



Nursing Knowledge and MRSA

Running head: NURSING KNOWLEDGE AND MRSA

Master of Public Health Project
Nursing Knowledge and Methicillin-Resistant *Staphylococcus aureus*:
Implications for Community Health Nursing in First Nations Communities

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Abstract

Methicillin-resistant *Staphylococcus aureus* (MRSA) has emerged as a serious nosocomial and community-associated pathogen in aboriginal people in Canada (Canadian Pediatric Society, 2005). A recent survey with First Nations employed community health nurses (CHNs) in the Atlantic region found that nursing knowledge is lowest in the area of emerging infections such as MRSA (Mi'kmaq Confederacy of Prince Edward Island, 2009). The objective of this project is to review the nursing literature on this topic and to describe the factors that contribute to low nursing knowledge of MRSA. A search of the literature published during 2000-2008 using Medline, CINAHL with full text, DARE, and CDSR was conducted using the following search terms: "community-acquired MRSA", "hospital-associated MRSA", "hospital-acquired MRSA", "community-associated MRSA", "MRSA", "community health nursing", "nurse" "nursing", "antibiotic resistant organisms", "nosocomial infections" and "knowledge". The search generated 48 papers for review. For each paper, information was obtained on the study population, health care setting (acute or community), geographic location of the research, and the study type. Publications were sorted by topic area MRSA (CA-MRSA, HA-MRSA or both) or nosocomial infections. The articles were also organized into key theme areas for further description. Sixty-two and one half percent (30) of the papers referred to healthcare workers as the study population (nurses, doctors, aides, dentists). Nurses were the primary study population in 37.5% (18) of the papers, with only three of these papers focused on community health nurses. The research in this area has emerged from the United Kingdom (37.5%) and the United States (35%), with a paucity of research on this topic in Canada (15%) and the

rest of the world. Sixty-two and one half percent of the papers focused on MRSA with two of the papers discussing CA-MRSA. Thirty-seven and one half percent of the papers focused on the broader topic of nosocomial infections. Acute care is the most common setting for research in this area (73%). Only five articles were found on this topic in a community setting. The majority of literature available addresses MRSA knowledge deficits and strategies to address them. There is limited literature published on the factors contributing to low nursing knowledge of MRSA. The review suggests that a gap exists in infection control content in nursing curriculum at the undergraduate level and between nurses' reported knowledge and practice. The review also suggests that nurses' personal way of knowing contributes to their knowledge of MRSA. Further research is required on these factors. Additional research on this topic is needed in Canada and in a variety of nursing practice settings. Nurses employed in First Nations communities warrant increased attention considering the implications of MRSA in aboriginal people.

Nursing Knowledge and Methicillin-Resistant *Staphylococcus aureus*:

Implications for Community Health Nursing in First Nations Communities

The emergence of MRSA as a nosocomial and community-associated pathogen in Canada has resulted in a number of concerns (Canadian Pediatric Society, 2005). MRSA is associated with high morbidity and mortality, increased health care costs (First Nations and Inuit Health Branch, 2008) and is considered a key health issue affecting the health of Canadian aboriginal people (Canadian Pediatric Society). In 1990, Taylor, Kirkland and Kowalewska-Grochowska were the first to document cases in the aboriginal population in Canada after an outbreak of a multi-strain cluster of MRSA in a First Nations community in Alberta from 1986-1989 (Hawkes, Barton, Conly, Nicolle, Barry, & Ford-Jones, 2007). Since this outbreak, there has been increased attention to MRSA in Canadian aboriginals (Canadian Pediatric Society). One Canadian study found that aboriginals were six times more likely to have community-acquired MRSA than non-aboriginals (Ofner-Agostini, Simor, Bryce, Mcgeer, Kiss, & Paton, 2006).

Much of the literature published in this area to date has focused on the epidemiology of the bacterium, risk factors, prevention and treatment. Recently, there has been more inquiry on the knowledge and practice of nurses in acute care settings. However, the literature in regards to the MRSA knowledge in community health nurses is limited. A recent survey conducted with First Nations employed community health nurses (CHNs) in the Atlantic region reports that nursing knowledge is lowest in the area of emerging infections such as MRSA (Mi'kmaq Confederacy of Prince Edward Island, 2009). This is a significant finding considering the implications of this emerging pathogen in aboriginal people.

It is important to understand the factors that contribute to low levels of nursing knowledge of MRSA. This project will provide an in-depth review of the nursing literature to explore the factors that contribute to low nursing knowledge levels of MRSA. The specific objectives guiding this project are:

1. To provide an overview of the literature of MRSA in Canada
2. To provide a description of the nursing theory of “multiple ways of knowing” in community health nursing
3. To describe the published literature regarding nursing knowledge and MRSA
4. To describe the factors contributing to nurses’ knowledge of MRSA
5. To discuss the implications of these findings to community health nursing practice in First Nation communities
6. To discuss questions for future research

The following section will provide an overview of the literature of MRSA in Canada, followed by a review of the history and context of community health nursing in First Nations communities in Atlantic Canada and will conclude with the theoretical framework for community health nursing knowledge.

MRSA: An Overview

This section will include definitions, MRSA in Canada, risk factors, and transmission.

Case definitions

The rise of anti-biotic resistant organisms has resulted from the overuse of antibiotics (Yetman, 2006). After repeated exposure to antibiotics, bacteria mutate and

become stronger and more resistant to antibiotic regimens (Yetman). In the case of MRSA, it is sometimes challenging for nurses to differentiate between the health-care associated and the community-associated strains of the bacteria. For the purposes of this discussion, the case definitions below are used:

MRSA: “MRSA demonstrates resistance to the semi-synthetic penicillins (methicillin, oxacillin and cloxacillin). It is also resistant to cephalosporins, monobactams and carbapenems. Resistance to other antibiotic classes may occur, but it is strain dependent” (Barton, Hawkes, Moore, Conly, Nicolle, Allen, et al. 2006, p.6C).

Health Care-Associated MRSA (HA-MRSA): “Patients with infections that developed ≥ 3 days after admission to hospital, or who stayed in a hospital or resided in a long-term care facility at any time during the 12 months before symptom onset” (Canadian Nosocomial Infection Surveillance Program, 2008).

Community Associated-MRSA: “MRSA isolates obtained from individuals in the community who have not had recent exposure to the health care system, or from patients in health care facilities in whom the infection was present or incubating at the time of admission” (Barton et al., 2006, p. 6C).

MRSA colonization: “The presence of MRSA without any clinical sign or symptoms of infection” (Canadian Nosocomial Infection Surveillance Program, 2008).

Nursing Knowledge and MRSA

The case definitions and the other terms defined below are found in the Appendix.

Aboriginal: “This is a collective name for all of the original peoples of Canada and their descendants. The Constitution Act of 1982 specifies that the Aboriginal Peoples in Canada consists of three groups - Indians, Inuit and Métis. Indians, Inuit and Métis peoples have unique heritages, languages, cultural practices and spiritual beliefs” (Indian & Northern Affairs Canada, 2001).

