Evaluation of a Training Course in Infection Control for Nurses

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Objective: *To evaluate the effectiveness of a training course in infection control for nurses.*
Material and Methods: *A quasi-experimental study was performed from November 1, 2001 to December 31, 2002. The study was divided into three phases; 1) pre-intervention (November 1-30, 2001) to survey baseline data among participants, 2) intervention (January 1-31, 2002) to establish, develop and conduct the training course, 3) post-intervention (February 1, 2002 to December 31, 2002) to evaluate the effectiveness of the training program, and conduct a workshop for infection control project presentations. The research instruments consisted of questionaires and a focus group discussion guide.*
Results: *Forty-six nurses who had experience of working as infection control nurses (ICN) for more than one year and 46 hospital administrators were enrolled in the pre-interventional phase. Major problems identified among ICNs were inadequate knowledge, multiple simultaneous job descriptions, overwork and lack of collaboration from colleagues. After intervention, significant improvement was observed on their knowledge and confidence among ICNs (rating scale, 4.09 vs. 3.43; $p<0.001$). All administrators agreed that the training course was beneficial to ICNs and believed that the problems in practices of IC would be solved. More satisfaction of ICNs among hospital administrators was also observed (97.7% vs. 28.3%; $p<0.001$).*
Conclusion: *The present study suggested that the training course to provide practical knowledge for ICNs be effective and should be conducted periodically to keep up with the advance in medical technology. An ICN network with other academic institutions should be established.*

Keywords*: Infection control, Training course, Nurses, Evaluation, Effectiveness, Thailand*

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Nosocomial infections are common causes of illness and death among hospitalized patients. It increases morbidity, mortality, costs, and length of stay (LOS) far beyond what is expected based on underlying disease states[1-6]. Nosocomial infections icnrease the cost per patient by $1,909 to $38,656 and increase LOS in the ICU by 4.3 to 15.6 days[5, 7-8]. In Thailand, it is estimated that the ICNs to patient ratio was 1 per the first 100 hospital beds and an additional one ICN per 250 hospital beds. Due to limited financial resources of hospitals, infection control is largely neglected in national healthcare priorities and by the international organizations that fund health care initiatives in developing countries. This resulted in sub-optimal national budgets for an infection control program.

Danchaivijitr and colleagues first reported that a national infection control program helped to reduce the national nosocomial infections rate from 11.7% to 7.3% during 1988 compared to during 1992 in Thailand[9-10]. However, little data has been available concerning training infection control nurses (ICNs) in developing countries. To evaluate the effectiveness of a training course in infection control among ICNs on knowledge, self-efficacy and hospital administrators

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perceptions, a quasi-experimental study was performed.

Material and Method

A quasi-experimental study was performed from November 1, 2001 to December 31, 2002. All infection control nurses who had work experience for at least one year and their hospital administrators were eligible for participation in the present study. The present study was divided into three phases. The first pre-intervention phase was performed from November 1 to 30, 2001 to survey the baseline data on characteristics, hospital settings, and previous experience among participants. The second intervention phase was performed from January 1-31, 2002 to establish, develop and conduct an infection control training course for ICNs. The third post-intervention phase from Febru-

Table 1. Demography, hospital settings and work experience among infection control nurses

Characteristics	Number (N=46)	%
Age (yr)		
30-40	28	60.9
> 40	18	39.1
Hospital settings		
Provincial hospitals	23	50
Regional hospitals	14	30.4
University hospitals	4	8.7
Army hospitals	2	4.3
Police/Private/Bangkok metropolitan hospitals	3	6.5
Number of ICNs in the hospital		
1	19	41.3
2	15	32.6
3	7	15.2
>3	5	10.9
Prior work experience		
ICU	22	47.8
Medicine	6	13
Surgery	6	13
Emergency	5	10.9
Others	7	15.2
Work experience as ICN (yr)		
1-5	26	56.5
6-10	14	30.4
>11	6	13.1
Working full-time	38	82.6
Hours of work/week		
10-20	8	17.4
21-30	5	10.9
31-40	33	71.7
ICN roles		
Surveillance	46	100
Counseling on infection control issues	45	97.8
Outbreak intervention	45	97.8
Involvement in infection control committee	44	95.7
Research	20	43.5
Quality assurance	36	78.3

