

Coming clean on hand hygiene

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Abstract

Introduction: Hand hygiene is universally recognized as one of the most effective ways to reduce the cross-transmission of hospital acquired infections. Successful strategies to improve hand hygiene compliance require a baseline knowledge of hand hygiene practices.

Methodology: A direct observational method was used to collect data about hand hygiene practices amongst medical doctors by a group of trained medical students during their clinical assignments. To prevent any bias during the observation, the purpose of the study was not disclosed to the doctors; they only knew that they were being observed for infection control practices. A structured data collection sheet was used to direct the observations. Data on hand hygiene practices was collected during routine clinical work over a number of weeks. Observers recorded the professional grade of physician observed, speciality, location, activity performed, method used, and facilities available.

Results: A total of 898 observations were recorded. Overall compliance before and after doctor-patient contact was 22.7% and 33.5% respectively. Within specialties, hand hygiene practices were lowest in obstetrics and gynaecology and highest in specialized surgical units. Poorest compliance was evident in house officers before patient contact, while the most compliant was the registrar group, following examination. Alcohol hand rub was the preferred method in the wards whilst hand washing was mainly utilised in the outpatient setting.

Conclusion: Hand hygiene amongst doctors in St Luke's Hospital is low and could be a factor in the high MRSA endemicity.

Introduction

Healthcare associated infections, especially those caused by multidrug-resistant bacteria such as methicillin-resistant *Staphylococcus aureus* (MRSA), are important causes of morbidity, mortality and increased costs for hospitalized patients.^{1,2} Hospitals in the Mediterranean region (including Malta, Cyprus and France) show a high prevalence of MRSA.³ Hand hygiene is recognized as the leading measure to prevent cross-transmission of microorganisms and to reduce the incidence of such infections.^{4,5}

Two major groups of micro-organisms are found on the skin: organisms that normally reside on it (resident flora) and contaminants (transient flora). Unless introduced into body tissues by trauma, surgery or medical devices, the pathogenic potential of the resident flora is low. Transient flora, following cross-transmission, are responsible for most hospital infections.⁶

Patient-to-patient transmission of infective organisms within healthcare settings primarily occurs via carriage on the hands of healthcare workers. Adherence to hand hygiene guidelines reduces hand colonization and therefore transmission of these organisms.^{2,7}

Numerous studies amongst health care workers have demonstrated low compliance with hand hygiene between patients and poor techniques when it is performed.¹ The aim of this study was to assess the current situation at St. Luke's Hospital, Malta since to date, no local audit has been carried out. Hand hygiene initiatives have been undertaken regularly by the Infection Control Committee of this hospital, and these

Key words

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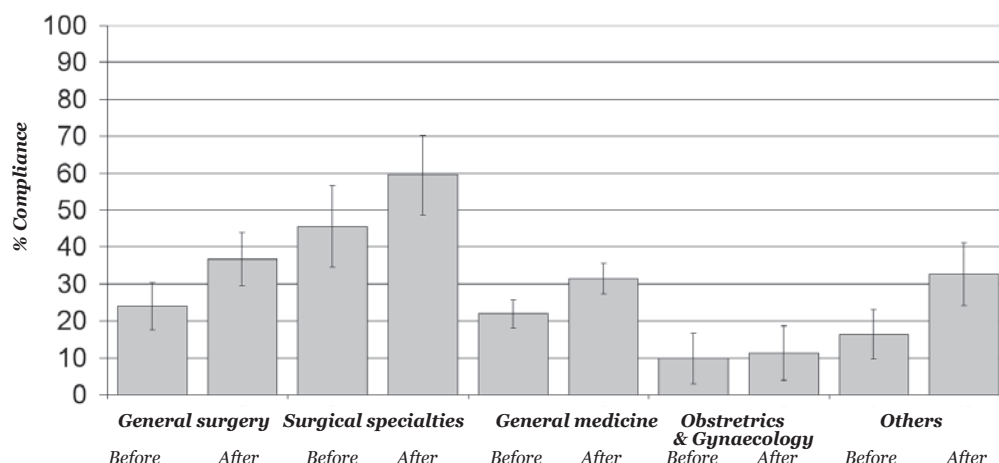
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Figure 1: Adherence to hand hygiene according to speciality with bars showing the 95% confidence intervals



have included several conferences that addressed this issue as well as dissemination of educational materials, particularly leaflets (<http://www.slh.gov.mt/icunit>).