Communicable Disease: “An illness due to a specific infectious agent or its toxic products that arises through transmission of that agent or its products from an infected person, animal, or reservoir to a susceptible host, either directly or indirectly through an intermediate plant or animal host, vector or the inanimate environment” (Last, 2001, p.35).

Epidemiology: “The study of the distribution and determinants of health-related states or events in specified populations and the application of this study to control of health problems” (Last, 2001, p.62).

First Nations: “A term that came into common usage in the 1970s to replace Indian. Although the term First Nation is widely used, no legal definition of it exists. Among its uses, the term “First Nations Peoples” refers generally to the Indian Peoples in Canada, both Status and non-Status” (Indian & Northern Affairs Canada, 2001).

Inuit: “Inuit are the Aboriginal People of Arctic Canada who live primarily in Nunavut, the Northwest Territories and northern parts of Labrador and Quebec” (Indian & Northern Affairs Canada, 2001).

Nosocomial Infection: “An infection originating in a medical facility, e.g. occurring in a patient in a hospital or other health care facility in whom the infection was not present or incubating at the time of admission. Includes infections acquired in the hospital but appearing after discharge; it also includes such infections among staff” (Last, 2001, p.125).

Pathogen: “Organism capable of causing disease (literally causing a pathological process)” (Last, 2001, p.132).

MRSA in Canada

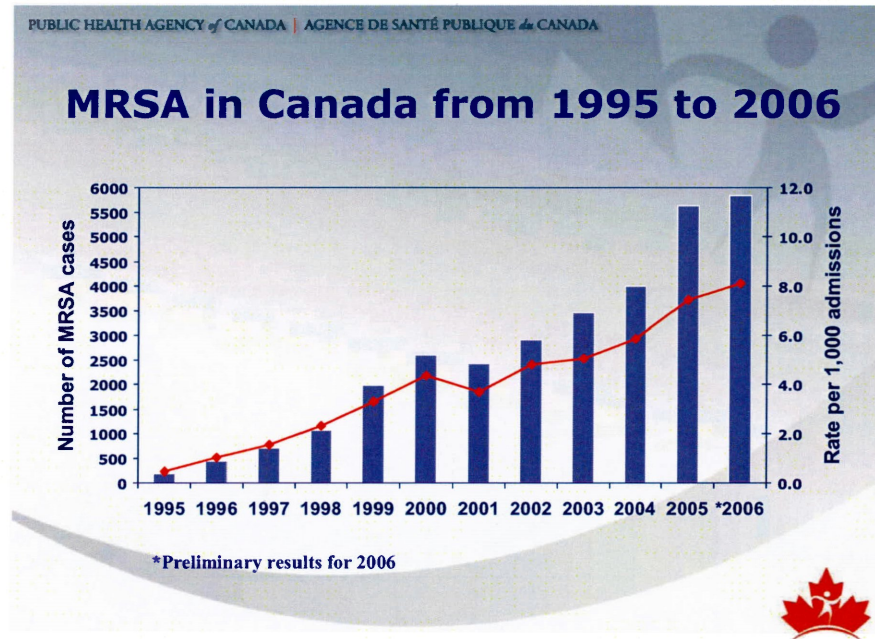
MRSA is increasing in Canada (Public Health Agency of Canada, 2008). MRSA increased in Canadian hospitals from 0.46% to 9.1% per 1000 admissions from 1995 to 2006 (Public Health Agency). This data is presented in Table 1. The Canadian Nosocomial Infection Surveillance Program (CNISP) reports a slight decrease of HA-MRSA in Canada in 2007, and that CA-MRSA increased by 8% (2008).

There are many limitations in the collection and availability of data on MRSA in Canada. While there is a need for MRSA surveillance data, the burden of disease is not as significant as what is experienced in the United States (Allen, 2006). Thus, there have not been significant investments in surveillance systems to capture HA-MRSA and CA-MRSA rates regardless of setting. The only systematic data collection on MRSA is

through the surveillance of hospital admissions (CNISP, 2008). Therefore, there are limitations to a broader public health interpretation of the data as the program falls within the domain of a nosocomial surveillance program (CNISP, 2008).

Table 1

MRSA in Canada 1995-2006



(CNISP, 2008)

Another factor for consideration is that MRSA is not a reportable disease in every jurisdiction in Canada (Nicolle, 2006). For example, consider two provinces in the Atlantic region: MRSA is reportable in Nova Scotia, and is not a reportable disease in the province of New Brunswick. Allen (2006) suggests, a “more structured and regulated approach to reporting and surveillance of MRSA at the provincial and national level” (p.162). Systematic data collection, analysis and communication are integral elements of a robust public health system (Last, 2001).

Risk Factors

There are different risk factors for HA-MRSA and CA-MRSA. Those identified as being at risk for HA-MRSA include persons: currently or recently hospitalized, residing in a long-term care facility, having invasive procedures and those with recent or long-term antibiotic use (First Nations and Inuit Health, 2008). Those identified at risk for CA-MRSA include: children < two years of age, minority populations (Aboriginal, African), athletes who play contact sports, intravenous drugs users, men who have sex with men, military personnel, correctional inmates, veterinarians, pet owners and pig farmers (Gilbert, MacDonald, Gregson, Siushansian, Zhang, Elsayed et al., 2006; Hawkes et al., 2007; Ofner- Agostini et al., 2006; Yetman, 2006). Other environmental risk factors such as low socio-economic status and overcrowded housing are described in the literature as risk factors for both HA-MRSA and CA-MRSA (Allen, 2006).

Transmission

MRSA infections are spread by close skin to skin contact with a person with MRSA infection or colonization or by coming into direct contact with a surface or item contaminated with MRSA (such as wound dressings, towels or linens) (Allen, 2006; Heymann, 2004). Sub-optimal hygiene, crowding, frequent skin to skin contact, sexual activity and sharing personal items can increase the likelihood of transmission (Allen, 2006; Barton et al., 2006; Gilbert et al., 2006). However, the main mode of transmission is via contaminated hands (Whitney, Marchant-Short & Yiu; cited in Leeseberg Stamler & Yiu, 2008). The outcomes of this infection can range from a mild abscess or cellulitis to invasive infections such as joint infections, necrotizing pneumonia or septicaemia (Adam, McGeer, & Simor, 2007; Kowalski, Berbari, & Osmon, 2005).

The next section will review community health nursing in First Nations communities in Atlantic Canada. This will provide the nursing practice context that we will be discussing in relation to the research findings.

The Landscape: First Nation Community Health Nursing in Atlantic Canada

Mary Thomas, an elder from Neskonilth Band once said, “In order to move ahead and get on with our lives, we have to know where we came from; we have to look at where we’ve been to get to where we’re going.” (Napoleon, 1992; cited in British Columbia First Nations Health Handbook, n.d., p.3) This section provides an overview of nursing practice in First Nations communities in Atlantic Canada including the following topics: demographics, First Nations managed health care, cultural competence and jurisdictional and legislative barriers. As there are limitations in published data regarding community health nursing in Atlantic Canada, some information contained in this section comes from my knowledge and experience as a community health nurse at First Nations and Inuit Health (FNIH), Atlantic Region.

