Strategies to Improve Hand Hygiene Practices in Two University Hospitals

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Objective: *To evaluate the strategies to improve hand hygiene practices among participants in two university hospitals.*

Material andMethod: *A quasi-experimental study was performed from January 1, 2001 to December 31, 2004 at Siriraj Hospital and from January 1, 2004 to July 31, 2004 at the neonatal intensive care unit (NICU), Maharaj Nakorn Chiang Mai Hospital. The study was divided into three phases; 1) pre-intervention phase to identify factors associated with non-adherence in hand hygiene practices among participants, 2) intervention phase, 3) post-intervention phase to include observations to evaluate the effectiveness of interventions on hand hygiene practices among participants. Interventions at Siriraj Hospital included distribution of posters, leaflets, rewarding healthcare workers (HCWs) who suggest the most attractive name for alcohol gel and a handwashing slogan, and a parade to boost hand hygiene practice. Interventions at Maharaj Nakorn Chiang Mai Hospital included training, a reminder poster display, provision of alcohol-based handrubs and performance feedback.*

Results: *Six hundred and forty-six HCWs were observed before and after the non-invasive procedures and 404 HCWs were observed before and after an invasive procedure at Siriraj Hospital. At Maharaj Nakorn Chiang Mai Hospital, participants included 26 nursing personnel in the NICU. After intervention, significant improvement on handwashing was observed in both the invasive procedure ($p<0.001$) and non-invasive procedures ($p<0.001$) at Siriraj Hosptial. Significant improvement on handhygiene practice was also observed among participants at Maharaj Nakorn Chiang Mai Hosptial ($p=0.001$).*

Conclusion: *Different strategies worked well in different institutions. The present study suggested the role of multi-faceted approaches to help improve handhygiene practices among HCWs.*

Keywords: *Hand hygiene, Strategies, University hospitals*

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Modern infection control is grounded in the work of Ignaz Semmelweis, who in the 1840s demonstrated the importance of hand hygiene for controlling transmission of infection in an obstetric ward. Although hand hygiene is the most important activity for the prevention of nosocomial infections, several observational studies demonstrate poor adherence by healthcare workers (HCWs)[1-5]. Factors associated with poor hand hygiene adherence include being physicians and nurse assistants. Noncompliance was observed higher in the intensive care unit than internal medicine units, during procedures that carry a high risk of contamination, and when intensity of patient care was high[1-3]. For physicians, adherence was associated with awareness of being observed, the belief of being a role

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model for other colleagues, a positive attitude toward hand hygiene after patient contact, and easy access to a hand-rub solution. Conversely, high workloaded, activities associated with a high risk of cross-transmission, and certain medical specialties (surgery, anesthesiology, emergency medicine, and intensive care medicine) were risk factors for non-adherence [4].

Limited data are available concerning factors associated with poor hand-hygiene adherence and interventions to improve hand hygiene practices among HCWs in developing countries. The authors performed a quasi-experimental study in two university hospitals to evaluate the effectiveness of different strategies to improve hand hygiene practices among HCWs.

Material and Method

A quasi-experimental study was performed from January 1, 2001 to December 31, 2004 at Siriraj Hospital and from January 1, 2004 to July 31, 2004 at the neonatal intensive care unit (NICU), Maharaj Nakorn Chiang Mai Hospital. The study was divided into three phases. The first phase, the pre-intervention phase, was performed from January 31, 2001 to September 30, 2001 at Siriraj Hospital and from January 1 to 30, 2004 at the NICU Maharaj Nakorn Chiang Mai Hospital to survey the baseline data on characteristics, hand hygiene practices and factors associated with poor hand hygiene practices among participants. The second phase, the intervention phase, was performed from October 31, 2001 to January 31, 2002 at Siriraj Hospital and from February 1 to 28, 2004 at the NICU Maharaj Nakorn Chiang Mai Hospital. The third phase, the post-intervention phase, from February 1, 2002 to December 31, 2004 at Siriraj Hospital and from March 1, 2004 to July 31, 2004 at Chiang Mai Hospital was performed to evaluate the effectiveness of interventions on hand hygiene practices among participants.