Methodology

We conducted a direct observational study of physicians working at St. Luke's Hospital between November 2005 and February 2006. The sample population included doctors of all grades (ranging from house-officers to consultants). The majority of observations were carried out in the following specialties: Surgical Specialty, General Surgery, Medicine, Obstetrics and Gynaecology. Any other specialties observed were grouped together.

Sixty medical students in different clinical years of their studies were recruited and trained on a one-to one basis. They were instructed to unobtrusively observe the doctors that they were assigned with for their clinical attachments (weekdays 9.00am–11.00am). During the stated period – one student

from each group was recruited on a voluntary basis. The time of the day was also advantageous, as activity tends to be more intensive. With the number of observers available for this study, the authors could cover 64% of firms in the hospital (48 firms from 75). No refusals were forthcoming. Each firm comprises approximately 4 doctors. The clinical attachments determined our sample population, the specialties observed, and the location of the observations. This is known as convenience sampling.

Each student was provided with a structured data collection sheet, developed purposely for this study, after a pre-testing phase. The aim of having a structured sheet was to minimise subjectivity due to having different observers. The observational log sheet incorporated pre-defined data fields including: doctors' grade, specialty, whether the hand hygiene opportunity occurred in a ward or out patient setting as well as the type of patient contact involved. It was also recorded whether hygiene facilities, namely hand washing sinks and alcohol rub stations were

Figure 2: Adherence to hand hygiene according to grade with bars showing the 95% confidence intervals

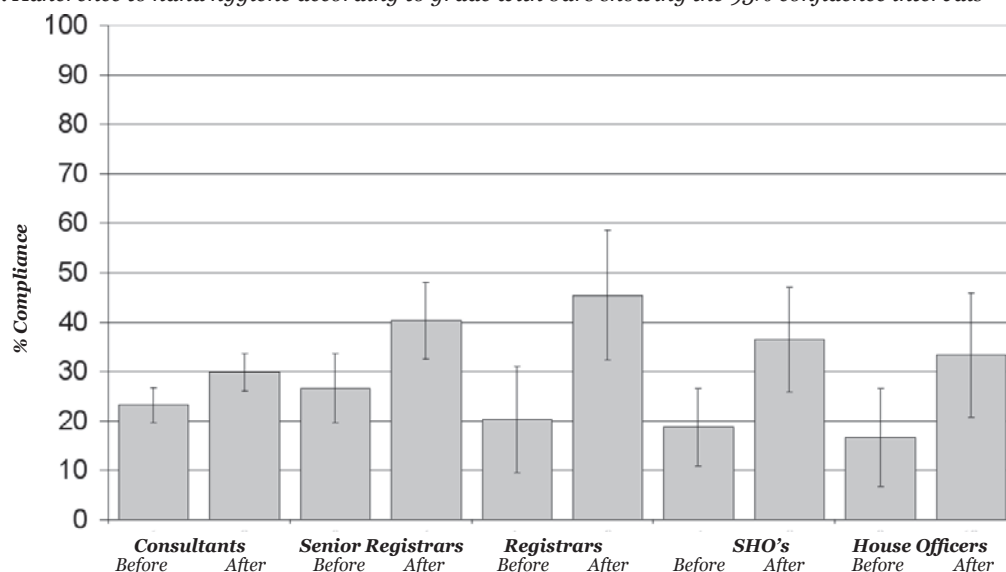
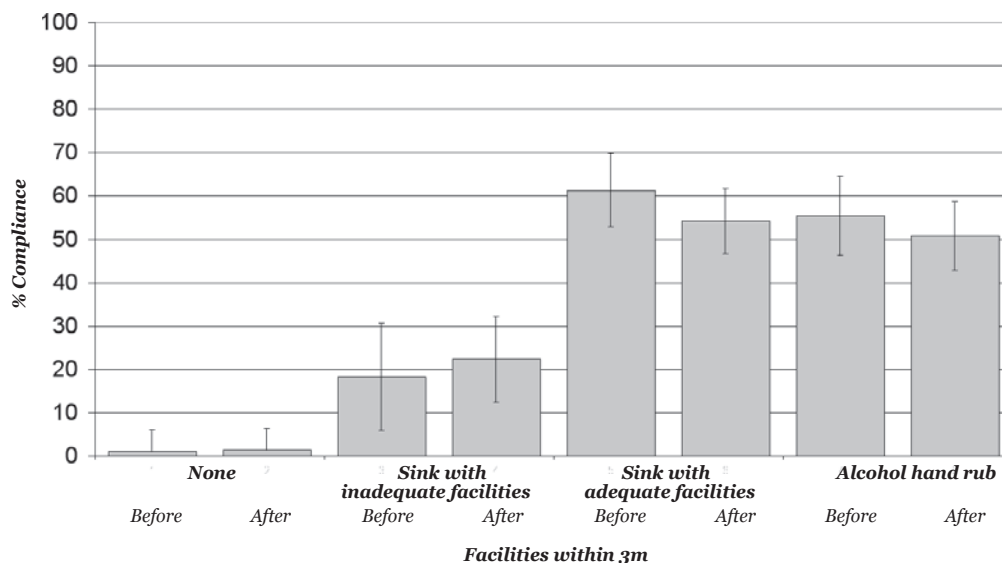