Demographics

The Atlantic region of Canada includes the provinces of Nova Scotia, New Brunswick, Prince Edward Island, and Newfoundland and Labrador. This region is within the traditional territories of the Mi’kmaq, Maliseet, Innu and Inuit peoples. There are approximately 37,867 First Nations people comprising approximately 1% of the population of Atlantic Canada (Statistics Canada, 2008). The population has increased by 2% since 2004-2005. The average age of First Nations people in Canada is 30 years of age, with 69.7% of the population under the age of 40 (Statistics Canada). There are

33 independent First Nations communities in Atlantic region ranging in size from 40 to 3200 members with 13 communities in Nova Scotia, 15 in New Brunswick, two in Prince Edward Island and three in Newfoundland and Labrador. Public health programs for the seven Inuit communities in Labrador are self-managed by the Nunatsiavut Department of Health and Social Development and are not included in this discussion.

There is a wealth of research on the poor health status of Canada's First Nations people (Shah, 2003; Smylie, 2000). Atlantic Canada is not unique from the rest of Canada as health issues such as poverty, housing concerns, mental health, infectious disease, Type II diabetes, addictions, and obesity abound (First Nations Centre, 2005).

First Nations Managed Health Care

As a result of the Indian Health Policy of 1979, followed by the federal governments' health transfer policy of 1989, there was a move to transfer control of health services to First Nations communities by the early 1990s (Kulig, MacLeod, & Lavoie, 2007). In Atlantic region, many First Nations communities chose to sign agreements for health transfer. This process was done in a bilateral way, without any involvement from the provincial governments (G. Bailey, personal communication, September, 2005). The process of health transfer was expedited in a swift manner with minimal planning and without the establishment of supportive environments.

What does health transfer look like through a community health nursing lens? While CHNs practice within provincial legislation (including scope of practice and nursing standards), they are employed by the Chief and Council (with the exception of 2 in Atlantic region), and are sometimes supervised by an individual with a limited health background (Kulig et al., 2007). Program policies and procedures were not considered at

the time of transfer leaving most communities without adequate supports for nursing practice. Nursing policies and procedures are still a gap in most First Nations communities in Atlantic region.

Cultural Competency

The Mi'kmaq belief that “for every sickness on this Earth, there is a medicine under your feet” emphasizes the importance of culture in community health nursing practice (Cook, 2005, p. 96). Cultural competence reduces disparities in health services and impacts the health status of culturally diverse communities (College of Registered Nurses of Nova Scotia, 2006; Community Health Nurses Associations of Canada, 2003; Mahealani, Broad & Allison, 2002; Nova Scotia Department of Health, 2005; Wittig, 2004). The First Nations perception of health differs from the traditional Western definition (First Nations Centre, 2005; Smylie & Anderson, 2006). The medicine wheel is a circular symbol that represents the wholeness of traditional First Nations life (First Nations Centre, 2005; Johnson, n.d.). Health and wellness are inseparable from the physical, spiritual, mental, economic, environmental, social and cultural wellness of the individual, family, and community (Johnson). It is a perfectly balanced shape without a top or bottom, length or width and represents constant movement and change (balance) (First Nations Centre). A healthy community is one with a lack of material scarcity and where its members are self-confident and participate in its political, economic and cultural life (First Nations Chiefs Health Committee and BC Ministry of Health, n.d.).

While a large proportion of First Nations people in Atlantic Canada are Roman Catholic, many use traditional teachings, ceremonies and medicines as part of health and healing (Nova Scotia Department of Health, 2005). A survey done with Mi'kmaq clients

at a First Nations community health center suggested that more than half of the clients (66%) use or have used traditional Mi'kmaq medicine and of this group a large number feel that traditional medicine is more effective than Western medicine (Cook, 2005). Furthermore, 92% of these participants do not discuss their use of traditional medicine with their physician (Cook).

This evidence implies that community health nurses should be aware of and responsive to the needs of their First Nations clients by providing opportunities to integrate sweetgrass, sweat lodges, healing circles, spirit workshops, and medicine teachings into the nursing care plan (Dobblesteyn, 2006; Mahealani Broad and Allison, 2002).

Jurisdictional and Legislative Barriers

The lack of clarity on roles and responsibilities of various stakeholders providing health care to First Nations peoples can be problematic (Nova Scotia Department of Health, 2005). Community health centers are funded to provide a range of public health services while primary, secondary and tertiary care is the responsibility of the provincial health system. The work within the community health center is public health oriented and this creates a need for inter-connectivity with respective public health partners. Each province has a unique public health structure as well as a unique history with the First Nations communities in their jurisdiction.

While there is no federal Public Health Act, the Public Health Agency of Canada (PHAC) works collaboratively with many partners in the prevention and control of communicable diseases (PHAC, 2008). PHAC's leadership role on MRSA surveillance through CNISP has already been described. The most recent national MRSA project is a

new educational initiative titled, *Safer Healthcare Now (SHN)*, that has been developed by PHAC, the Community Healthcare Infection Control Association of Canada and the Canadian Patient Safety Authority (PHAC, 2008). The objective of this project is to provide health staff across Canada with the knowledge and tools needed to address MRSA in their workplace (PHAC, 2008)

Authority for communicable disease control lies within the domain of the provincial government. Therefore, issues such as provincial surveillance, diagnosis, notification of communicable diseases and outbreak identification are managed at a local public health unit level. Furthermore, the provincial public health systems do not have the capacity for First Nations people to self-identify their ethnicity (Smylie & Anderson, 2006). Thus, local public health units are unable to identify a First Nations client as living on reserve until contact tracing is started. As noted previously, the unique structure and history of the local public health unit impacts how communicable disease management plays out at the community level. Some First Nations communities may be contacted to proceed with communicable disease case follow-up, while other CHNs may never be informed of the disease in their community. CHNs require community level data that reflects First Nations ethnicity and geographic location (Smylie & Anderson). While this is the current reality there are many options for integration of services involving the federal government, provincial government and First Nations being explored (e.g. Panorama project)(NS Department of Health, 2005; First Nations and Inuit Health Branch, 2006).

There are many complexities in the day to day practice of First Nations employed CHNs that affects the acquisition and implementation of new knowledge. As discussed,

the multitude of health issues in the First Nations population, the move towards self-determination in health programs and understanding the aboriginal traditions and ways of knowing impact community health nursing knowledge. The overlay of the jurisdictional web adds further complexity to the CHNs nursing knowledge especially in the area of communicable disease prevention and control.

The following section will introduce the theoretical framework that outlines the foundation of knowledge patterns in nursing.

Multiple Ways of Knowing: A Theoretical Framework

Simply defined, knowledge is an “awareness or familiarity gained by experience (of a person, fact or thing)” (Barber, 1998, p. 787). This field of study emerged from the work of early theorists like Descartes who proposed that all knowledge can be explained by cause and effect (Streubert Speziale, 2003). This viewpoint was challenged in later years by theorists such as Kant, Husserl and the German school of philosophy (Streubert Speziale). They proposed that not all of reality can be explained by cause and effect and this development provided an opportunity for exploration of the lived experience and the meaning of this in social science (Streubert Speziale).