ary 1, 2002 to December 31, 2002 was performed to evaluate the effectiveness of the training program, and to conduct a workshop for infection control project presentations. The research instruments consisted of data collection tools with open and closed end questions including rating scale for participants and a focus group discussion guide. The data collection tools were validated by five infection control experts and 10 ICNs and had a content validity index of 0.92. The main outcome in the present study were to identify factors that need improvement associated with infection control program in the hospitals and to compare knowledge and confidence among ICNs before and after training. The second outcomes were hospital administrator satisfactions and ICN's competency in problem-solving in infection control. Infection control nurses and their hospital administrators rated on their knowledge and confidence and compared this objective measures between pre- and post-intervention phases. Rating scale interpretation among participants were 1) level between 1.00-1.33 represented low knowledge and confidence, 2) level between 1.34-3.66 represented intermediate knowledge and confidence, and 3) level between 3.67-5.00 represented high knowledge and confidence.

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 Rank Sum Test. All *P* values were two tailed ; $P<0.05$ was considered statistically significant.

Table 2. Problems and areas that need improvement among infection control nurses during the pre-interventional phase (N=46)

Problems and Areas for Improvement	No	%
Identified problems		
Inadequate knowledge	37	80.4
Multiple simultaneous job descriptions	35	76.1
Overwork	34	73.9
Lack of collaboration from other departments	26	56.5
Being unable to handle assigned job	19	41.3
Lack of administration support	17	37
Inappropriate personality	7	15.2
Lack of standard written guidelines	7	15.2
Areas that need improvement		
Knowledge	43	93.5
Adminstration skill	42	91.3
Personality	26	56.5
Computer support for IC research	11	23.9

Table 3. Levels of satisfaction of infection control nurses and areas the administrators needed help for improvement during pre-intervention phase (N=46)

Levels of Satisfaction and Areas for Improvement	No	%
Levels of satisfaction		
Very satisfactory	4	8.7
Moderately satisfactory	23	50.0
Not quite satisfactory	15	32.6
Not at all satisfactory	4	8.7
Areas for improvement		
Knowledge	28	60.9
Administration skill	23	50.0
Personality	14	30.4
Other	10	21.7

Table 4. Scores on knowledge and confidence during pre- vs. post-intervention phases among infection control nurses*

Confidence	Pre-intervention	Post-intervention	p-value
Surveillance	3.43+/-0.55	4.09+/-0.53	<0.001
Quality assurance in infection control	3.46+/-0.64	4.07+/-0.48	<0.001
Counselling in infection control issues	3.85+/-0.71	4.39+/-0.53	0.001
Administration skill in infection control	4.00+/-0.67	4.38+/-0.53	0.005
Follow-up on infection control intervention	3.21+/-0.63	3.91+/-0.57	<0.001
Research skill in infection control	3.06+/-0.81	4.00+/-0.58	<0.001

*Rating scale interpretation: 1.00-1.33= low self-efficacy, 1.34-3.66= intermediate self-efficacy, 3.67-5.00= high self-efficacy

Table 5. Knowledge and confidence during pre- vs. post-intervention phase among infection control nurses according to hospital administrators

Seft-efficacy	Pre-intervention	Post-intervention	p-value
Surveillance	4.32+/-1.25	4.09+/-0.71	0.71
Quality assurance in infection control	4.13+/-1.67	4.42+/-0.81	0.46
Counselling in infection control issues	4.77+/-1.07	5.05+/-0.81	0.20
Administration skill in infection control	4.93+/-1.08	5.09+/-0.75	0.92
Follow-up on infection control intervention	4.41+/-1.06	4.64+/-0.84	0.48
Research skill in infection control	4.09+/-1.35	4.25+/-1.20	0.60

Results

Forty-six ICNs and 46 hospital administrators in all regions in Thailand were enrolled during the pre-intervention phase, while 45 ICNs and their 45 hospital administrators were enrolled during the post-intervention phase. The majority of ICNs and their hospital administrators were from provincial and regional hospitals (37/46; 80.4%). The mean age for ICNs was 39.7 years (range, 30-52). Twenty-three (23/46; 50%) nurses had work experience of more than 10 years as ICNs, and thirty-eight ICNs (38/46; 82.6%) reported functioning as full time ICNs in their hospitals. All participants had experience in surveillance and the majority of them had been involved in counseling in infection control issues (45/46; 97.8%) and in infection control work groups (44/46; 95.7%). Demography, hospital settings and work experience for participants are summarized in Table 1.

