital and heads of the clinical units where the survey was conducted.

Results

Hand hygiene compliance among health workers of Korle-Bu Teaching Hospital

As displayed in Table 1, hand hygiene compliance among doctors and nurses at selected service provision centres in the teaching hospital was generally low. Overall, the high patient density areas (emergency rooms, treatment rooms, and labour wards) which also corresponded with high-risk patient contact centres, offered relatively more HH opportunities for both doctors and nurses; yet HH compliance was low, especially among nurses.

In all the centres, the percentage of HH actions performed was higher after examining or touching a patient than before examining or touching a patient among both doctors and nurses. Before examining patients the lowest percentage of compliance for doctors was 9.2% in a medium-risk centre (on a Child Health ward) compared to 21.7% compliance as the lowest percentage after examining a patient. Similarly for nurses, the lowest percentage of compliance was 9.7% in a high-risk centre, the Surgical Medical Emergency, compared to 22% as the lowest percentage of compliance in the Children's Emergency Room.

Interestingly, the percentage of HH compliance for doctors was relatively higher in the high-risk patient contact centres than in the medium-risk centres both before and after examining or touching a patient. The nurses had a higher percentage of HH compliance on the inpatient wards (medium patient contact risk) than in the emergency rooms (high-risk areas). Also, nurses had more opportunities to practice HH than doctors after touching contaminated objects or materials in the patients' surroundings, and they exhibited a relatively higher percentage of HH compliance in these circumstances compared to other times when HH procedures were called for. Nurses exhibited 50% or more HH compliance in all high- and medium-risk centres, particularly in the Child Health and OBGYN service centres.

Unfortunately, as indicated in Table 1, among both doctors and nurses, HH compliance after exposure to body fluids and touching mucus membranes of patients was low. Among doctors it ranged from 15% at a medium-risk centres (surgical ward) to 28.3% in the NICU (a high-risk area), and among nurses it ranged from 16.2% at a medium-risk centres (surgical ward) to 29.8% in the NICU.

It is important to note that health workers (doctors and nurses) in the Child Health NICU had a relatively higher percentage of HH compliance for all five care-related HH practices than workers in the other centres, especially before performing an aseptic procedure, after examining a patient, and after touching contaminated objects or materials in the patients'

Table 1. Hand hygiene compliance among health workers (doctors and nurses) in 15 service centres of Korle-Bu Teaching Hospital

Service Provision Centre		Total estimated HH Opportunities (% of HH action performed) among health workers for care-related HH practices											
		Before examining (touching) a patient		Before aseptic /clean procedure		After body fluid exposure risk (touching mucus membranes, eye, nose etc)		After examining (touching) a patient		After touching contaminated objects with blood or body fluids (patient's surroundings)		**Overall average Compliance (%)**	
		doctor	**nurse**	**doctor**	**nurse**	**doctor**	**nurse**	**doctor**	**nurse**	**doctor**	**nurse**	**doctor**	**nurse**
Medical	High risk (2 SME centres)	150(11)	120(9.7)	110(21)	90(18.2)	103(22.3)	112(23)	157(28)	60(25.7)	142(24)	160(29)	21.3	21.2
	Medium risk (3 wards)	62(9.6)	80(12.3)	40(17.4)	35(19.2)	52(22)	65(25.6)	74(18.4)	87(22.3)	70(23.6)	95(30.5)	18.2	22.0
Surgical	High risk (treatment room)	46(42)	60(45)	42(57)	56(54.2)	38(22)	32(26.7)	40(50)	46(51.1)	37(38.2)	62(42.3)	41.8	43.9
	Medium risk (2 wards)	65(10.2)	84(11.6)	52(18.5)	63(20.5)	40(15)	53(16.2)	61(27.3)	82(23.3)	52(34.4)	94(34)	21.1	21.0
Child Health	High risk (ER)	70(10.4)	86(9.6)	62(27)	57(24.8)	55(23)	40(19.7)	68(25.7)	81(22)	69(38)	75(35.6)	24.8	22.3
	Medium risk (1 ward)	32(9.2)	41(11)	27(13.8)	20(15)	17(18.2)	23(19.7)	35(22.1)	47(25)	26(50.7)	51(52.3)	22.8	24.6
	NICU (High risk)	102(17.2)	116(14.7)	114(49)	125(46.2)	97(28.3)	88(29.8)	98(52.1)	121(50.2)	62(51.3)	91(52.2)	38.6	38.8
OBGYN	High risk (ER & labour ward)	120(10.2)	142(10.1)	116(27)	18(21.2)	93(19.1)	102(16.6)	126(51)	130(50.2)	82(49.6)	143(53.7)	31.4	30.4
	Medium risk (1 ward)	58(9.4)	64(11.1)	47(13.7)	51(14)	42(24.3)	38(26)	60(21.7)	68(24)	63(51)	71(53)	24.0	25.6

Note numbers in parenthesis represent HH actions performed as a percentage of the total estimated HH opportunities.