The research instruments consisted of data collection tools for factors associated with non-adherence in hand hygiene distributed to all participants and hand hygiene observation form for investigators. Interventions at Siriraj Hospital included distribution of posters, leaflets, rewarding healthcare workers who suggested the most attractive name for alcohol gel and a handwashing slogan, and a parade to boost hand hygiene practice. Interventions at the NICU Maharaj Nakorn Chiang Mai Hospital included training, reminder poster display, provision of alcohol-based handrubs and performance feedback. The main outcome in the present study was the hand hygiene compliance rate among participants after intervention for both hospitals. The second outcomes at the NICU Maharaj Nakorn Chiang Mai Hospital included alcohol-based hand rub consumption rates and nosocomial infection rates.

Table 1. Hand hygiene practices before non-invasive procedures, pre and post intervention, Siriraj Hospital (%)

HCWs	Pre-intervention	%	Post-intervention	%	p
Physicians	0/128	0.0	8/110	7.2	0.006
Residents	1/147	0.7	3/103	2.9	0.353
Nurses	3/112	2.7	32/177	18.1	0.0002
Nurse-aides	9/124	7.3	23/105	21.9	0.003
Others	16/132	12.1	20/146	13.6	0.847
Total	29/643	4.5	86/641	13.4	0.0001

Table 2. Hand hygiene practices after non-invasive procedures, pre and post intervention, Siriraj Hospital (%)

HCWs	Pre-intervention	%	Post-intervention	%	p
Physicians	15/128	11.7	32/110	29.0	0.0015-0.002
Residents	12/147	8.2	26/103	25.2	0.0005
Nurses	50/102	49.0	91/177	51.4	0.794
Nurse-aides	35/124	28.2	52/105	49.5	0.022
Others	24/142	16.9	76/146	52.1	<0.0001
Total	136/643	21.1	277/641	43.2	<0.0001

Data analysis was performed using SPSS Version 10.0 (SPSS, Chicago, IL). Categorical variables were compared using Chi Square Test or Fisher Exact Probability Test, as appropriate. Continuous variables were compared using the Wilcoxon Sign Rank Sum Test. All *p* values were two tailed; $p<0.05$ was considered statistically significant.

Results

Observations were made in healthcare workers before they performed non-invasive procedures and found that only 4.5% washed their hands. The practice rose to 13.4% after the intervention (Table 1). The same trend was observed for hand hygiene practices after non-invasive procedures (Table 2). In invasive proce-

Table 3. Hand hygiene practices before invasive procedures, pre and post intervention, Siriraj Hospital (%)

HCWs	Pre-intervention	%	Post-intervention	%	p
Physicians	0/15	0.0	2/66	3.0	0.805
Residents	6/72	8.3	14/72	19.4	0.092
Nurses	20/201	10.0	51/171	29.8	<0.0001
Nurse-aides	1/18	5.5	9/23	39.1	0.034
Others	7/98	7.1	13/71	18.3	0.047
Total	34/404	8.4	89/403	22.1	<0.0001

Table 4. Hand hygiene practices after invasive procedures, pre and post intervention, Siriraj Hospital (%)

HCWs	Pre-intervention	%	Post-intervention	%	p
Physicians	11/15	73.3	7/66	10.6	<0.0001
Residents	19/72	26.4	34/72	47.2	0.016
Nurses	77/201	38.3	108/171	63.2	<0.0001
Nurse-aides	9/18	50.0	19/23	82.6	0.059
Others	29/98	29.6	34/71	47.9	0.023
Total	145/404	35.9	202/403	50.1	0.0001

Table 5. Barriers to good hand hygiene practices, Siriraj Hospital

Barriers	No. response	%
Sink		
Inadequate number	397	13.9
Inconvenient location	395	4.8
Soap-Inadequate	195	18.5
Antiseptics		
Inadequate supply	368	13.0
Dirty containers	363	1.9
Hand towel		
Inadequate amount	398	28.9
Inadequate cleaning	392	11.7
Multiple use	399	10.3

Table 6. Hand hygiene practices by questionnaires, Siriraj hospital

Hand Hygiene Practice	No. response	%
Prior to patient care	402	35.8
After patient care	403	71.7
After contact with patients, secretion	398	99.2
After removing gloves	400	91.0
Before aseptic techniques	391	69.8
After aseptic techniques	396	88.9
Before invasive procedures	396	76.0
After invasive procedures	392	94.9

dures, hand hygiene practices rose sharply after the intervention (Table 3 and 4). Barriers to good hand hygiene practices reported are shown in Table 5. Short of supply of materials and inconvenience for handwashing were found. The data on hand hygiene practices reported in questionnaires (Table 6) were much better than those found by observation.