The problems identified among ICNs during the pre-interventional phase included inadequate knowledge (37/46; 80.4%), multiple simultaneous job descriptions (35;46; 76.1%), overwork (34/3; 73.9%), and lack of collaboration among nurses in other departments (26/46; 56.5%). Twenty-seven ICNs (58.7%) reported "moderate to high" satisfaction with their work prior to the intervention and 28 (60.9%) would like their hospital administrators to help improve their infection control knowledge. Identified problems, areas that are needed for improvement, and level of satisfaction among ICNs prior to the intervention are summarized in Tables 2 and 3.

After the intervention, significant improvement was observed on knowledge and confidence among ICNs participating in the present study (rating scale, 4.09 vs. 3.43; $p<0.001$). Although these objective parameters were not rated statistically significant among hospital administrators, all of them (N=45) agreed that the training course was beneficial to ICNs to practice and the majority (42/45; 93.2%) believed that the previous problems in practices were solved. More satisfaction of their ICNs among their hospital administrators was also observed (97.7% vs. 28.3%; $p<0.001$). Details on knowledge and confidence between pre- and post-intervention among ICNs and their hospital administrators are summarized and compared in Tables 4 and 5, respectively. With respect to infection control research presentations, 13 ICNs (28.9%) reported that their infection control researches had been completed and was ready for presentation, 12 ICNs (26.7%) had completed their researches but were not ready for presentation and 20 ICNs (44.4%) had not yet completed their researches during the post-intervention phase.

Discussion

The infection control nurses had diverse backgrounds. While some ICNs were aware of their profesional roles, others might not. Nevertheless, the majority of them experienced similar problems prior to their training including inadequate knowledge, multiple simultaneous job descriptions, overwork and lack of collaboration from nurses in other departments. A policy from hospital administrators to help support IC practices was needed[11]. The present study suggested the positive roles of an infection control training course to provide practical knowledge for ICNs. This strategy seems effective as an intervention to increase knowledge and confidence for ICNs on their roles. It also emphasized five distinct processes of learning including awareness, information on data gathering, intellectual, emotion and behavioral changes and nine distinct processes of education including assessing : education need, goals and objectives, management support, fiscal responsibility, basic principle and effective teaching, enhancing understanding and learning retention, evaluation plan and methodology, innovation in teaching infection control practices, and development of

training tools[12].

Several limitations to the present study deserve to be noted. Because long-term data regarding their knowledge and confidence was not collected, any conclusion on long-term effect of this intervention on outcomes cannot be made. The fact that the majority of nurses had not finished their research projects during the post-intervention make it impossible to evaluate this outcome. Although significant improvement was observed on knowledge and confidence among ICNs, these objective measurements were not rated statistically significant by their hospital administrators. However, the majority of hospital administrators were subjectively more satisfied with their ICNs after training.

Despite these limitations, the presented data suggested a positive role of education on practical knowledge of infection control among ICNs and emphasized the need to have continuous education among ICNs. Furthermore, ICNs should establish their network with other academic institutions to help support their roles and to help keep up with their knowledge. Further studies on long-term effectiveness of education program for ICNs in developing countries are needed.

Conclusion

The training course in infection control for ICNs was effective in improving knowledge and confidence of the ICNs. The ICNs and their administrators were satisfied.