Multiple ways of knowing, first described in the nursing literature by Carper (1978; cited in Fawcett, 2004), are four knowledge patterns in nursing: empirics, ethics, esthetics, and personal. Carper proposed that positive care outcomes result only from the integration of the four knowledge patterns (1978). Subsequent authors (Jacobs-Kramer & Chinn, 1988; White, 1995; cited in Fawcett) have built upon Carper’s work and this theory has been incorporated into the Canadian Community Health Nursing Practice

Model (Canadian Community Health Nurses Association (CHNAC), 2003). The multiple ways of knowing framework is outlined in Table 2.

Table 2
Multiple Ways of Knowing Framework

Way Of Knowing	Definition
Aesthetics	<p>The art of nursing, means adapting knowledge and practice to particular rather than universal circumstances. It encourages nurses to explore possibilities, promotes individual creativity and style, and contributes to the transformative power of community health nursing.</p> <p>Example: The way a nurse would provide care differently for two elderly women based on the nurse's knowledge of each woman's particular life circumstances</p>
Empirics	<p>Empirics, the science of community health nursing, includes research, epidemiology and theories and models (incorporating publicly verifiable, factual descriptions, explanations and predictions based on subjective and objective data). Empirical knowledge is generated and tested by scientific research (Fawcett, Watson, Neuman & Hinton, 2001).</p> <p>Example: Treatment regimens for diabetes mellitus.</p>

Way Of Knowing	Definition
Personal Knowledge	<p>The most fundamental way of knowing, comes from discovery of self, values and morals and lived experience. It involves continuous learning through reflective practice.</p> <p>Reflective practice in community health nursing combines critical examination of practice, interpersonal relationships and intuition to evaluate, adapt and enhance practice.</p> <p>Example: Understanding of one's beliefs and the capacity for change.</p>
Ethics	<p>Ethics or moral knowledge, describes the moral obligations, values and goals of community health nursing. It is guided by moral principles and ethical standards set by the Canadian Nurses Association (2002). Ethical inquiry clarifies values and beliefs and uses dialogue to examine the social and political impact of community health nursing on the health environment (Fawcett et al., 2001).</p> <p>Example: This type of knowing is important when decisions of right and wrong are blurred by differences in values and beliefs.</p>

Way Of Knowing	Definition
Socio-political knowledge	<p>Socio-political knowledge or emancipatory knowing, goes beyond personal knowing and nurse-client introspection. It places nursing within the broader social, political and economic context where nursing and health care happen. It equips the nurse to question the status quo and structures of domination in society that affect the health of individuals and communities.</p> <p>Example: The effect of social determinants on health.</p>
(CHNAC, 2003, pg.7; Streubert Speziale, 2002, pg 4-6).	

Knowing is defined as “the state of being aware or informed of anything” (Barber, 1998, p.787). This framework of knowing describes nurses as active participants in the acquisition of new knowledge (CHNAC, 2003). The ideology of this framework is supported by the findings of Belenky, Clinchy and Tarule (1986; cited in Streubert Speziale, 2003). They suggest that “when presented with received knowledge from authority figures (teachers, adults); the receiver should ask themselves about their own perceptions of this knowledge” (p.3).

An understanding of the evolution of knowledge theory and the multiple ways of knowing framework is an important consideration for this review. Multiple ways of knowing recognizes that knowledge is more complex than what is learned through empirical inquiry (CHNAC, 2003). “By recognizing diverse evidence for practice,

community health nursing is able to question and move beyond the status quo, evolve and create relevant and effective action for community health” (Community Health Nurses Association of Canada, 2003, p.7).

Method

A search of the literature using Medline, CINAHL with full text, DARE, and CDSR was conducted using the following medical subject heading (MeSH) and text words used alone or in combination: “community-acquired MRSA”, “hospital-associated MRSA”, “hospital-acquired MRSA”, “community-associated MRSA”, “MRSA”, “community health nursing”, “nurse” “nursing”, “antibiotic resistant organisms”, “nosocomial infections” and “knowledge”. Journal articles published during 2000-2008 were included. Further articles were acquired after review of the initial reference list.

Table 3 outlines the inclusion and exclusion criteria for the search.

Table 3
Search Criteria

Category	Inclusion Criteria	Exclusion Criteria
Language	English	Non-English
Study Population	Registered Nurses (All Countries)	
Topic Of Interest	Community Associated MRSA Hospital Care Associated MRSA Nosocomial Infections	
Study Type	Systematic Reviews Meta-Analyses Prospective/Retrospective Studies Practice Guidelines Narrative Reviews, Grey Literature	Letters Editorial News reports

It became evident early in the search that the MRSA literature in the community setting is very limited. Accordingly, there was a lack of published literature on the knowledge of community health nurses in regards to MRSA. A decision was made to include literature regarding infection control and nosocomial infections.

For each article, information was obtained on the study population, health care setting (acute or community), geographic location of the research, and the study type. Publications were also categorized as dealing with specifically with MRSA (CA-MRSA, HA-MRSA or both) or the broader category of nosocomial infections. Comparisons of practice areas in the acute care setting have not been attempted in this review.

Results

The search was completed in October 2008 and generated more than 100 articles. 48 papers were selected for review after eliminating articles that did not meet the inclusion criteria. Further articles were acquired on review of the reference list of the articles found in the initial review.

Sixty-two and one half percent (30) of the papers referred to healthcare workers as the study population (nurses, doctors, aides, dentists). Nurses were the primary study population in 37.5% (18) of the papers, with only three of these papers focused on community health nurses. The research in this area has emerged from the United Kingdom (37.5%) and the United States (35%), with a paucity of research on this topic in Canada (15%) and the rest of the world. Sixty-two and one half percent of the papers focused on MRSA with three of the papers discussing CA-MRSA. Thirty-seven and one half percent of the papers focused on the broader topic of nosocomial infections. Acute care is the most common setting for research in this area (73%). Seventeen percent of the

papers were set in both acute and community settings. Only five articles were set in a community setting.

Eight articles were found that addressed the project objective of describing the factors contributing to nurses' knowledge of MRSA. There were no studies found on MRSA knowledge in First Nations employed CHNs nurses in Canada. A summary of these findings are found in Table 4. The section following the summary table describes the themes that emerged in this review.