Figure 3: Adherence to hand hygiene according to facilities with bars showing the 95% confidence intervals. 'Sink with adequate facilities' includes the presence of alcohol or soap with concurrent paper towels. 'Inadequate facilities' signifies the presence of cloth towels irrespective of the availability of soap



present within 3 metres. In the case of the sink it additionally assessed whether adequate facilities for hand washing and drying were present. Finally, hand hygiene practices before and after the patient contact was recorded together with the method used. If hand hygiene was undertaken between patients, this was noted as post contact for the first patient and before contact for the second, as long as no contact with the environment was observed in the meantime.

Consultants of every firm were informed that an observational study on infection control practices would be taking place during the medical students' clinical placements, but the actual nature of the study was not disclosed, to avoid the Hawthorne effect. The consultants were asked to inform their respective firms. Nevertheless subject confidentiality was guaranteed as observations were not linked to an individual but only to a grade and specialty. This study was approved by The Malta Medical School Research Ethics Committee.

Figure 4: Method used according to location when hand hygiene practices were performed. 'Ward Other' includes any observations made on the wards at any time during the specified period when a ward round was not taking place. 'Other' includes locations in the hospital besides wards and outpatients, such as the Accident and Emergency Department

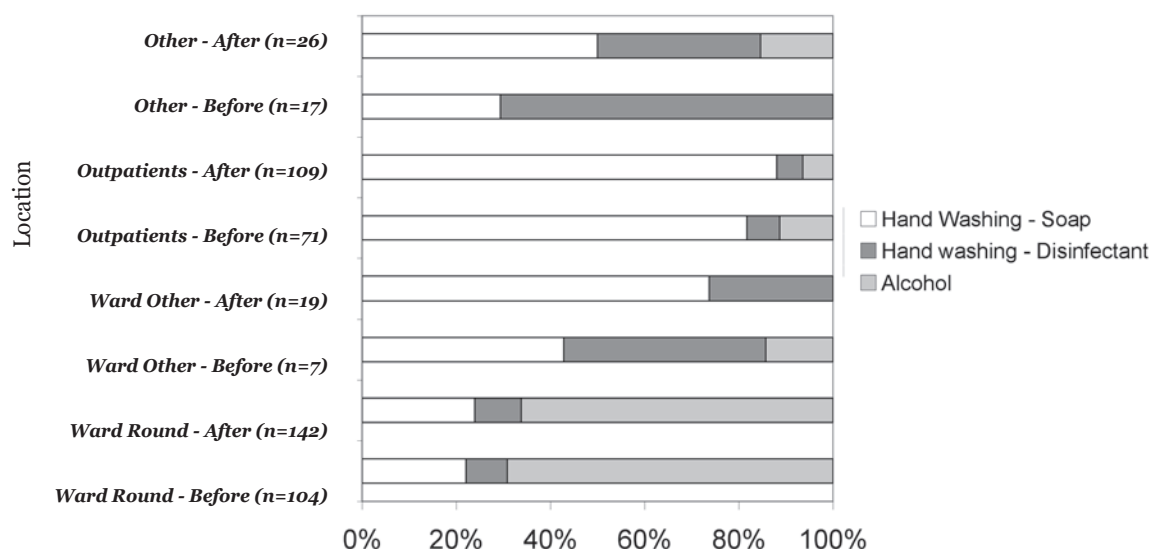


Table 1: Adherence to hand hygiene according to specialty and grade

<i>Specialities</i>	<i>Grade</i>	<i>Number of observations</i>	<i>Hand hygiene Before - Yes (%)</i>	<i>Hand hygiene After - Yes (%)</i>
General Surgery	Consultant	88	35.2	50.0
	Senior Registrar	31	19.4	16.1
	Registrar	3	0	66.7
	Senior House Officer	18	0	11.1
	House Officer	31	12.9	32.3
Surgical Speciality	Consultant	66	47.0	63.6
	Senior Registrar	5	0	0
	Registrar	7	71.4	71.4
