Role of nurses in prevention of antimicrobial resistance

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Abstract
Antimicrobial resistance (AMR) is an important issue in many countries especially at tertiary health care facilities. Improvements in quality in the area of AMR are urgently needed in many countries including Thailand to provide effective and efficient services with the ultimate goal of improving quality of care and patients’ quality of life. Nurses play a major role in controlling AMR problems because patients are in their “hands” and infections with resistant organisms are primarily transmitted through direct contact. Thailand has initiated several steps to build capacity of nurses in this area. These include a Master’s degree programme and short training courses in the area of infection control with the focus on AMR. The nursing and midwifery workforce can play an important role in prevention of nosocomial infection (NI) including AMR prevention and control if they have been properly educated and trained. This paper focuses on the situation of AMR in Thailand and the initiatives of the Faculty of Nursing, Chiang Mai University in building capacity of nurse-midwives in general and infection control nurses in NI and AMR prevention and control and in other areas.

Antimicrobial resistance in Thailand
The primary mission of the health care facility is to respond to the needs of the client or patient, family and community by providing effective and efficient services with equal access to quality of care. Inadequate quality of care could cause nosocomial infection (NI), an infection that can be acquired during hospitalization, and antimicrobial resistance (AMR). AMR has become one of the serious health problems in many countries including Thailand. Its consequences have impacts on the patient and on the family, health personnel and hospitals. In most hospitals, infection prevention and control activities have been integrated into the system of care. NI is one of the key indicators for hospital accreditation in Thailand.

Incidence of antimicrobial resistant infection
Antimicrobial resistance has been a serious problem especially at the tertiary health care level. The high incidence and impact of AMR
in Thailand has been reported in many studies. Inchai et al. (2003) examined the incidences and distribution of methicillin-resistant Staphylococcus aureus (MRSA) infection in one tertiary care university affiliated hospital during a three-month period. The results showed that the incidence of MRSA infection was 8.2 infections per 1000 admitted patients. At the department level, the majority of the incidences occurred in the medical department (10.8 incidences/1000 admitted patients) followed by the orthopaedic and surgical departments with an incidence of 9.9 and 7.4 per 1000 admitted patients, respectively. The highest incidence of MRSA infection was found in the paediatric intensive care ward with the incidence of 103.4 incidences per 1000 admitted patients followed by the burn unit and surgical intensive care unit with the incidence of 90.9 and 68.2 incidences per 1000 admitted patients, respectively.

Further, Sritippayawan et al. (2009) determined the incidence and risk factors of multi-drug resistance (MDR) NI in a paediatric intensive care unit (PICU) of a university hospital in Thailand during an eight-month period in 2005 among children aged 15 years or less who developed a PICU-related NI. The results showed that 44 patients developed 58 episodes of PICU-related NI with the rate of 28.3 per 1000 patient-days. Thirty episodes (52%) were MDR NI. One of the major risk factors was the history of previous use of a broad-spectrum antibiotic (OR = 9.7, p < .01).

It is clear that the AMR rate is increasing and has evidently an impact on the patients. Apisarnthanarak and Mundy (2009) utilized a matched case control study of mortality associated with MDR Acinetobacter baumannii infections at a Thai tertiary health care centre from July 1, 2007, to June 30, 2008. A case was defined as a patient who was infected with MDR Acinetobacter baumannii and met the definition of a NI. A matched control patient had non-MDR Acinetobacter baumannii infection at a similar infection site, hospital unit, and date of admission. Fifty-six patients with MDR Acinetobacter baumannii infection had higher mortality (80% VS 14%; p < .001) and length of hospitalization was higher (9 days VS 5.4 days, p < .001).

Factors associated with AMR infection in Thailand

Many factors influence the occurrence of AMR problems in Thailand including availability of antimicrobial drugs without prescription, inappropriate physician prescription, and inappropriate practice of AMR prevention and control among health care workers.

1. Availability of antimicrobial drugs without prescription

Antimicrobial drugs are available for purchase in local pharmacies, or in private shops as over-the-counter preparations. Some are without prescription. The use is often inappropriate because of inadequacy in the law enforcement for the regulations regarding antimicrobial purchases. There is also evidence that antimicrobial agents are often sold inappropriately in indications and in quantities in many developing countries.