Table 4

Review Summary: Nursing Knowledge and MRSA

Author (Year)	Study Population*	Topic**	Country	Setting***	Design	Theme****	Sub Topic
Hallett (2000)	Nurses (community)	MRSA	U.K.	Community	Qualitative Interviews	Knowledge Factors	Curriculum Content, Personal Ways of Knowing
Larson et al. (2000)	Healthcare workers	Nosocomial	U.S.	Acute	Narrative Review	Strategy	Organizational Campaigns
Pittet et al. (2000)	Healthcare workers	MRSA	Switzerland	Acute	Observational Study	Knowledge Deficit	Hand Hygiene
Silverman et al. (2001)	Nurses (First Nations employed)	Nosocomial	Canada	Community	Survey	Knowledge Deficit	Environmental Improvements
Conly (2002)	Healthcare workers	Nosocomial	Canada	All	Narrative Review	Knowledge Deficit	Anti-biotic Stewardship
Boyer & Pittet (2002)	Healthcare workers	Nosocomial	U.S.	All	Guidelines	Strategy	Infection Control Policy, Surveillance of Infection, Reduction in Inappropriate Prescribing
Anderson (2003)	Nurses	MRSA	U.S.	Acute	Narrative Review	Knowledge Deficit	Standards and Guidelines
Navaneeth et al. (2003)	Nurses	Nosocomial	Saudi Arabia	Acute	Survey	Knowledge Factors	Considerations for Occupational Health Nurses Education
Antoniak (2004)	Nurses	Nosocomial	United Arab Emirates	Acute	Narrative Review	Strategy	Curriculum Content, Education
Gould (2004)	Nurses	Nosocomial	U.K.	Acute	Observational Study	Knowledge Deficit	Infection Control Policy, Surveillance of Infection
						Knowledge Factors	Gap Between Knowledge and Practice
						Strategy	Standards Precautions, Ability to Critically Review the Literature
						Knowledge Deficit	Infection Control Policy, Performance Feedback

Author (Year)	Study Population*	Topic**	Country	Setting***	Design	Theme****	Sub Topic
Stirling et al. (2004)	Nurses	Nosocomial	Canada	Acute	Narrative Review	Knowledge Deficit	Epidemiology, Disease Transmission
Trampuz and Widmer (2004)	Healthcare workers	MRSA	U.S.	Acute	Narrative Review	Knowledge Deficit Strategy	Hand Hygiene Environmental Improvements, Organizational Leadership
Banning (2005)	Nurses	MRSA	U.K.	All	Narrative Review	Knowledge Deficit	Disease Transmission, Standard Precautions, Difference between CA-MRSA and HA-MRSA
Berhe et al. (2005)	Healthcare workers	Nosocomial	U.S.	Acute	Questionnaire	Knowledge Deficit	Gap between Knowledge and Practice
Easton et al. (2005)	Healthcare workers	MRSA	U.K.	Acute	Survey	Knowledge Deficit Knowledge Factors	Standard Precautions, Difference between CA-MRSA and HA-MRSA Gap between Knowledge and Practice
Gill et al. (2005)	Nurses	MRSA	U.S.	Acute	Guidelines	Strategy Knowledge Factors	Standards and Guidelines Education
Fairclough (2005)	Healthcare workers	MRSA	U.K.	Acute	Narrative Review	Knowledge Deficit	Hand Hygiene
Ott et al. (2005)	Nurses	MRSA	Canada	Acute	Narrative Review	Strategy Knowledge Factors	Home Study Program Gap between Knowledge and Practice, Education
Ploneynski & Ploneynski (2005)	Nurses	MRSA	U.S.	Acute	Narrative Review	Knowledge Deficit Strategy	Anti-biotic Stewardship Infection Control Policy, Surveillance of Infection
Preston (2005)	Nurses	Nosocomial	U.K.	Acute	Narrative Review	Strategy Knowledge Factors	Audits, Risk Assessment Protocols Gap Between Knowledge and Practice

Author (Year)	Study Population*	Topic**	Country	Setting***	Design	Theme****	Sub Topic
Prieto & Clark (2005)	Healthcare workers	Nosocomial	U.K.	Acute	Case Study	Knowledge Deficit	Standard Precautions
van Gemert-Pijnen et al. (2005)	Healthcare workers	MRSA	Holland	Acute	Questionnaire	Knowledge Factors	Gap between Knowledge and Practice, Personal Ways of Knowing
Wilcox (2005)	Nurses	MRSA	U.K.	Acute	Narrative Review	Knowledge Deficit Strategy	Nosocomial Infections Organizational Campaigns
Wills (2005)	Healthcare workers	MRSA	U.K.	Acute	Narrative Review	Strategy	Organizational Campaigns, Infection Control Policy, Reduction of Inappropriate Prescribing
Barton et al. (2006)	Healthcare workers	CA-MRSA	Canada	All	Guidelines	Strategy	Standards and Guidelines
Dragon (2006)	Healthcare workers	Nosocomial	U.K.	Acute	Narrative Review	Strategy	Use of Alcohol Sanitizer, Surveillance of Infection, Public Education
Holcombe (2006)	Healthcare workers	CA-MRSA	U.S.	All	Guidelines	Strategy	Standards and Guidelines
Hussein et al. (2006)	Healthcare workers	Nosocomial	U.S.	Acute	Observational Study	Knowledge Deficit Knowledge Factors	Hand Hygiene, Use of Alcohol Sanitizer Gap Between Knowledge and Practice
Lines (2006)	Nurses	MRSA	U.K.	Acute	Qualitative Interview	Strategy Knowledge Factors	Infection Control Policy, Reduction of Inappropriate Prescribing Gap between Knowledge and Practice
Maskerine & Loeb (2006)	Healthcare workers	MRSA	U.S.	Acute	Narrative Review	Knowledge Deficit Strategy	Hand Hygiene Performance Feedback

Author (Year)	Study Population*	Topic**	Country	Setting***	Design	Theme****	Sub Topic
Alberta Health & Wellness (2007)	Healthcare workers	MRSA	Canada	All	Guidelines	Strategy	Standards and Guidelines
Alex & Letizia (2007)	Nurses	MRSA	U.S.	Community	Narrative Review	Knowledge Deficit	Considerations in School Settings
Beer & Fear (2007)	Healthcare workers	MRSA	U.K.	Acute	Narrative Review	Knowledge Deficit	Panton-Valentine leukocidin
Farley (2007)	Nurses	MRSA	U.S.	Acute	Narrative Review	Knowledge Deficit	Considerations for Nurse Practitioners
Forsha & Richmond (2007)	Healthcare workers	MRSA	U.S.	Acute	Narrative Review	Strategy	Positive Deviance Approach
Ghabrah (2007)	Healthcare workers	MRSA	Saudi Arabia	Acute	Questionnaire	Knowledge Deficit	Standard Precautions
Gould (2007)	Nurses (community)	Nosocomial	U.K.	All	Narrative Review	Knowledge Deficit	Difference between CA-MRSA and HA-MRSA
Larsen et al. (2007)	Healthcare workers	Nosocomial	U.S.	Acute	Survey	Knowledge Deficit	Anti-biotic Stewardship
Nazarko (2007)	Healthcare workers	MRSA	U.K.	Community	Narrative Review	Strategy	Infection Control Policy, Organizational Campaigns
Alberta Health & Wellness (2008)	Healthcare workers	MRSA	Canada	All	Standards	Knowledge Deficit	Considerations in the Home setting
Barnes & Jinks (2008)	Healthcare workers	Nosocomial	U.K.	Acute	Narrative Review	Strategy	Standards and Guidelines
Cole (2008)	Healthcare workers	Nosocomial	U.K.	Acute	Narrative Review	Knowledge Factors	Gap Between Knowledge and Practice
Hospital Infection Control (2008)	Healthcare workers	MRSA	U.S.	Acute	Narrative Review	Knowledge Factors	Personal Ways of Knowing
						Strategy	Positive Deviance Approach

