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PERFORMANCE FEEDBACK INCREASES THE INCIDENCE OF HANDWASHING BY STAFF FOLLOWING PATIENT CONTACT IN INTENSIVE CARE

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ABSTRACT

Nosocomial infections affect up to 30% of ICU patients. Although infection rates decline with increasing handwashing frequency, handwashing rates in ICU's are poor. This study investigated the hypotheses that the subjects' profession would not influence, and performance feedback would not increase the incidence of handwashing post-patient contact.

The study involved an initial period of covert observation to record the baseline level of handwashing, followed by a period of overt observation with regular feedback on handwashing performance by means of letters to staff and histograms of the data displayed in the ICU. Handwashing incidence was reassessed 6 months after performance feedback had ceased.

Handwashing differed significantly between professions ($P = 0.0001$). Initially, the incidence of handwashing was highest amongst wardsmen (90%) and lowest amongst VMO's (20%). Sixty-nine percent of RN's, 57% of physiotherapists, 41% of RMO's and 35% of radiographers washed their hands after touching patients.

With the exception of the wardsmen, there was a trend towards an increased frequency in handwashing in all groups after performance feedback, but the differences were only statistically significant in the VMO and physiotherapists groups ($P<0.001$). The improvements were maintained for 6 months after the feedback phase ended in 4 of the 6 groups.

INTRODUCTION

Nosocomial infections occur in 5-10% of hospital patients and up to 30% of Intensive Care (ICU) patients (1, 2). Patients in ICU are particularly susceptible, due to immunosuppression, major trauma or surgery, and the use of multiple invasive devices which facilitate entry of microorganisms (3). The cost of health care is increased due to the extended stay of patients who acquire such infections (1,4,5).

An epidemiological study which assessed the relative importance of airborne and direct contact transmission of microorganisms confirmed that direct contact is the principal pathway of microbial transmission (6). Despite the documented link between handwashing frequency and nosocomial infection (2), handwashing rates in hospitals are poor. Baseline handwashing rates of 28% (2), 41% (7) and 63% (8) have been observed in various ICU's.

A number of attempts have been made to improve these rates. Sakata *et al.*, (9), in response to an outbreak of *Acinetobacter calcoaceticus* in a neonatal ICU, encouraged staff to handwash. They reported an unquantified reduction in colonization. As infected patients were also isolated and treated with antibiotics, it is difficult to assess how much of this improvement was due to an increase in handwashing.

Doebbeling *et al.*, (3) assessed whether changes in the type of handwashing agent affected handwashing incidence, and found that although the incidence of handwashing was significantly higher when chlorhexidine was available as opposed to soap and alcohol, it did not rise above 48%.

Performance feedback on the previous day's handwashing incidence was used by one group to improve handwashing compliance amongst kitchen workers (10), after a previous attempt to

improve compliance via lectures and slides on the importance of handwashing failed to elicit a sustained improvement. This was followed by a study which used performance feedback on a small group of nurses (8). The investigators observed a significant increase in handwashing incidence from 63% to 98% during the performance feedback phase, however the study was limited by its' small sample size (n = 12) and the limited duration of the performance feedback phase (3 weeks).

The performance feedback technique was extended to cover all staff coming into patient contact in ICU by Conly *et al.*, (2). This study incorporated the use of a number of techniques, including performance feedback, review and modification of handwashing policies, memoranda to all staff and departments, display of infection control posters, and specific requests to handwash made to all staff entering the unit. The investigators found a significant improvement in handwashing incidence post- intervention (up from 28% to 81%), however, the results were based on 4 x 4 hour surveys in 6 years, and as a consequence the number of observations of patient contacts was small. Details of the performance feedback were not provided, and with so many interventions it was difficult to specify which of them had the desired effect.

Tibballs (11) conducted a study on RMO's in the ICU at the Children's Hospital, Melbourne, to determine if performance feedback could be used as a simple, low cost, and effective method of modifying handwashing behaviour. His study involved an initial period of covert observation to record the baseline level of handwashing preceding and following patient contact, followed by a period of observation with regular feedback on handwashing performance by means of letters to staff and histograms of the data displayed in the ICU. He found a significant ($p<10^{-6}$) improvement in handwashing performance, which was maintained over a 5 week period of unobtrusive observations. The following study was a modification of Tibballs' study, in that it was extended to cover all staff coming into patient contact, and ran for 13 months.

The hypotheses were that 1. the type of profession would not influence the incidence of handwashing post-patient contact, and 2. performance feedback would not increase the incidence of handwashing post-patient contact. The validity of the 2nd hypothesis rested on the assumption that the performance of the same individuals was being monitored over time.