2. Inappropriate prescription

The use of antimicrobial drugs should be based on appropriate indications. However, a survey of antimicrobial drug use among 42 university hospitals, regional, and provincial hospitals in Thailand in 1999 showed only 0.8% of appropriate use of antimicrobial drugs. Studies are needed to update the situation.

3. Inappropriate practice of AMR prevention and control

The Healthcare Infection Control Practices Advisory Committee and the Society for Healthcare Epidemiology of America has recommended approaches to control or
eradicate multidrug-resistant organisms in health care settings. These include administrative support, judicious use of antimicrobials, surveillance, standard and contact precautions, and decolonization. There is evidence that these approaches were not followed by health care workers regularly. For example, Duangmoragot (1995)9 found that only half of nurses reported the MDR suspected cases to an infection control nurse (ICN). Similarly, hand hygiene was only practiced approximately 80% of the time, after providing direct care to MDR-infected patients. Gown, mask, and glove were used only 50% of the time when cleaning the bed and accessories of the MDR-infected patients. Inappropriate practice of AMR prevention and control plays a major role in the spread of AMR infections from cross-infections. Therefore, improving infection control practices of MDR is crucial. Without initiatives, AMR problems could be even worse. Evidence shows that one trained ICN per 100 beds is assigned to do full-time work on infection control in the health care facilities and one additional ICN per 250 beds yields effective infection control outcomes. The majority of ICNs in Thailand had experiences providing nursing care for patients. However, if they are assigned to do full-time work on infection control, they need additional training to acquire knowledge and skills in the area of infectious diseases, epidemiology, microbiology, disease surveillance, environmental sanitation, quality management, data analysis, leadership skills, and teaching. Unfortunately, one of the major findings showed that ICNs had insufficient knowledge and skills in infection control and they suggested the schools to provide infection control training courses for them.10 Studies of the roles of ICNs found an insufficient number of full-time ICNs per hospital bed due to the shortage of ICN posts in most hospitals.11

The Faculty of Nursing, Chiang Mai University, located in the north of Thailand, recognized the problems of NI and AMR, the need to educate nurse-midwives on the issues and the need to produce competent ICNs for the health-care system. The school decided to meet the challenges by building capacity of nurse-midwives and initiated some related work.

**AMR infection control initiatives in capacity building**

Since 1992, the Faculty of Nursing, Chiang Mai University has initiated and implemented many programmes to reduce AMR and NI problems including a Master’s programme, the only one in the country and in the Region, and a series of short training courses. All of these programmes have been approved by the Thailand Nursing and Midwifery Council. At the beginning of these initiatives, the programmes were financially supported by the China Medical Board of New York, a USA foundation. Details of some of the programmes are as follows:

1. **Master’s programme in infection control nursing**

   The two-year Master of Nursing Science Programme in Infection Control Nursing was started in 1992. The primary objective of the programme was to educate and prepare nurses to have an advanced role in infection control nursing. The curriculum composed of a total of 42 credit hours. The main topics include concepts and main theories in nursing, research design in nursing and data analysis, systematic review and research utilization, nursing leadership in health system, competency development of advanced practice nurses, advanced health assessment, basic medical microbiology, advanced infection control nursing, advanced practicum in infection control nursing, epidemiology of infectious diseases, issues and problems in infectious diseases, and a thesis. AMR is included in the courses and theses.

   This programme has been conducted successfully. Recently the programme has been...
approved and certified by the Thailand Nursing and Midwifery Council as one of the advanced nursing practice programmes at the Master’s level. The programme admits 15 students annually. As of October 2010, the school has produced approximately 225 nurses who are now functioning as ICNs in health-care settings throughout the country.

Studies on AMR by graduates can be broadly categorized into the following aspects: epidemiology of and risk factors of AMR, and intervention for the prevention and control of AMR. Selected examples are presented as follows: Judang (2002) studied the incidence, risk factors, and impact of pneumonia caused by AMR among patients (n = 223) admitted at a medical intensive care unit during the year 2000-2001. Results showed that incidences of ventilator-associated pneumonia were 18.8 infections per 1000 ventilator-days. Risk factors included underlying diseases such as chronic obstructive pulmonary diseases and duration of ventilator uses (p < .001). All causative agents were AMR Staphylococcus aureus and AMR Acinetobacter baumannii. The costs of the AMR treatment were twice as high compared with those who did not develop the infection. This study provided empirical data that AMR is a major problem in Thailand especially at a tertiary health care setting.