ER = Emergency room NICU = Neonatal Intensive Care Unit SME = Surgical Medical Emergency

OBGYN = Obstetrics and Gynaecology Department

Table 2. Assessment of effective hand hygiene practices by health workers in 15 service provision centres at Korle-Bu Teaching Hospital

Service Provision Centre		**Effective hand hygiene practice**						**Total (%)**
		Soap and running water used for hand washing	Running water available for hand washing	Wash hands for recommended 40-60 seconds.	Hands cleaned with alcohol hand rub	Staff dry hands with clean single use towels	Staff perform steps of hand washing appropriately	
SME	M/F Ward	√	√	*0*	*0*	√	*0*	*3 (50)*
	Resuscitation Unit	√	√	*0*	*0*	√	*0*	*3 (50)*
Medical	2nd Floor	√	√	*0*	*0*	√	*0*	*3 (50)*
	3rd Floor	√	√	*0*	*0*	√	*0*	*3 (50)*
	4th Floor	√	√	*0*	*0*	√	*0*	*3 (50)*
Surgical	Treatment room	√	√	*0*	*0*	√	*0*	*3 (50)*
	4th Floor	√	√	*0*	*0*	√	*0*	*3 (50)*
	5th Floor	√	√	*0*	*0*	√	*0*	*3 (50)*
Child Health	ER	√	√	√	√	*0*	*0*	*2 (33)*
	3rd Floor	√	√	*0*	√	√	*0*	*4 (67)*
	NICU	√	√	√	√	√	*0*	*4 (67)*
OBGYN	ER	√	√	√	*0*	*0*	*0*	*2 (50)*
	Labour ward 1	√	√	*0*	*0*	√	*0*	*3 (50)*
	2nd Floor	√	√	*0*	*0*	√	*0*	*3 (50)*
Central Laboratory	*Phlebotomy room*	√	√	*0*	*0*	√	*0*	*3 (50)*

0 = less than 50% of health workers in service center complied with HH procedures
√ = 50% or more of health workers in service center complied with HH procedures

Table 3. Availability of basic hand hygiene materials/equipment in 15 service centres of Korle-Bu Teaching Hospital

Service Provision Centre		Availability and function of HH materials								Total (%)
		Alcohol hand rub available	Single use towel available	Soap in perforated dish (not left on basin /sink)	Liquid soap dispenser available	Liquid soap in dispenser	Liquid soap available and readily accessible	A hand hygiene facility available and readily accessible	Hand hygiene facility clean	
SME	M/F Ward	*0*	√	*0*	√	*0*	*0*	√	√	*4 (50)*
	Resuscitation Unit	*0*	√	√	√	*0*	*0*	√	√	*5 (63)*
Medical	2nd Floor	*0*	√	√	√	√	√	√	√	*7 (88)*
	3rd Floor	*0*	√	√	√	*0*	√	√	√	*6 (75)*
	4th Floor	*0*	√	√	√	√	√	√	√	*7 (88)*
Surgical	Treatment room	*0*	√	*0*	√	√	√	√	√	*6 (75)*
	4th Floor	*0*	√	√	√	*0*	*0*	*0*	√	*4 (50)*
	5th Floor	*0*	√	*0*	√	*0*	*0*	*0*	√	*3 (38)*
Child Health	ER	√	√	*0*	*0*	*0*	*0*	√	√	*4 (50)*
	3rd Floor	√	√	√	*0*	*0*	√	√	√	*6 (75)*
	NICU	√	√	√	*0*	*0*	*0*	√	√	*5 (63)*
OBGYN	ER	*0*	*0*	*0*	√	*0*	*0*	√	*0*	*2 (25)*
	Labour ward 1	*0*	√	√	√	√	√	√	√	*7 (88)*
	2nd Floor	*0*	√	*0*	*0*	*0*	*0*	*0*	√	*2 (25)*
Central Laboratory	*Phlebotomy room*	*0*	*0*	*0*	*0*	*0*	*0*	√	√	*2 (25)*

0 = hand hygiene material/equipment absent during the period of observation

√ = hand hygiene material/equipment present or available during the period of observation

surroundings. In this unit, doctors exhibited relatively higher HH compliance for all HH practices observed except after body fluid exposure and touching contaminated objects in the patient's surroundings, where the nurses had a higher percentage.