Author (Year)	Study Population*	Topic**	Country	Setting***	Design	Theme****	Sub Topic
Lopez-Alcade et al. (2008)	Healthcare workers	MRSA	Spain	Acute	Intervention protocol (proposal)	Strategy	Infection Control Policy
Lugg & Ahmed (2008)	Nurses	MRSA	U.K.	Acute	Mixed Methods	Knowledge Deficit Knowledge Factors	Disease Transmission Gap between Knowledge and Practice
Rollins (2008)	Healthcare workers	Nosocomial	U.S.	Acute	Narrative Review	Strategy	Organizational Campaign
Tisinger (2008)	Healthcare workers	MRSA	U.S.	Community	Narrative Review	Knowledge Deficit Strategy	Epidemiology Surveillance of Infection
Trigg et al. (2008)	Healthcare workers	MRSA	U.K.	Acute	Audit	Knowledge Factors Strategy	Gap between Knowledge and Practice Infection Control Policy, Audits,
* Healthcare workers = heterogeneous group including any of the following nurses, doctors, healthcare aides, veterinarians, dentists Nurses = Nurses are the primary study population							
** MRSA = MRSA, CA-MRSA, or HA-MRSA Nosocomial = An infection originating in a medical facility							
*** Acute Care, Community Care or All Healthcare settings							
**** Knowledge Deficit, Strategy to Address Knowledge Deficits or Factors Contributing to Nursing Knowledge of MRSA							

Knowledge needs and strategies to improve knowledge and practice will be reviewed first. This will be followed by a more detailed review of the studies exploring the factors contributing to nursing knowledge.

Knowledge Deficits and Strategies

The literature on this topic is largely empiric, with an emphasis on increasing knowledge in the areas of hand hygiene (Fairclough, 2005; Maskerine & Loeb, 2006; Pittet, Hugonnet, Harbarth, Mouraga, Sauvan, Touveneau, et al., 2005; Trampuz & Widmer, 2004), standard precautions (Banning, 2005; Easton, 2005; Gould, 2004; Ghabrah, 2007; Prieto & Clark, 2005), disease transmission (Banning, 2005; Lugg & Ahmed, 2008; Stirling, Littlejohn, & Willbond, 2008; Tisinger, 2008) and antibiotic stewardship (Conly, 2002; Plonczynski & Plonczynski, 2005). Raising awareness among health care workers about MRSA and the implications on practice in various settings is a key message throughout the literature (Alex & Letizia, 2007; Anderson, 2003; Farley, 2007; Nazarko, 2007).

Strategies to address MRSA knowledge deficits were abundant in the literature. Infection control policies and procedures were mentioned the most frequently (Antoniak, 2004; Conly, 2002; Gould, 2004; Larson, Quiros, Giblin, & Lin, 2007; Lines, 2006; López-Alcalde, Conterno, Mateos-Mazón, Guevara-Eslava, Job-Neto, & Solà, 2008; Plonczynski & Plonczynski, 2005; Trigg, 2008; Wilcox, 2005; Wills, 2005). Other strategies frequently mentioned include: education on surveillance of infection incidence and treatment (Conly, 2002; Plonczynski & Plonczynski, 2005; Tisinger, 2008), broad health care system campaigns (Larson, Early, Cloonan, Sugrue, & Parides, 2000; Larson et al., 2007; Pittet et al., 2000; Wilcox, 2005; Wills, 2005), education regarding alcohol

based sanitizer (Dragon, 2006; Hussein, Khakoo, & Hobbs, 2006; Pittet et al., 2000; Trampuz & Widmer, 2004;) and the implementation of MRSA standards and guidelines (Alberta Health and Wellness, 2007; Alberta Health and Wellness, 2008; Barton et al., 2006; Boyce & Pittet, 2002; Holcombe, 2006).

There are other strategies mentioned less frequently in the review but are worth noting. They include: reduction of inappropriate prescribing (Conly, 2002; Lines, 2006; Plonczynski & Plonczynski, 2005; Wills, 2005), improved environmental conditions (ie. access to hand washing facilities, alcohol hand sanitizer at the bedside) (Pittet et al., 2000; Rollins, 2008; Trampuz & Widmer, 2004), education of patients to advocate for hand hygiene (Dragon, 2006; Rollins, 2008), organizational leadership (Antoniak, 2004; Trampuz & Widmer, 2004), performance feedback and audits (Gould, 2004; Maskerine & Loeb, 2006; Preston, 2005; Trigg, 2008) and a positive deviance approach (Forsha & Richmond, 2007; Hospital Infection Control, 2008). Positive deviance is a participatory approach where staff identifies the issues and work collaboratively to identify solutions (Hospital Infection Control)

The following section will provide a review of the eight papers that specifically address the objective of describing the factors contributing to nurses' knowledge of MRSA. These factors can be grouped into three areas: nursing education (basic/continuing), a gap between reported knowledge and practice and nurses' personal ways of knowing.

Nursing Education

Nursing knowledge is integral for relevant and effective action for community health (CHNAC, 2003). However, nurses are not knowledgeable of MRSA despite the

introduction of guidelines for various health care settings in both Canada and the United States (Barton et al., 2006; Easton, 2005; Prieto & Clark, 2005). The literature suggests that the lack of knowledge of MRSA and other anti-biotic resistant organisms can stem from lack of content in nursing curriculum (Andersen, 2003; Gill, Kumar, Todd & Wiskin, 2005; Hallett, 2000). Nurses consider their basic education to be an important source of knowledge (Gill et al., 2005), but there is a recognition that infection control is not often a subject that is covered well within core nursing curriculum (Anderson, 2003). A study by Hallett (2000), identified a “fatalistic approach” (p.107) by community health nurses in infection control as “practitioners appear to emerge from the educational process unsure what they think and unsure what to do” (p.107).

While there were no published studies regarding nursing students' knowledge of MRSA, one study investigated MRSA awareness and knowledge in new nursing staff in a tertiary care hospital in Saudi Arabia (Navaneeth, 2003). The nurses had difficulty in detecting an outbreak of MRSA in the hospital and they were not familiar with the proper treatment regime (Navaneeth). These findings were consistent with the hypothesis that basic nursing education does not provide adequate knowledge of MRSA or infection control measures.

The Gap between Nursing Knowledge and Practice

The literature also suggests that the lack of knowledge of MRSA and other nosocomial infections can stem from limitations in continuing education provided by the employer (Andersen, 2003; Gill et al., 2005; Ott, Shen & Sherwood, 2005). Registered nurses have entry level competencies from their professional licensing body (College of Registered Nurses, 2006). However, the need for continuing education for nurses in

MRSA goes beyond basic education and has been noted in both published studies and various clinical guidelines (Gill et al., 2005). One study assessed the learning needs of CHNs in First Nations communities (Silverman, Goodline, Ladouceur & Quinn, 2001). While the survey questions did not address MRSA or nosocomial infections, 64.5% of those surveyed requested public health and programming planning initiatives (including communicable disease control) to be included in their learning program (Silverman et al). As previously mentioned, a regional communicable disease program survey conducted in 2008, found that Atlantic First Nations employed CHNs' level of knowledge was lowest for emerging infectious diseases such as MRSA (Mi'kmaq Confederacy of Prince Edward Island, 2009). The nurses identified MRSA as a priority for future training sessions (Mi'kmaq Confederacy of Prince Edward Island, 2009).