	Senior House Officer	1	0	0
	House Officer	0	0	0
Medicine	Consultant	274	17.5	19.7
	Senior Registrar	102	32.4	52.0
	Registrar	19	21.1	52.6
	Senior House Officer	52	28.8	46.2
	House Officer	14	7.1	28.6
Obstetrics and Gynaecology	Consultant	27	3.7	3.7
	Senior Registrar	8	0	0
	Registrar	12	0	16.7
	Senior House Officer	15	13.3	6.7
	House Officer	9	44.4	44.4
Other	Consultant	84	16.7	23.8
	Senior Registrar	8	25.0	50.0
	Registrar	14	14.3	42.9
	Senior House Officer	10	10.0	80.0
	House Officer	0	0	0

Statistical analysis

The data collected was checked and coded according to a predetermined coding system agreed between the data analysts and the author of the data collection form on which the observations were recorded. The coded data was entered into Microsoft® Excel and analysed using SPSS® 14.0 (SPSS Inc., Chicago, Illinois, USA). Mainly descriptive analyses were conducted, while the Chi-square test was performed to test for association and the z-test was used to determine if there was a statistically significant difference between proportions. The 95% level of significance was taken as the cut-off to determine statistical significance. The data was analysed to ascertain any differences amongst different grades and specialties. The authors also correlated compliance for physicians who had hand hygiene facilities available or not in different locations such as outpatients and in the wards, and also for the clinical activity being carried out.

Results

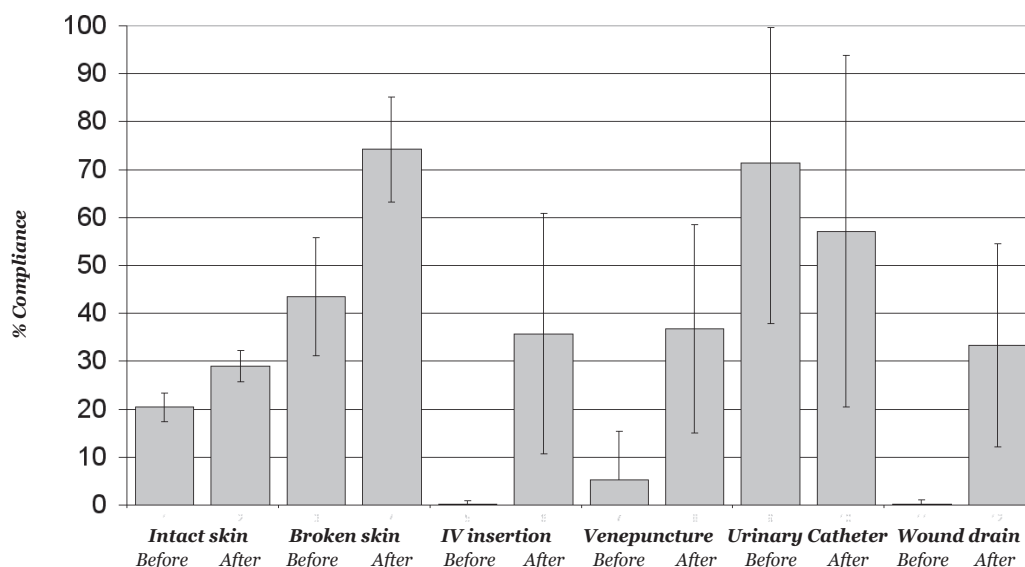
A total of 898 observations were made. Overall compliance before and after doctor-patient contact was 22.7% and 33.5% respectively. When hand hygiene compliance, both before and

after patient contact, was assessed by specialty, a significant association was present ($p < 0.001$). Before patient contact, compliance ranged from 9.9% in obstetrics and gynaecology to 45.6% in surgical specialties, whereas after doctor-patient contact, the same specialties showed rates of 11.3% and 59.5% respectively. This can be seen in Figure 1, where in various instances the 95% confidence interval bars do not overlap, indicating a significant difference.