In addition, health workers in the surgical treatment/wound dressing room also exhibited relatively high HH compliance, especially before and after examining or touching a patient, before an aseptic procedure, and after touching contaminated objects or materials in the patients' surroundings.

Table 1 also shows the overall average HH compliance in all 15 centres. The overall average compliance for doctors ranged from 18.2% at a medium-risk centre to 41.8% at a high-risk centre. Similarly, among nurses, the overall average compliance ranged from 21.0% at a medium-risk centre to 43.9% at a high-risk centre.

Practice of effective hand hygiene procedures by health workers

Observations indicated that health workers in all 15 clinical service provision centres exhibited relatively good personal HH compliance regarding the use of the washroom, before and after eating, and before leaving the service centre at the end of working shifts. It was noted that most health workers (doctors and nurses) observed in all 15 centres during the survey period washed their hands after using the washroom, before attending to a patient, or before undertaking any procedure. Almost all health workers washed their hands before and after eating during the working shift and also before leaving at the end of the working shift.

Table 2 illustrates HH procedures among health workers as observed and compared with effective HH techniques recommended by the WHO. In all 15 centres, almost all health workers who practiced HH were observed to use soap and running water, and running water was observed to be available in these centres. However, more than half of the health workers in each area were observed practicing the recommended effective hand washing procedure using running water and soap in only three centres, specifically the NICU, the Child Health Emergency Room, and the Labour Ward 1 of OBGYN.

As indicated in Table 2, alcohol hand rub was available for use by health workers in only three service centres. Incidentally, all three centres were in the Department of Child Health and although alcohol hand rub was present, less than half of the health workers observed in the Child Health Emergency Room used it.

Overall, the observers determined that most staff (doctors, nurses and laboratory personnel) in all 15 service centres performed the steps of effective HH (either with soap and running water or alcohol hand rub) incorrectly according to WHO hand hygiene guidelines.

Availability and function of basic hand hygiene materials/equipment

Table 3 shows that in all but two centres (the OBGYN emergency room and the phlebotomy room of the Central Laboratory) where single use towels were not available, health workers dried their hands with clean single-use towels. Regarding the storage of soap for hand washing, eight centres had soap in perforated containers (which was a preferred option) while seven left the soap on the sink or basin.

Basic equipment for HH such as a liquid soap dispenser was not available in five service centres, which included all high-risk and medium-contact centres in the Department of Child Health and the phlebotomy room of the Central Laboratory. Although ten centres had liquid soap dispensers, liquid soap was available for use in only four centres. Liquid soap dispensers were observed not to be readily accessible to health workers in six centres; health workers had to walk through congested work stations to have access. This situation was noticed in both high-risk patient contact and high patient density centres, in all clinical departments of the hospital (Table 3). However, in all but one centre, the available HH facility was observed to be clean.

Regarding the availability of HH facilities, the Children's Emergency Room and second floor of the OBGYN and phlebotomy room of the Central Laboratory were the least resourced areas. Overall, no single service provision centre in the Hospital had all the basic facilities needed for effective hand hygiene.

Discussion

This cross-sectional study involving concealed observation of hand hygiene practices of health workers and hand hygiene resources in Korle-Bu Teaching Hospital in Ghana indicated that hand hygiene compliance of doctors and nurses was low and that basic hand hygiene facilities were limited in all 15 service provision centres. This finding agrees with those of other baseline surveys which indicated that health worker compliance with hand hygiene recommendations at baseline was low [5,12,17-21].

The current survey indicated that adherence to the care-related HH practices observed (*i.e.*, before and after examining or touching a patient, before aseptic/cleaning procedures, after body fluid exposure risk, and after touching patient surroundings) was low among doctors and nurses in all the service provision centres surveyed. Overall compliance with care-related HH practices ranged from 9.2% to 57% among doctors and 9.6% to 54% among nurses.