Operational definitions

1. Handwashing was defined as any action to cleanse the hands with either water plus Hibiclens, or with Hibiclens handrub alone.
2. Patient contact was defined as any contact by the hands of the staff with the patient's skin, secretions, excretions, blood, or any invasive device, but not contact with bed linen, monitoring equipment, or medical records.

METHODS

Setting

The study was conducted over a 13-month period (December 1992-December 1993) in the Intensive Care and High Dependency Units (HDU), Illawarra Regional Hospital, Wollongong Campus. The ICU is a 7-bed general unit. The ICU is comprised of a main room with 5 beds separated by dividers, containing 2 wash-basins and a Hibicol (Chlorhexidine 5mg/ml; Alcohol

760ml/L) pump mounted on the wall at the foot of each bed; and a 2-bed room containing a pump but neither divider nor wash-basin.

The HDU is adjacent, and consists of one room with 6 beds separated by curtains. There are no basins or wall-mounted Hibicol pumps in the room, but there are 3 sinks with elbow-operated taps and Hibiclens (Chlorhexidine 40mg/ml; Alcohol 40mg/ml) pumps in the corridor outside.

Subjects

The subjects of the study were 45 Registered Nurses (RN's), 10 Visiting Medical Officers (VMO's), 25 Resident Medical Officers and Registrars (RMO's), 11 physiotherapists (Physios), 15 radiographers (X-Ray), and 14 wardsmen, who had patient contact during the period of the study.

Study design

The study was separated into 4 sequential phases. Phase 1 was a period of covert observation to establish background levels of handwashing. This was carried out over a 6 week period in October to November, 1992. Phase 2 covered a period of 5 months from December, 1992 to April, 1993. During this time, staff were aware that their handwashing frequency was being observed, but were not aware of who was watching them. Charts of revised handwashing performance were displayed above the sinks at 6 weekly intervals during this phase. Each chart was displayed until replaced by the next chart. Phase 3 was a period of 6 months where no

observations were made, and staff were told the study was over. During Phase 4, observations were made of handwashing frequency without the subjects' knowledge, over a 2 month period in October-December, 1993.

The handwashing practices of staff were observed by 4 members of the nursing staff during rostered shifts. All three shifts in a 24 hour period were covered regularly. Observation times were scheduled for periods with frequent patient contact such as ward rounds, and routine radiography and physiotherapy. Handwashing or failure to handwash following patient contact was recorded. Leaving the area without handwashing was considered failure to wash.

Ethics

Observing staff covertly has ethical implications, however, when studying behaviour it is necessary that the subjects are unaware of being observed otherwise they modify their behaviour. Permission to carry out the study was obtained from the Unit's Medical Director and Nurse Unit Manager. Approval was obtained prior to publication from the Director of Health Services Development, Illawarra Area Health Service.

Statistical analysis

The significance of differences observed in handwashing incidence between staff groups was assessed via a Chi^2 contingency test. An analog of Tukey's multiple comparison test suitable for categorical data was used to determine which of the groups differed, as recommended by Zar (12). The data were analysed for difference over time via a comparison of proportions test (12).

RESULTS

Handwashing performance as a function of profession

Handwashing differed significantly between groups ($P = 0.0001$). During the initial period of covert observation, the incidence of handwashing was 4.5 times higher amongst wardsmen (90%) than amongst VMO's (20%) (see Appendix for raw data). Sixty-nine percent of RN's, 57% of physios, 41% of RMO's and 35% of radiographers washed their hands after touching patients (Fig 1).

A multiple comparison test showed that the incidence of handwashing amongst Wardsmen was significantly higher than amongst all the other professional groups, while the incidence amongst RN's was similar only to that of the physiotherapists. Handwashing incidence in the RMO group differed significantly from all but the physiotherapists and radiographers. Radiographers differed from all but the RMO's and VMO's (Table 1).

Handwashing compliance in response to performance feedback

The handwashing compliance of the Wardsmen declined from a baseline level of 90% to one of 81% during the performance feedback phase, and to one of 82% after 6 months. The difference was not significant ($0.1 < P < 0.25$) (Table 2). RN's started and finished with a handwashing incidence of 69%, which improved to one of 74% during the period of feedback . The difference was not significant ($0.50 < P < 0.75$).

The incidence of handwashing amongst physiotherapists improved from 57% to 94% during the feedback phase and declined marginally to 93% after a 6 month period. VMO's improved from 20% to 28% during the feedback phase, and rose to 77% after the 6 month period. The improvements were statistically significant ($P < 0.001$).

The incidence of handwashing amongst RMO's and radiographers improved over the period of the study - the former from 41% to 42% to 54% and the latter from 35% to 30% to 41% - but the difference was not statistically significant ($0.25 < P < 0.50$).