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References

1. Jarvis WR. Selected aspects of the socioeconomic impact of nosocomial infections: morbidity, mortality, cost, and prevention. Infect Control Hosp Epidemiol 1996;17:552-7.
2. Mundy LM, Fraser VJ. Determining the cost-effectiveness of hospital epidemiology and infection control programs. In: Mayhall CG, editor. Hospital epidemiology and infection control. 2nd ed. Philadelphia: Lippincott Williams and Wilkins, 1999: 1437-43.
3. Wenzel RP. The Lowbury lecture: the economics of nosocomial infections. J Hosp Infect 1995;31: 79-87.
4. Digiovine B, Chenoweth C, Watts C, Higgins M. The attributable mortality and costs of primary nosocomial bloodstream infections in the intensive care units. Am J Respir Crit Care Med 1999; 160:976-81.
5. Dominguez TE, Chalom R, Costarino AT Jr. The impact of adverse patient occurrences on hospital costs in the pediatric intensive care unit. Crit Care Med 2001;29:169-74.
6. Slonim AD, Singh N. Nosocomial bloodstream infection and cost. Crit Care Med 2001;29:1849.
7. Diaz MC, Garcia MM, Bueno CA, Lopez LA, Delgado RM, Galvez VR. The estimation of the cost of nosocomial infection in an intensive care unit. Med Clin (Barc) 1993;100:329-32.
8. Miller ZC. Excess length of stay, charges, and mortality attributable to medical injuries during hospitalization. JAMA 2003;290:1860-74.
9. Danchaivijitr S, Chokloikaew S. A national prevalence study on nosocomial infections, 1988. J Med Assoc Thai 1982;72(Suppl 2):S1-5.
10. Danchaivijitr S, Tangtrakool T, Chokloikaew S. The second Thai national prevalence study on nosocomial infections, 1992. J Med Assoc Thai 1995;78 (Suppl 2):S67-72.
11. Raza MW, Kazi BM, Mustafa M, Gould FK. Developing countries have their own characteristic problems with infection control. J Hosp Infect 2004; 57:294-9.
12. Carr HA, Hinson PL. Education and training. In: Carrio R, editor. APIC Text of infection control and epidemiology. Washington DC: The Association for Professionals in Infection Control and Epidemiology, Inc (APIC), 2005:11-1-11-18.

การประเมินโครงการฝึกอบรมพยาบาลควบคุมโรคติดเชื้อ

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วัตถุประสงค์ : *เพื่อประเมินผลของโครงการฝึกอบรมพยาบาลควบคุมโรคติดเชื้อ*

วัสดุและวิธีการ : *การฝึกอบรมการควบคุมโรคติดเชื้อระหว่าง 1 พฤศจิกายน พ.ศ. 2544 ถึง 31 ธันวาคม พ.ศ. 2545 ประเมินผล โดยแบ่งการวิจัยเป็น 3 ช่วงคือ 1) ช่วงก่อนวิจัย เพื่อประเมินข้อมูลพื้นฐานของผู้เข้าอบรม 2) ช่วงกำหนดมาตรการ และ 3) ช่วงหลังกำหนดมาตรการเพื่อประเมินผลและติดตามผลการวิจัย*

ผลการศึกษา : *พยาบาล 46 คน ซึ่งมีประสบการณ์การทำงานเป็นพยาบาลควบคุมโรคติดเชื้อมากกว่า 1 ปี และผู้บริหารจำนวน 46 ท่าน เข้าร่วมวิจัย ปัญหาส่วนใหญ่ ที่พบก่อนการวิจัย คือ พยาบาลควบคุมโรคติดเชื้อมีความรู้ไม่เพียงพอ และได้รับการมอบหมายไปทำงานหลายอย่าง รวมทั้งปัญหาในการประสานงานกับแผนกอื่น ๆ หลังจากการทดลองพบว่าพยาบาลควบคุมโรคติดเชื้อมีความรู้เพิ่มมากขึ้น อย่างไรก็ตามผู้บริหารโรงพยาบาลมีความพึงพอใจในการปฏิบัติงานของพยาบาลควบคุมโรคติดเชื้อเพิ่มขึ้นแต่ไม่มีนัยสำคัญทางสถิติ ผู้บริหารทุกคนมีความพึงพอใจในประโยชน์ของการฝึกอบรม และเชื่อว่าปัญหาส่วนใหญ่ถูกคลี่คลายไป*

สรุป : *การจัดการอบรมเพื่อพัฒนาความรู้ของพยาบาลควบคุมโรคติดเชื้อมีประสิทธิภาพดี และน่าจะจัดการฝึกอบรมเพื่อเพิ่มพูนความรู้แก่พยาบาลควบคุมโรคติดเชื้อทุกปี*