Overall, compliance was higher when the risk was perceived to be higher. This perception was demonstrated by higher percentages of HH compliance after touching patients than before touching patients and also in high-risk patient contact service centres (*i.e.*, the emergency room, wound dressing/treatment rooms, and labour ward) than it was in medium-risk patient contact centres (*i.e.*, the inpatient wards), especially among doctors. In addition, health workers in all service centres had very high compliance for personal HH practices (*i.e.*, after using the washroom, before and after eating, and before leaving work at end of the working shift).

The general low HH compliance observed in this study agrees with findings from a multicentre baseline HH survey conducted in the southern Mediterranean region (between 2002 and 2003 in 22 hospitals) which found that the overall compliance rate was very low (27.6%), and was significantly higher where the perceived risk was considered to be high [21]. In the Neonatal Intensive Care Unit (NICU) of the Department of Child Health where a previous study on hand hygiene had been conducted [12], compliance with care-related HH practices among doctors and nurses was relatively much better. HH was relatively better practiced in the NICU before an aseptic procedure, after touching a patient, and after touching instruments/objects contaminated with blood or body fluids in the patient's surroundings. The previous HH study in the unit indicated among other findings that compliance with recommended HH procedures by health workers was low [12].

However, the current survey demonstrated general improvement in HH compliance of health workers in the NICU because of the interventions instituted after the baseline survey three years ago. In the previous study, HH compliance of doctors after touching a patient was 38.5% compared to our finding of 52.1%, and that of nurses was 9.9% compared to 50.2% in this study [12]. Another study in an NICU in Thailand involving 26 nursing personnel showed that HH compliance improved significantly from 6.3% before implementing a hand hygiene promotion programme to 81.2% seven months after the program was instituted [20]. A refresher course aimed at the health workers in the NICU at the KBTH may help increase compliance in our facility since it has been close to three years since the intervention was instituted.

It is crucially important for health workers to practice hand hygiene, especially during the care of patients in intensive care and emergency units [22]. Hand hygiene is considered to be the most important tool in nosocomial infection control [23] and evidence exists that, compared with no HH at all, a simple hand wash (with soap and water) or alcohol hand rub reduces the transmission of nosocomial pathogens [18,22,24,25].

Several studies have provided evidence that health worker hand hygiene practices greatly improve when interventions are implemented after baseline surveys [5,6,26]. Providing a planned HH training programme to health workers is important in creating sensitivity and renewing knowledge on the subject [26]. A 2011 survey by Erkan *et al.* in which the HH behaviour and knowledge of nurses were evaluated before and after training, determined that training increased the nurses' knowledge of HH, the frequency and time the nurses spent practicing HH, and the quality of HH practiced by the nurses [26].

In our survey as well, HH compliance of health workers in the NICU was much better compared to that in the other 14 service centres, emphasizing that HH interventions implemented after a baseline survey garnered improvement in health worker HH practices. The institution of HH interventions in all service areas, especially in the high-risk patient contact and high patient density centres (*i.e.*, emergency rooms, treatment rooms and labour wards) is a policy worth pursuing by the management of our teaching hospital.

Overall compliance with the WHO recommended procedures for effective HH (either with soap and water or alcohol hand rub) among health workers was low, particularly in the high patient density centres. This low compliance agrees with findings from another large hospital where observations indicated that among health workers who attempted HH, improper procedures and hand-drying were common [10]. Thoroughly drying the hands is essential as wet hands have been described to significantly increase risk of cross-transmission [23,24].

Unfortunately, HH compliance among health workers is influenced by multiple factors, and its promotion is particularly complex in developing countries where limited resources can strongly influence practices [6,7,27-31]. Our survey indicated

that alcohol hand rub was available for use by health workers in only 3 of the 15 centres in our hospital. Furthermore, even in the few centres where alcohol hand rub was available, health workers did not use it. Alcohol hand rub is known to be effective in preventing nosocomial infections [19], and ample evidence exists of its efficacy and convenience [19,25,32]. A measure to encourage its use in areas with high patient density (*i.e.*, emergency rooms, labour wards and NICU) is to make alcohol hand rub available in convenient locations, or in individual pocket-size bottles to be carried by health-care workers. Evidence indicates that when basic HH apparatus such as alcohol hand rub are introduced on easily accessible trolleys in service provision points, usage among health workers increase [33].