Compliance by grade ranged from 16.7% in house officers to 26.6% in senior registrars before patient contact, and from 29.9% in consultants to 45.5% in registrars after patient contact. However, it can be seen from Figure 2, there are no clear instances where the 95% CI bars do not overlap. This indicates that there is substantial variation between the results and therefore difficulty in coming to a conclusion.

The presence of adequate facilities resulted in a significant ($p < 0.001$) improvement in compliance (Figure 3). When no facilities, neither soap and water or alcohol, were available within three meters, compliance was only 1% before patient contact and 1.3% after. On the other hand, when soap and water were available this was 61.5% before and 54.2% after. When alcohol was present, 42.2% and 36.5% adhered to hand hygiene before and after contact respectively. It should be noted

Figure 5: Adherence to hand hygiene according to activity being performed with bars showing the 95% confidence intervals



that Figure 3 only shows hand hygiene compliance in relation to the presence or absence of the different facilities. It does not, however, indicate method used and therefore it is not possible to establish preference for hand washing or alcohol rub, in a background of availability, amongst observed doctors. The preferred method of hand hygiene during ward rounds was alcohol hand rub while in outpatients, hand washing with soap was preferred ($p < 0.0001$) (Figure 4).

Our results indicated that adherence to hand hygiene was poor in cases of contact with intact skin: 20.4% undertook hand hygiene before and 29% after intact skin contact (Figure 5). Hand hygiene before manipulation of critical items or high-risk activities (e.g. IV lines, broken skin) was also low, with an average compliance of 20% before and 50.1% after patient contact. Results showed a highly significant difference ($p < 0.0001$) in hand hygiene compliance after patient contact when comparing contact with intact skin as against activities which have an increased risk of cross transmission such as examination of wounds, abscesses etc (Figure 5). However, there was no statistical difference when the same activities before patient contact were evaluated.

There was quite substantial difference by grade for hand hygiene compliance within each speciality (Table 1). However it should be noted that the number of observations in the different specialties and grades varied highly and as a result it was not possible to establish significant patterns by grade. The highest number of observations were those of consultants in the general medicine (274) where 17.5% and 19.7% were compliant prior to and after patient contact respectively.

Discussion

Although the hand hygiene procedure is simple, its application by health workers remains universally, unacceptably

low.^{4,6,8} Numerous studies have demonstrated low compliance with hand hygiene related to patient contact, as well as poor techniques when it is performed.¹ Among such studies are those carried in Turkey, United Kingdom and Switzerland.^{1,9-11} Studies were also carried out in southern Mediterranean countries including Egypt (52.8%) and Tunisia (32.3%) compared with Algeria (18.6%) and Morocco (16.9%).¹² A number of studies showed that when hand hygiene campaigns were performed, compliance improved considerably.^{9,11} Various factors influence compliance with hand hygiene. These include knowledge and awareness of hand hygiene indications and requirements, personal and group performance, as well as the intensity of the workload and the type, accessibility and tolerance to hand hygiene products.⁴

To our knowledge, our study is the first to assess adherence to hand hygiene amongst doctors in St. Luke's Hospital. Observational methods, like the one we used, have been reported to be the best way to assess hand hygiene practices since self-reporting methods such as those used in questionnaire-based studies do not predict actual practice and are therefore less reliable.¹³

The level of overall compliance reported here is low when compared to the 48% compliance observed by Pittet *et al.* in Switzerland,¹⁰ similar to the 31.9% observed by Kuzu *et al.* in Turkey¹ and higher than the 20% baseline compliance observed by Thomas *et al.* in USA.¹⁴

In our study, we differentiated between hand hygiene compliance before and after patient contact. In fact, compliance following patient contact was significantly higher. Such practice suggests that doctors think it is more important to prevent cross-infection from one patient to another,¹³ but are clearly less aware of the risk of hand contamination from the inanimate environment which can then be transferred to a patient upon

examination. This may also be because it is easier to perceive one's hands more contaminated after coming into contact with a patient than when touching the environment beforehand.