Judang et al. (2000) examined risk factors for AMR infections in a tertiary university hospital among cases of infection (n = 100) and control (n = 100) in 2000. It was found that long duration of admission (> 4 weeks), a history of receiving antibiotics, and invasive instruments were significant factors for AMR infections. The results of the study guided the policy regarding the appropriate use of antibiotics as well as provided education to medical students and physicians to realize the importance of antibiotic usage and understand the indications for antibiotic use. The results of the study also guided nursing personnel to strictly adhere to the practices of prevention and control of AMR infection especially among patients who had those risk factors.

Duangmoragot et al. (1995) studied the effect of participatory learning on practices among nurses for the prevention and control of AMR infection in one provincial hospital. This quasi-experimental research aimed to compare the practice of prevention and control of AMR infection among nurses before and after participatory learning. The sample consisted of 63 nurses working in the surgical department. Data collection was carried out from October 2004 to January 2005. The research tools consisted of the participatory learning plans, the practice observation form and the practice questionnaire. The results of the study illustrated that, after completing the participatory learning, the nursing practices for the prevention and control of AMR infection was significantly different (p < .05). Activities that nurses improved their behaviour significantly after joining the programme included notifying infection control nurses when there is a case of MDR bacterial infection, patient isolation, hand hygiene, glove wearing, mask and gown wearing, management of patient’s belongings, and linen management. This study shows that participatory learning can change nursing practice according to the guidelines for prevention and control of AMR infection. Therefore, it is recommended that participatory learning should be used to promote nursing practice for prevention and control of AMR infection.

These studies are presented as examples. There have been many studies focusing on the interventions that could reduce not only inappropriate infection control practices but also the incidence of infection.

2. Short training courses

Although the Master’s degree programme is being offered, the annual intake is only 15 students, which is not sufficient. Furthermore, there have been requests to offer the tailor-
made programmes to meet the needs of each individual. Many ICNs could not leave the full-time job to attend the two-year Master’s degree programme. Thus, many short training courses have been offered in series.

2.1 The first infection control training course

This course was initiated, implemented, and tested in 2003. The course consists of 80 hours of theoretical knowledge and a practicum. The theoretical course includes an update in epidemiology of NI, investigation of outbreaks, appraisal of data for nosocomial infection control, data analysis and management, evidence-based practice in infection control, project development and implementation in infection control, information technologies in infection control, practice guidelines development and implementation, leadership in infection control, and health economics in infection control. As for the practicum, each participant developed and conducted the infection control project in their own setting with the supervision of the faculty members responsible for the course using a variety of methods including an infection control newsletter, internet-based web board, email, and telephone calls.

Picheansathian et al. (2003) conducted an evaluation of this course by asking the participants to share their opinions on the course and the perceived self-efficacy in ICN role (n = 46), while asking the supervisors to provide their opinions on the quality of the role of the participants comparing before and after the training course (n = 46). A majority of participants strongly believed agreed that all topics in the course were highly applicable to their work. They also stated that networking among participants was good and that they could share their experiences and knowledge. When comparing their self-efficacy on the infection control roles before and after attending the course, it was found that their perception of the self-efficacy increased significantly (p < .05) in the following roles; infections disease surveillance, routine quality control monitoring, consultation, serving as a committee member, monitoring of and support to the infection control activities, education, and research utilization. All supervisors agreed that the training course was beneficial to the hospital and on the role development of ICNs. A majority of them (93.2%) stated that ICNs improved their roles as an ICN after attending the course. The differences in perception regarding the ICN’s roles as compared with the baseline, were rated higher for each role but the differences were not significant. The results of this study provided critical inputs for course revision.

2.2 The certificate programme of nursing specialty in infection control and nursing care for infectious patients

This four-month programme was initiated and has been implemented since 2006. The primary goal of the programme was to improve knowledge and skills of ICNs not only in the area of infection control but in the area of health system, health policy, and infection control at the national level, infectious diseases epidemiology, infectious diseases surveillance, evidence-based utilization for infection control, research process and utilization, information technologies, and strategies to promote the work of infection control.

This programme has an intake of 45 students annually. All graduates who complete the programme work as ICNs in many healthcare settings throughout the country.

Other related initiatives

In addition to capacity building, a best practice model to reduce AMR problems, guidelines, and networking have been developed.