Another important observation was that care-related HH compliance among nurses was relatively better in the wards (*i.e.*, low density patient centres) compared to the compliance observed in the emergency centres. In practice, nurses on the wards may have ample time to prepare to touch or perform procedures on patients relative to the time they have to interact with patients in high patient density emergency centres. Thus low HH compliance among health workers may be associated with insufficient time to perform HH procedures as a result of high workload or understaffing. Other observational studies have also shown that the time required for health workers to leave a patient's bedside or examination point, to go to a sink and wash and dry their hands before attending to the next patient, is a deterrent to a high HH compliance [32].

In addition, in our setting, although soap dispensers were present in 10 of the 15 centres, liquid soap was available for use in only four. These dispensers were not readily accessible by health staff during the care of patients, especially in emergency centres. Single use towels or disposable paper towels were also absent in two service centres. A previous study in another large hospital in Ghana found that limited access to HH facilities was one of the primary recognized causes of low HH compliance [10]. The provision of these basic HH commodities should be considered a priority in quality health care delivery by the hospital. We believe HH would be more frequently practiced in Korle-Bu Teaching Hospital if basic HH facilities were made consistently available and therefore recommend the promotion of alcohol hand rub as a more readily accessible and effective HH measure for workers in this large hospital [19].

Some limitations of this observational assessment are important to note. Because of the relatively short duration of the study, the inventory of HH resources and observation of practices was conducted at a single point in time and may not represent the true availability of resources over time. Furthermore, because data was collected by observers watching large, busy health worker groups, there may have been a potential under-recording of HH events. Inter-observer variability among the six observers in recording HH opportunities and actions by health workers in these 15 centres was an additional limitation. Acknowledging these limitations, this baseline assessment provides a guide to future efforts in improving HH in the KBTH.

Conclusion

This study provides evidence that care-related HH compliance among doctors and nurses in this large West African teaching hospital is low; therefore, there is a need to design HH promotion intervention programmes in all service provision centres. These programs should emphasise HH practices as the foundation of universal basic precautions in reducing nosocomial infections, reducing complications, and improving quality of health-care delivery [5,34]. In addition, HH education and promotion in the hospital (and other health facilities) should include the introduction of alcohol-based hand rubs as an accessible and effective HH option.

Finally, the provision of a more consistent supply of either disposable paper towels or single-use cloth towels as well as a consistent supply of liquid soap in dispensers in easily accessible locations is a policy worth pursuing.

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References

1. Larson EL (1995) APIC guideline for hand washing and hand antisepsis in health care settings. Am J Infect Control. 23: 251-269.
2. Reybrouck G (1983) Role of the hands in the spread of nosocomial infections. Int. J Hosp Infect 4: 103-110.