DISCUSSION

Performance as a function of profession

Profession significantly influenced the frequency of handwashing post-patient contact. The lack of compliance with handwashing by medical personnel has been well documented and was supported by the pre-intervention results (2,7). Handwashing is under-emphasized in the present system of medical training (7). VMO's may perceive handwashing between patients as unimportant as their patient contacts were usually limited, non-invasive and with regions of the body considered less dirty. Despite this, handwashing is an important procedure for doctors as even limited contact with patients can result in transfer of organisms which can be recovered up to 2.5 hours later (7). As VMO's visit a number of patients throughout the hospital, failure to

handwash can result in widespread contamination. Similar arguments apply to radiographers and physiotherapists.

Wardsmen - who had the highest handwashing frequency - had incentive to handwash, as their hands were often in contact with moist and odiferous body regions. Handwashing rates may have been boosted by fear of acquiring an infection.

The incidence of handwashing amongst registered nurses was intermediate to the other groups. It was noted that an increased workload and emergency situations resulted in failure to wash hands. All four observers noticed that staff were less likely to wash their hands whilst working in HDU - where the handwashing facilities are less than ideal - although the incidence in each unit was not formally quantified.

Performance feedback

Phases of surveillance and performance feedback were implemented to increase the incidence of handwashing post-patient contact amongst ICU staff. A definite trend towards increased compliance was observed over time.

Following performance feedback a significant improvement was measured amongst physiotherapists and VMO's. The improvement was marked, and was sustained for 6 months after the performance feedback ended. These results are in agreement with those of Tibballs who found the improvement in doctors' compliance with handwashing was maintained for at least 2 months.

RMO's and radiologists showed a non-significant improvement in handwashing percentages over the period of the study. However, the assumption that the 2nd hypothesis rested on - that the

performance of the same individuals was being monitored over time - was violated as staff turnover was high amongst RMO's and radiographers.

The incidence of handwashing amongst registered nurses did increase by 5% but statistically it was not significant, and the increase was not maintained after performance feedback ended. This improvement was much smaller than the 35% increase in handwashing compliance noted by Mayer *et al.*, (8) during their performance feedback study. The differences may be due to their small sample size (n = 12) and the limited duration of their performance feedback phase (3 weeks). A small group may be easier to motivate than a large one, and three weeks is too short for the novelty of performance feedback to wear off. It was interesting to note that handwashing incidence 6 months after performance feedback ended was 13% lower than the original baseline level in Mayer's group. Conly *et al.*, (2) found that the improvements following performance feedback were not maintained 4 years after feedback ended.

Achieving handwashing rates of 100% may not be ideal. Nurses have more frequent contacts with patients per day in comparison to the other subjects. High rates of handwashing with antiseptic agents can lead to excessive dryness, cracking and dermatitis which in turn can increase the incidence of nosocomial infections (10). On dermatitic skin, bacterial counts cannot be decreased appreciably with antiseptic agents and personnel with dermatitic skin tend to avoid handwashing, therefore colonization with *Staphylococcus aureus* may become more common (10). In a study by Wenzel *et al.*, (1) patients were infected by *S. aureus* transferred from dermatitic lesions on nurses hands which had been caused by excessive handwashing with chlorhexidine. Cross-contamination by ICU nurses is also less likely due to the one-to-one staff-to-patient ratio.

The incidence of handwashing amongst wardsmen decreased by 9% during the performance feedback phase. This may have been a reaction to observation. Several staff voiced resentment over this issue. There was also a 10-25% probability that this decline was due to experimental artefact, i.e. pure chance.

CONCLUSION

This study identified that some health professionals have a less than acceptable rate of handwashing. Feedback on handwashing performance resulted in improved handwashing compliance in 4 of the 6 professions tested. The improvement was generally sustained for 6 months after feedback ended. As another study which utilized performance feedback showed that the improvement was not maintained for 4 years (2), it would be interesting to follow this study with surveys at various time intervals to determine at which time performance declines again. This would allow units to maximize performance with the minimum intervention.