1. Best practice model

The best practice model to reduce AMR problems consists of six steps.
Step 1. AMR problems identification and prioritization

In this step, the AMR problem should be quantified. Data and information from infectious disease epidemiological studies should be conducted and reviewed. Consultations with experts in this area or hospital epidemiologists could provide fruitful information. Other important aspects to discuss in this step included impact of the problems. The morbidity and mortality impacts should be highlighted in the discussion to prioritize the problem. Then, the meeting to establish a committee to solve the problem should be conducted. The infection control committee should be appointed with members recruited from all parties involved. One of the members should work full-time and be responsible only in the area of infection control. Policies related to AMR and quality improvement should be reviewed and updated. The AMR quality improvement plan should be initiated. Importantly, collaboration with affiliated hospitals for the practicum is essential. A win-win approach has been used for the practices by helping the unit in the hospital in prevention and control of infection and, in turn, participants could learn from the actual infection control practicum.

Experts in the area of infection control and in the area of evidence-based practices should be invited to provide the basic principles and knowledge in these areas. Time should be allowed to discuss, identify, and prioritize the AMR problem. Possibility of an AMR project for each unit should be encouraged, discussed and initiated with support from the hospital administrator. During this step, experts should be available for consultation when needed. The results from the discussion regarding the projects should be summarized and classified into categories.

Step 2. Development of AMR prevention and control programme

The AMR prevention and control programme can be implemented using a variety of strategies and methods under the quality improvement programme. Under these programmes, many projects of AMR prevention and control could be initiated. Meetings among the infection control committee, hospital administrators and stakeholders should be conducted to initiate and conduct AMR quality improvement through evidence-based practices. Based on our experiences, many projects failed to finish on time or were delayed if the project was started without adequate preparation. Therefore, workshops to prepare the committee and the involved staff are crucial.

Step 3. Project planning and development

In this step, the project should be started. It is the time to assign a responsible person, set up a timeline, and initiate a process for activities and their evaluation. The duration of each project could be six months or longer for all processes depending on the situation. Experts should be involved in project planning and development to facilitate the progress and to identify and solve the problems or barriers that might exist. The projects should be submitted for approval from the hospital administrator.

Step 4. Project implementation

In this step, project staff identify guidelines or best available evidence from a variety of sources. It could be the results from primary research, related guidelines, or expert opinions. This step is critical when identifying guidelines based on evidence. Experts must be available to help identify the source of guidelines, evaluate the quality of the guidelines and develop guidelines applicable to the local context. Since some of the evidence is not in the native language, experts play an important role to help in translation during this period. Then, guidelines based on the evidence should be drafted and refined. A meeting among those who will utilize the guidelines such as nursing staff working in the unit, patients, and other involved health-care workers should be conducted to get a
consensus on the guidelines and an agreement to implement them.

Step 5. AMR practice, promotion and support

This step is important and could determine the success or failure of the projects. The responsible staff must identify strategies and use them to promote the practices of the guidelines. A variety of methods could be used including group discussion, morning conference, lecture, training workshop, or rewarding activities. Experts and responsible staff should provide advice, support, and consultation when needed.

Step 6. Project evaluation and conclusion

In this step, staff responsible for each project should conduct the evaluation and conclusion of the project as well as writing the report. Experts should provide training for responsible staff on the project evaluation, and writing the report. Responsible staff should conduct the workshop or the meeting to discuss, evaluate, and conclude the project. Sharing of knowledge and experiences should be the main objectives so that each individual can learn from each other. Then, the schedule to have a project presentation should be developed with the participants and the hospital administrators.

2. Development of guidelines

A few guidelines were developed, for example, the guidelines related to eight important infection control aspects with financial support from the WHO Country Office, Thailand. The guidelines were utilized in many infection control projects.\(^\text{15}\) Also, guidelines on management of avian influenza for nurses were developed, tested, and utilized.\(^\text{16}\) However, there is a need to develop AMR-specific guidelines applicable to the local context.

3. Development of networking

Two networking exercises were initiated and conducted actively by members.

- The infection control nurse group was formed with the primary purpose of sharing information on infection control practices among its members.
- The Nursing Association for Prevention and Control of Infection was formally established with the primary purpose of providing education training activities for its members as well as other related health care workers.

The above-mentioned initiatives have started yielding results but yet a lot more needs to be done so that nurses can play a critical role in reducing NI as well as AMR in any health care setting.

References and bibliography