3. Larson E (1988) A causal link between hand washing and risk of infection? Examination of the evidence. Infect Control Hosp Epidemiol 9: 28-36.
4. Pittet D, Allegranzi B, Sax H, Dharan S, Pessoa da Silva C, Donaldson L, Boyce J (2006) Evidence-based model for hand transmission during patient care and the role of improved practices. Lancet Infect Dis 6: 641-652.
5. Allegranzi B, Sax H, Bengaly L, Richet H, Minta D, Chraiti M (2010) Successful Implementation of the World Health Organization Hand Hygiene Improvement Strategy in a Referral Hospital in Mali, Africa. Infection Control and Hospital Epidemiolog 31 Suppl 2: 133-141.
6. World Health Organization (2009) WHO guidelines for hand hygiene in health care. Geneva: World Health Organization.
7. Pittet D, Simon A, Hugonnet S, Pessoa-Silva CL, Sauvan V, Perneger TV (2004) Hand hygiene among physicians: performance, beliefs, and perceptions. Ann Intern Med 141: 1–8.
8. Pittet D (2004) The Lowbury lecture: behaviour in infection control. J Hosp Infect 58: 1–13.
9. Pittet D (2000) Improving compliance with hand hygiene in hospitals. Infect Control Hosp Epidemiol 21: 381–386.
10. Owusu-Ofori A, Jennings R, Burgess J, Prasad PA, Acheampong F, Coffin SE (2010) Assessing Hand Hygiene Resources and Practices at a Large African Teaching Hospital. Infect Control Hosp Epidemiol 31 Suppl 8: 802-808.
11. Annual Report of the Korle-Bu Teaching Hospital (2009).
12. Asare A, Enweronu-Laryea CC, Newman MJ (2009) Hand hygiene practices in a neonatal intensive care unit in Ghana. J Infect Dev Ctries 3 Suppl 5: 352-356.
13. Ward infrastructure survey (2010) Geneva: World Health Organization.
14. Observation Form (2010). Geneva, Switzerland: World Health Organization; 2010.
15. Sax H, Uckay I, Pittet D (2009) The World Health Organization hand hygiene observation method. Am J Infect Control 37: 827-834.
16. World Health Organization (2009) WHO guidelines for hand hygiene in health care. Geneva, Switzerland: World Health Organization.
17. Doebbeling BN, Stanley GL, Sheetz CT (1992) Comparative efficacy of alternative hand-washing agents in reducing nosocomial infections in intensive care units. N Engl J Med 327: 88-93.
18. Graham M (1990) Frequency and duration of hand washing in an intensive care unit. Am J Infect Control 18: 77-81.
19. Nguyen KV, Nguyen PT, Jones SL (2008) Effectiveness of an alcohol-based hand hygiene programme in reducing nosocomial infections in the Urology Ward of Binh Dan Hospital, Vietnam. Trop Med Int Health 13 Suppl 10: 1297-1302.
20. Picheansathian W, Pearson A, Suchaxaya P (2008) The effectiveness of a promotion programme on hand hygiene compliance and nosocomial infections in a neonatal intensive care unit. Int J Nurs Pract 14 Suppl 4: 315-321.
21. Amazian K, Abdelmoumène T, Sekkat S, Terzaki S, Njah M, Dhidah L (2006). Multicentre study on hand hygiene facilities and practice in the Mediterranean area: results from the NosoMed Network. J Hosp Infect 62 Suppl 3: 311-318.
22. Malik RK, Montecalvo MA, Reale MR, Li K, Maw M, Munoz JL (1999) Epidemiology and control of vancomycin-resistant enterococci in a regional neonatal intensive care unit. Pediatr. Infect. Dis. J 18: 352–356.
23. Nystrom B (1994) Impact of handwashing on mortality in intensive care: examination of the evidence. Infect. Control Hosp. Epidemiol 15: 435–436.
24. Shahid NS, Greenough WB, Samadi AR, Huq MI, Rahman N (1996) Hand washing with soap reduces diarrhoea and spread of bacterial pathogens in a Bangladesh village. J Diarrhoeal Dis Res 14: 85-89.
25. Casewell M, Phillips I (2000) Hands as route of transmission for *Klebsiella* species. *BMJ* 977 Suppl 2: 1315-1317.
26. Erkan T, Fındık UY, Tokuc B (2011) Hand-washing behaviour and nurses' knowledge after a training programme. International Journal of Nursing Practice 17: 464–469.
27. Glynn A, Ward V, Wilson J, Charlett A, Cookson B, Taylor L, Cole N (1997) Hospital Acquired Infection: Surveillance, Policies and Practice. Public Health Laboratory Service, London.
28. Creedon SA (2005) Healthcare workers' hand decontamination practices: compliance with recommended guidelines. Journal of Advanced Nursing 51 Suppl 3: 208–216.
29. Rebaudet S, De Pina JJ, Rapp C, Kraemer P, Savini H, Demortiere E, Simon F (2008). Risk of nosocomial infection in Intertropical Africa. Part 4: prevention. Med Trop 68 Suppl 1: 73-82.
30. Borghi J, Guinness L, Ouedraogo J, Curtis V (2002) Is hygiene promotion cost-effective? A case study in Burkina Faso. Trop Med Int Health 7 Suppl 11: 960-969.
31. Hugonne S, Perneger T, Pittet D (2002) Alcohol-Based Handrub Improves Compliance With Hand Hygiene in Intensive Care Units. Arch Intern Med 162: 1037-1043.
32. Boyce JM, Pittet D (2002) 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. Morb. Mortal. Wkly. Rep 51: 1–45.
33. Wharton EM, Platt AJ (2006) Can we improve doctors' hand hygiene on ward rounds? Journal of Hospital Infection 64; 400-409.
34. Samuel R, Almedom AM, Hagos G, Albin S, Mutungi A (2005) Promotion of hand washing as a measure of quality of care and prevention of hospital-acquired infections in Eritrea: the Keren study. Afr Health Sci 5 Suppl 1: 4-13.

Corresponding author
Alfred E. Yawson
Public Health Unit
Korle-Bu Teaching Hospital
PO Box KB 77
Korle-Bu, Accra, Ghana
Telephone: +233 302 673033; Cell phone: +233 244 662711, +233 206 301049
Email: aeyawson@yahoo.com

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