Numerous studies and clinical guidelines have emphasized the importance of adherence to workplace MRSA policies and procedures in order to provide a safe environment for both nurses and clients (Barton et al., 2006). Easton, Sarma, Williams, Marwick, Phillips and Nathwani found that 70% of nurses were able to correctly identify *S. Aureus* as a gram positive organism (2005). They also found knowledge deficits as only 14% of nurses correctly identified the risk factors for MRSA colonization and infection (Easton et al.). Furthermore, the majority of nurses in this study failed to identify the most common sites for MRSA infection as well as common complications of MRSA infection (Easton et al.).

Prieto and Clark (2005) conducted a study with 100 nurses and 18 health care assistants on the implementation of contact precautions with MRSA and *Clostridium difficile*. They found low knowledge levels of MRSA and contact precautions in the

study population. Lugg and Ahmed (2008) also reported low knowledge levels of MRSA in a group of adult and pediatric nurses. A difference was found, however, in the adult nurses as they reported higher knowledge and self-reported practice than the pediatric nurses (Lugg & Ahmed).

Trigg conducted a hospital audit on MRSA knowledge levels and found that 71% of staff felt MRSA was a serious issue and that most nurses had read the MRSA policy (2008). Different results were found in a qualitative study done by Lines (2006). A group of 10 experienced registered nurses reported that MRSA was uncontrollable and they did not feel that the management of MRSA was a priority in their nursing care (Lines).

van Gemert-Pijnen, Hendrix, van der Palen and Schellens conducted a study in Dutch hospitals where they reviewed the performance of MRSA protocols with a variety of health care workers using a questionnaire and a practical test (2005). The results of the questionnaire were positive in relation to the knowledge, attitude and self-reported behaviour related to MRSA protocols. Ninety-seven percent of nurses reported familiarity with the protocol and subsequently reported 91% compliance with the protocol (van Gemert-Pijnen et al.). The results of the practical test demonstrated that staff overestimated their knowledge of MRSA protocols because they were only able to carry out the practical test scenarios less than 50% of the time (van Gemert-Pijnen et al.). These results are consistent with a study done by Berhe, Edmond, and Bearman (2005) and Ghabrah, Madani, Albarrak, Alhazmi, Alazraqi, Alhudaithi, et al. (2007), where the health care worker's self-reported high knowledge of infection control and compliance with infection control measures is better than their actual demonstrated practice.

Multiple Ways of Knowing: Personal Knowledge

Four articles explored nurses' personal way of knowing, or the ability of the nurse to know oneself (Cole, 2008; Hallett, 2000; Prieto & Clark, 2005; van Gemert-Pijnen et al., 2005). van Gemert-Pijnen et al.'s study (2005), as discussed previously, describes nurses' personal way of knowing. The completion of the practical test demonstrated that some nurses had challenges with the MRSA protocols because the protocols interfered with client care and they were not consistent with their practice needs (van Gemert-Pijnen et al.).

Prieto and Clark (2005) also provided insight to the participants' decision making in relation to their infection control practice. The authors found that nurses (100) and assistants (18) held personal beliefs and perceptions of risk (to themselves and to the client) that the authors stated to be irrational (Prieto & Clark). These results were similar to Hallett's findings (2000). Using a qualitative interview method, Hallett found the seven nurses interviewed appeared ambivalent towards infection control and what could realistically be achieved through policy (2000).

Cole (2008) authored the final paper reviewed for this section. His narrative review provides an overview of the concept of compliance. The author discussed the reality of low knowledge levels of policies and procedures regardless of availability (Cole). The author challenges the concept that increasing knowledge will result in improved policy adherence and concludes that incorporation of the personal, lived experience is integral to decision making in practice (Cole).

“Infection control education is fundamental to the ongoing development of practice. However, it needs to include more than microbiology, epidemiology and universal precautions. Compliance is a social construct and infection control nursing, this author would argue, is a social science” (Cole, 2008, p. 703).

Discussion

The purpose of this review is two-fold. The first objective is to describe the published literature regarding nursing knowledge and MRSA and secondly to describe the factors contributing to nurses' knowledge of MRSA. The results of this review have demonstrated that the research on this topic is largely empiric and has increased between 2000 and 2008. While MRSA affects health care practitioners in all settings, research is limited to acute care settings. The review also demonstrates that nurses are less likely to be the primary study population as compared to the broad category of health care workers.

The research on this topic area is more common in the United States and the United Kingdom. Canadian research on this topic was surprisingly low given the media attention to outbreaks of nosocomial infections in health care facilities over the past few years. The majority of the papers in the review were focused on MRSA or the broader topic of nosocomial infections. Only four papers focused on CA-MRSA. This was an unexpected finding considering increasing rates of CA-MRSA in Canada (CNSIP, 2008). Only one paper was found that reviewed nursing knowledge needs in First Nations employed CHNs in Canada. No papers were found looking specifically at MRSA in First Nations employed CHNs. This was not an unexpected finding, yet it highlights a research gap considering the trends of MRSA in Canadian aboriginals.

The majority of papers in this review emphasize areas of knowledge deficits in MRSA and various approaches to mitigate these deficits. The identification of knowledge deficits is a key component of the knowledge cycle and is integral to effective

nursing practice (CHNAC, 2003). Nursing knowledge of MRSA was consistently reported as low in this review (Barton et al., 2005; Easton, 2005; Lugg & Ahmed, 2008; Navaneeth, 2003; Prieto & Clark, 2005; Trigg, 2008). Knowledge deficits identified include (in descending order of frequency): hand hygiene, standard precautions, disease transmission, antibiotic stewardship, the difference between CA-MRSA and HA-MRSA, and epidemiology. There were several narrative reviews that focused on raising awareness among nurses in other settings (school, occupational health, nurse practitioners, and community). Deficits found in fundamental concepts such as hand hygiene and disease transmission were unexpected findings. These findings have a broader application than just the acute care setting. The areas that have been identified as deficits are fundamental concepts in infection control and are a cornerstone of nursing practice, regardless of setting.

The largest number of papers in this review focused on strategies for improving practitioner knowledge and practice. The strategies identified include (in descending order of frequency): infection control policies and procedures, education on surveillance of infection incidence and treatment, broad health care system campaigns, education regarding alcohol based sanitizer, implementation of MRSA standards and guidelines, reduction of inappropriate prescribing, improved environmental conditions (ie. access to hand washing facilities, alcohol hand sanitizer at the bedside), education of patients to advocate for hand hygiene, organizational leadership, performance feedback and audits.