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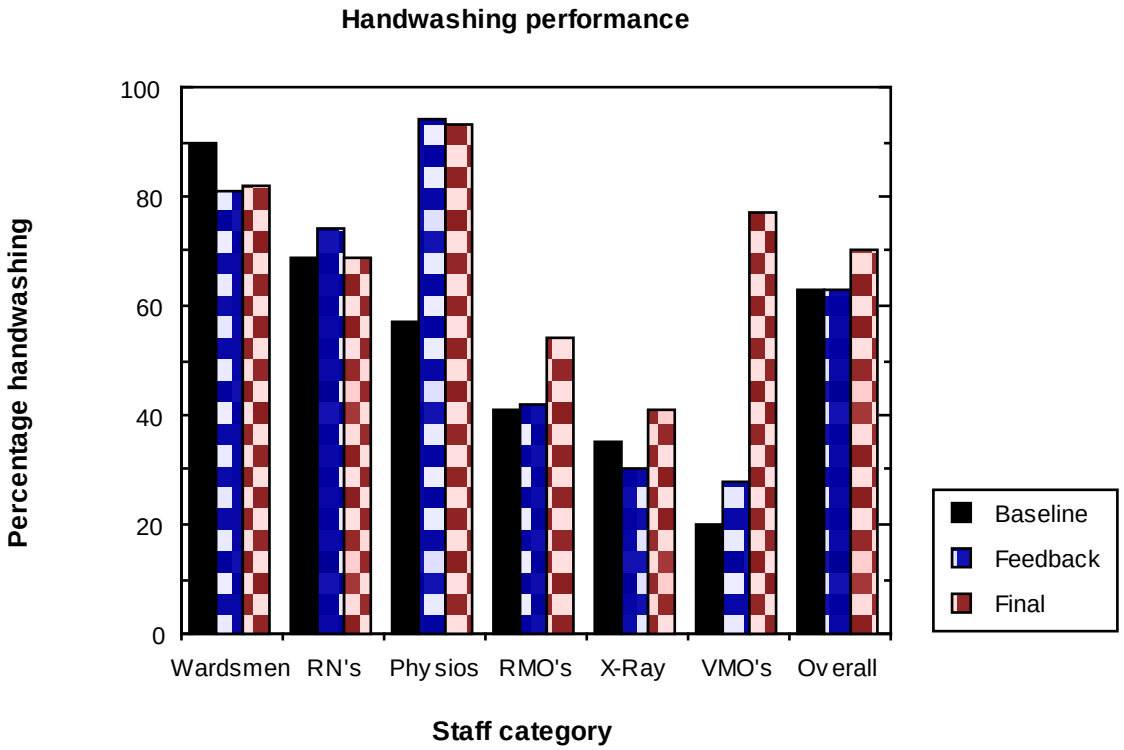

Fig 1. Percentage of staff handwashing following patient contact during the baseline, performance feedback and final phases of observation.

APPENDIX

Baseline phase

Table 1. The baseline incidence of staff washing hands following patient contact. Observations were made during Oct-Nov, 1992.

Response	W'men	RN's	Physios	RMO's	X-Ray	VMO's	Overall
Yes	81	58	17	16	14	4	190
No	9	26	13	23	26	16	113
Total	90	84	30	39	40	20	303
% Hand-washing	90	69	57	41	35	20	63

Performance-feedback phase

Table 2. Incidence of handwashing amongst staff following patient contact during the performance feedback phase. Observations were recorded from Dec 1992-Apr 1993.

Response	W'men	RN's	Physios	RMO's	X-Ray	VMO's	Overall
Yes	154	105	34	39	21	16	369
No	37	37	2	54	49	42	221
Total	191	142	36	93	70	58	590
% Hand-washing	81	74	94	42	30	28	63

Final phase

Table 3. Incidence of handwashing amongst staff following patient contact during the final phase. Observations were recorded from Oct-Dec 1993.

Response	W'men	RN's	Physios	RMO's	X-Ray	VMO's	Overall
Yes	74	51	28	21	17	17	208
No	16	23	2	18	24	5	88
Total	90	74	30	39	41	22	296
% Hand-washing	82	69	93	54	41	77	70

Table 1. Results of a multiple comparisons test for categorical data to determine which professional groups differed.

Profession	Wardsmen	RN's	Physios	RMO's	X-Ray	VMO's
Wardsmen		Differ	Differ	Differ	Differ	Differ
RN's	Differ		=	Differ	Differ	Differ
Physios	Differ	=		=	Differ	Differ
RMO's	Differ	Differ	=		=	Differ
X-Ray	Differ	Differ	Differ	=		=
VMO's	Differ	Differ	Differ	Differ	=	

Table 2. Results of the comparison of proportions tests analyzing for difference in handwashing incidence over time.

Profession	Test statistic	Critical value	P value
Wardsmen	3.95	5.99	0.10< P < 0.25
RN's	0.89	5.99	0.50< P < 0.75
Physiotherapists	19.68	5.99	P< 0.001*
RMO's	1.82	5.99	0.25< P < 0.50
X-Ray	1.52	5.99	0.25< P < 0.50

VMO's	21.6	5.99	P< 0.001*

* Significant difference