At Maharaj Nakorn Chiang Mai Hospital, a different study was done in the neonatal intensive care unit. Twenty-six nurses were enrolled (Table 7). Hand hygiene practices were observed before the intervention. As shown in Table 8, proper hand hygiene was observed only in 6.3% of procedures. After the intervention, good handwashing rose steadily from 44.4% in the first month to 90.8% in the fifth month (Table 9).

Discussion

Compliance with hand hygiene reccomendations is poor worldwide. While the technique for hand hygiene is simple, the multiple interdependence of factors which determine hand hygiene behaviour makes the study of hand hygiene complex. In the present study, the authors identified poor knowledge in appropriate hand hygiene and inadequate hand hygiene equipments as factors associated with poor hand hygiene adherence. These factors prompted the investigators to design a multi-faceted interventions to help improve hand hygiene practices. The presented data emphasized that input from behavioral and social sciences is essential when designing studies to investigate hand hygiene compliance. Thus, interventions to increase compliance with hand hygiene practices must be appropriate for different cultural and social needs.

Successful hand hygiene interventions have been reported with the use of education and multifaceted interventions [5-7]. These interventions include education, written instructions and posted reminders regarding hand hygiene and proper hand washing techniques, covert observation, financial incentives, and

Table 7. Participants' demography at the Maharaj Nakorn Chiang Mai Hospital neonatal intensive care unit (N=26)

Demography	Number	(%)
Occupation		
Nurses	17	65.4
Nurses assistants	9	34.6
Age (years)		
20-30	13	50.0
31-40	7	26.9
41-50	6	23.1
Work experience (years)		
<5	13	50.0
6-11	7	26.9
11-15	2	7.7
16-20	0	0
>20	4	15.4

Table 8. Hand hygiene practices by activities in NICU

Hand hygiene practices and activities	Observed number	Hand hygiene					
		AD	%	NA	%	ND	%
Prior to contact patients' secretion	28	5	17.9	15	53.6	8	28.5
Prior to patients' contact	93	8	8.6	22	23.7	63	67.7
After contact contaminated healthcare equipments	35	2	5.7	21	60	12	34.3
After removing gloves	17	1	5.9	11	64.7	5	29.4
Prior to intravenous line insertion	20	1	5.0	5	25	14	70
Prior to nasogastric tube insertion	81	3	3.7	10	12.3	68	84
After contact patients	14	0	0	6	42.9	8	57.1
After heavily contaminated activities	21	0	0	3	14.3	18	85.7
After suturing wounds	1	0	0	0	0	1	100
After contact with patient clothes	10	0	0	7	70	3	30
Total	320	20	(6.3)	100	31.2	200	62.5

AD = Adequate, NA = Non-adequate,
ND = Not done

Table 9. Hand hygiene practices by activities before and after interventions at the NICU Maharaj Nakorn Chiang Mai Hospital

Hand hygiene practices and activities	Pre-intervenetion (%)	Post-intervention (%)				
		M1	M2	M3	M4	M5
Prior to patients' contact	8.6	30.6	72.7	74.1	85.7	93.0
After patient contact	0	42.3	100	81.8	100	73.3
After contact patients' secretion	17.9	17.9	90	50	100	91.7
After intravenous line insertion	5	40	93.3	88.9	100	100
After insertion of nasogastric tube	3.7	37.5	63.6	82.6	100	100
After havily contaminated activities	0	100	87.5	100	50	100
After suturing wound	0	100	100	-	100	-
After contact with contaminated patient care equipment	6.7	58.3	86.7	-	-	100
After contact patients' clothes	0	40	60	94.4	100	0
After removing gloves	5.9	28.6	100	100	-	100
Total	20/320 (6.3)	55/125 (44.4)	114/141 (80.9)	128/159 (80.5)	87/94 (92.6)	128/141 (90.8)

M = month

regular group feedback on compliance. Notably, some of these interventions also have an impact on decreasing overall rates of nosocomial infection and respiratory infections[6-7]. Although nosocomial infection rates were not significantly decreased, the present study emphasizes the role of multi-faceted interventions to help improve hand hygiene practices among HCWs, which has been consistently shown in the literature. The fact that nosocomial infection rates did not significantly decrease may further suggest the multi-faceted natures of nosocomial infections that may require multiple interventions to help reduce nosocomial infection rates and emphasizes the role of adequate use of standard precautions in Thailand[8-10].