The review also revealed three different approaches in improving health care worker knowledge and practice. The papers were targeted at the individual practitioner,

hospital units or wards or the organizational level. There were no papers found in the review that compare outcomes of strategies directed at individuals, units or organizational level. There were no papers that report on the outcome of multiple intervention strategies (individuals, units and organizational).

There is more attention to the improvement of practice of individual practitioners in this review. The positive deviance approach was discussed in two papers and is suggested as an organizational strategy for improving MRSA knowledge. This was a new finding and appears to be an approach that is consistent with the principles found in successful participatory action projects in First Nations communities (Smith & Davies, 2006). A participatory approach involves participants coming together, understanding each other's goals, influencing each other's work, building partnerships and the self-identification of solutions (Smith & Davies).

The review also focused on a closer examination of the nursing literature on possible factors contributing to nursing knowledge of MRSA. The results of this examination were limited to only eight papers that address this objective. These factors can be grouped into three areas: nursing education (basic/continuing), a gap between reported knowledge and practice and nurses' personal ways of knowing. The limited amount of research is of particular significance in the results of this review. The findings suggest that the answers are in part related to the lack of content in undergraduate nursing curriculum and the gap between nurses' perceived infection control knowledge and practice.

Perhaps the answer can be found in further exploration of nurses' personal way of knowing. The papers reviewed provided evidence of the reflective nature of nursing practice that "combines critical examination of practice, interpersonal relationships and intuition to evaluate, adapt and enhance practice" (CHNAC, 2003, p.7). These findings have identified that the traditional empirical approach to this area of study needs to be broadened to encompass critical inquiry on the other areas of nursing knowledge. These findings are consistent with the CHNAC multiple ways of knowing framework.

Limitations

In conducting this research, articles found in Medline, CINAHL with full text, DARE, and CDSR were reviewed. It is possible that some articles published in journals not indexed in these databases were missed. There are several limitations in this review. The majority of the papers on this topic are narrative reviews and are generally set in acute care settings. A smaller number of papers used either a quantitative, qualitative or mixed method. However, sample sizes in all of these studies are small. Only one proposal for a systematic review was found (Lopez-Alcade et al., 2008). Papers investigating the factors contributing to nursing knowledge are also limited. While the findings are useful to inform an educational program design, they are not generalizable to nurses in other settings.

Significance of Findings to Public Health Policy and Practice

There were many themes that emerged in this review that have implications for First Nations community health nursing in Atlantic Canada. It is known that MRSA knowledge levels are low in this population of nurses. This is consistent with the findings of this review. The findings have suggested many areas that will inform an

education strategy for First Nations employed CHNs. This strategy should be participatory in nature, where nurses self-identify their learning needs and how to address them (CHNAC, 2003). The strategy needs to consider the themes that emerged in the review. Topics that could be considered include: MRSA incidence in aboriginal people, transmission, treatment, the difference between HA-MRSA and CA-MRSA, social determinants of MRSA, cultural competence, hand hygiene, standard precautions and the reduction of inappropriate prescribing. The findings also suggest that a strategy include interventions at the workplace and community level. Activities that could be considered are: education and leadership of Chief, council and community, education of all healthcare providers, education of community members to be informed about hand hygiene and appropriate antibiotic use, development and implementation of appropriate infection control policies and procedures (e.g. MRSA, hand hygiene), and monitoring and feedback on infection control performance.

Significance of Findings to Public Health Research

The need for attention to First Nations employed CHNs knowledge of MRSA is immediate. The review of the trends of MRSA in Canadian aboriginals, the implications of this pathogen on the health of Canada's First Nations people, and the absence of current research on this topic identify this as a potential area for future research.

The literature reviewed on nursing knowledge and MRSA is complex and raises many challenges for nursing educators, practitioners and managers. MRSA first emerged in the acute care setting and is now a reality in all areas of nursing practice in Canada. However, there is silence of this topic within the nursing research community in Canada.

Furthermore, this review has identified a need for further study on nursing knowledge of MRSA in settings outside of acute care.

Lastly, these findings support the theoretical framework of multiple ways of knowing. Nurses develop “their own unique pathway to knowledge construction and problem solving, which is dependent on their previous experiences” (Cole, 2008, p.702). Further exploration of the integration of knowledge patterns will improve our collective understanding of how the nurse “co-creates nursing knowledge” (CHNAC, 2003, p.7) which leads to improved knowledge and practice.

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Appendix

Definition of Terms

Aboriginal: “This is a collective name for all of the original peoples of Canada and their descendants. The Constitution Act of 1982 specifies that the Aboriginal Peoples in Canada consists of three groups - Indians, Inuit and Métis. Indians, Inuit and Métis peoples have unique heritages, languages, cultural practices and spiritual beliefs” (Indian & Northern Affairs Canada, 2001).

Communicable Disease: “An illness due to a specific infectious agent or its toxic products that arises through transmission of that agent or its products from an infected person, animal, or reservoir to a susceptible host, either directly or indirectly through an intermediate plant or animal host, vector or the inanimate environment” (Last, 2001, p.35).

Community Associated-MRSA: “MRSA isolates obtained from individuals in the community who have not had recent exposure to the health care system, or from patients in health care facilities in whom the infection was present or incubating at the time of admission” (Barton, Hawkes, Moore, Conly, Nicolle, Allen, et al., 2006, p. 6C).

Epidemiology: “The study of the distribution and determinants of health-related states or events in specified populations and the application of this study to control of health problems” (Last, 2001, p.62).

First Nations: “A term that came into common usage in the 1970s to replace Indian. Although the term First Nation is widely used, no legal definition of it exists. Among its uses, the term “First Nations Peoples” refers generally to the Indian Peoples in Canada, both Status and non-Status” (Indian & Northern Affairs Canada, 2001).

Inuit: “Inuit are the Aboriginal People of Arctic Canada who live primarily in Nunavut, the Northwest Territories and northern parts of Labrador and Quebec” (Indian & Northern Affairs Canada, 2001).

Health Care-Associated MRSA (HA-MRSA): “Patients with infections that developed ≥ 3 days after admission to hospital, or who stayed in a hospital or resided in a long-term care facility at any time during the 12 months before symptom onset” (Canadian Nosocomial Infection Surveillance Program, 2008).

MRSA: “MRSA demonstrates resistance to the semi-synthetic penicillins (methicillin, oxacillin and cloxacillin). It is also resistant to cephalosporins, monobactams and carbapenems. Resistance to other antibiotic classes may occur, but it is strain dependent” (Barton et al., 2006, p.6C).

MRSA colonization: “The presence of MRSA without any clinical sign or symptoms of infection” (Canadian Nosocomial Infection Surveillance Program, 2008).

Nosocomial Infection: “An infection originating in a medical facility, e.g. occurring in a patient in a hospital or other health care facility in whom the infection was not present or incubating at the time of admission. Includes infections acquired in the hospital but appearing after discharge; it also includes such infections among staff” (Last, 2001, p.125).

Pathogen: “Organism capable of causing disease (literally causing a pathological process)” (Last, 2001, p.132).