Other studies have tried to assess differences in compliance between different groups of health care workers.¹⁵ We have tried to find differences according to doctors' speciality and grade. It is difficult to conclude reasons for such differences since it is unlikely that doctors in different units have varying knowledge and awareness about the importance of hand decontamination. In addition, variation in the kind of patients they care for, as well as differences in workload, may also be contributory factors. Whether this might be due to individual variables, group behaviour, or system constraints remains to be tested.¹

It has been shown that one of the most self-reported reasons for not practising hand hygiene according to guidelines is the provision of inadequate facilities.⁶ Our results concur with this. In fact, a large increase in compliance was observed when facilities were available in the immediate working vicinity. Besides making hand hygiene facilities more available throughout the hospital, these should also be easily accessible and clearly visible, as both these factors have also been found to increase compliance to hand hygiene practices.¹⁶

The Association of Professionals in Infection Control (APIC) guidelines (1995)¹⁷ and the Centers for Disease Control (CDC) (1998) (<http://www.cdc.gov>) recommend that effective hand decontamination can be achieved either by hand washing with plain or antimicrobial soap and water, or otherwise by the use of rinse-free antimicrobial hand rubs. The fact that a preference for alcohol was seen during ward rounds (in 66.6% of cases before patient contact as shown in Figure 4) when compared to hand washing and for soap and water at outpatients ($p < 0.001$), should also be taken into consideration when facilities are being supplied. Alcohol hand rub is recommended by international organisations because it requires less time, acts faster, is less irritating,¹⁸ and is easily available at the bedside.⁶

We observed that when the contamination potential of an activity increased, the hand hygiene after patient contact also increased. This may be because doctors believe that the risk of transmission of transient flora is less when the only patient contact is with intact skin.

This study has several limitations, which may limit the generalisation of the results. The observers and population sample were selected by convenience sampling. Convenience sampling involves choosing readily available subjects even though the participants may not be typical of the population. Thus there is no assurance that every subject has an equal chance of being selected,¹⁹ and therefore may result in selection bias. However, we do not think that this has a major impact on our conclusions because we sampled 48 of the 75 firms in the hospital. At the same time, our method afforded a prolonged contact duration with our observed subjects, which in itself adds more depth to our study.

A potential disadvantage of any observational method is the Hawthorne Effect - the presence of the observer may lead to a change in the behaviour of people under observation.^{20, 21} To reduce this effect, the consultants and their respective firms were not informed about the actual nature of the study but were only told that an infection control study was in place.

Due to ethical reasons, no record was kept of the identity of the doctors being observed. Unfortunately, this could have introduced bias since the number of times that the same doctor was observed could not be calculated. We only assessed compliance to hand hygiene. We did not observe if their method followed the defined six step technique set up by Ayliffe *et al.* that is now acknowledged as the standard technique for carrying out hand decontamination.²²

Potential approaches to improve hand hygiene compliance should include interventions at three levels: education, motivation and system.⁶ Educational campaigns have had a significant positive effect on hand hygiene compliance in a number of hospitals.^{9,11,14} Routine observation and feedback may motivate healthcare workers to increase their compliance.⁶ Changes in the system may include an increase in the amount and accessibility of facilities, reminders in the workplace,¹¹ avoiding overcrowding, understaffing and excessive workload.⁶ Using hand hygiene as a sole measure to reduce infection is unlikely to be successful when other factors in infection control, such as environmental hygiene, crowding, staffing levels and education, are inadequate.²³ Hand hygiene nevertheless remains an integral component of every infection control effort.

Future research may include a self-reported study carried out to assess knowledge and perception of hand hygiene compliance and the method used. The study could be expanded to include not only doctors but other health-care workers. The effect of education, motivational factors and changes in the system on hand hygiene compliance could also be studied. The Malta Health Division has recently agreed to participate in the "Clean Care is Safer Care" initiative spearheaded by the World Health Organisation. This campaign has developed a number of tools, including audit documentation for hand hygiene compliance, which can be adopted by such future studies.

In conclusion, this study has provided an insight of hand hygiene practices amongst doctors in St. Luke's Hospital. The low compliance observed should create awareness among healthcare workers and in the health system in general. Efforts to intervene and improve should be carried out.

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