There are several limitations to the present study. The nature of a quasi-experimental study without using control might create some biases on the outcomes (hand hygiene practices). The small sample size and lack of long-term follow-up at the NICU Maharaj Nakorn Chiang Mai Hospital made it impossible to assess the long-term outcomes of these interventions. Because skin flora of Thai patients differ from hospital to hospital, the lack of microbiology data on the HCWs' hand make it impossible to correlate the outcome of hand hygiene pathogen as a cause of nosocomial infections. Despite these limitations, the presented data is considered the first data to show that multi-faceted interventions worked well to improve hand hygiene among HCWs in Thailand.

Conclusion

The present study suggested that multi-faceted interventions can help improve hand hygiene practices among HCWs in Thailand. Interventions to increase compliance with hand hygiene practices must also be appropriate for different cultural and social needs. Further studies to evaluate simple interventions to help improve hand hygiene among HCWs in developing countries are needed.

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กลยุทธ์ในการพัฒนาการล้างมือในโรงพยาบาลมหาวิทยาลัยสองแห่ง

สมหวัง ด่านชัยวิจิตร, วิลาวัณย์ พิเชียรเสถียร, อนุชา อภิสารธนารักษ์, กาญจนา คชินทร, รัชดา เจิดรังษี

วัตถุประสงค์ : *เพื่อประเมินกลยุทธ์ช่วยเพิ่มอัตราการล้างมือในโรงพยาบาลมหาวิทยาลัย 2 แห่ง*

วัสดุและวิธีการ : *ผู้วิจัยได้ทำการทดลองประเภทก่อนและหลังดำเนินกลยุทธ์ที่โรงพยาบาลศิริราชและห้องผู้ป่วยฉุกเฉินเด็กแรกเกิดโรงพยาบาลมหาราชนครเชียงใหม่ การศึกษาได้แบ่งเป็น 3 ช่วง คือ 1) ช่วงก่อนการวิจัย เพื่อหาอัตราการล้างมือและปัจจัยเสี่ยงในการไม่ล้างมือในกลุ่มผู้ร่วมวิจัย 2) ช่วงกำหนดมาตรการ และ 3) ช่วงหลังกำหนดมาตรการเพื่อสำรวจและติดตามอัตราการล้างมือ มาตรการที่โรงพยาบาลศิริราช ประกอบด้วยการให้การศึกษา ชนิดโปสเตอร์ แผ่นพับ ใบปลิว การให้รางวัลผู้ให้คำขวัญดีเด่นในการล้างมือและชื่อของแอลกอฮอล์ถูมือ มาตรการที่ห้องผู้ป่วยฉุกเฉินเด็กแรกเกิดโรงพยาบาลมหาราชนครเชียงใหม่ ประกอบด้วย การฝึกอบรม การแจกจ่ายโปสเตอร์ แอลกอฮอล์ถูมือและการให้ข้อมูลการปฏิบัติย้อนกลับต่อผู้ร่วมวิจัย*

ผลการศึกษา : *ที่โรงพยาบาลศิริราชพยาบาลพบว่ามีบุคลากรการแพทย์ 646 คนถูกสำรวจ สำหรับการล้างมือก่อนและหลังการทำหัตถการแบบไม่รุกราน และบุคลากร 404 ท่าน ถูกสำรวจ สำหรับการล้างมือก่อนและหลังสำหรับหัตถการแบบรุกราน ส่วนที่โรงพยาบาลมหาราชนครเชียงใหม่ ผู้เข้าร่วมวิจัยประกอบด้วยพยาบาล 26 คน ในหอผู้ป่วยเด็กแรกเกิดฉุกเฉิน หลังจากการกำหนดมาตรการ พบว่ามีการพัฒนาในการล้างมือเพิ่มขึ้นสำหรับหัตถการแบบรุกราน ($p<0.001$) และแบบไม่รุกราน ($p<0.001$) ที่โรงพยาบาลศิริราช และการล้างมือมีการปฏิบัติมากขึ้นในกลุ่มผู้ปฏิบัติงานที่หอผู้ป่วยเด็กแรกเกิดฉุกเฉินที่โรงพยาบาลมหาราชนครเชียงใหม่อย่างมีนัยสำคัญ ($p=0.001$)*

สรุป : *ผลการศึกษานี้พบว่าการใช้มาตรการหลากหลายร่วมกันในโรงพยาบาลมหาวิทยาลัย สามารถเพิ่มอัตราการล้างมือแก่ผู้เข้าร่วมวิจัยได้อย่างมีนัยสำคัญ*