

Safe practice of population-focused nursing care: Development of a public health nursing concept

L. Michele Issel, PhD, RN

Betty Bekemeier, PhD, MPH, RN

Patient safety, a cornerstone of quality nursing care in most healthcare organizations, has not received attention in the specialty of public health nursing, owing to the conceptual challenges of applying this individual level concept to populations. Public health nurses (PHNs), by definition, provide population-focused care. Safe practice of population-focused nursing care involves preventing errors that would affect the health of entire populations and communities. The purpose of this article is to conceptually develop the public health nursing concept of safe practice of population-focused care and calls for related research. Key literature on patient safety is reviewed. Concepts applying to population-focused care are organized based on Donabedian's Framework. Structural, operational and system failures and process errors of omission and commission can occur at the population level of practice and potentially influence outcomes for population-patients. Practice, research and policy implications are discussed. Safe PHN population-focused practice deserves attention.

Registered nurses (RNs) comprise 25% of the United States' multidisciplinary public health workforce and are the largest professional discipline within the public health system.¹ Nurses also provide the executive leadership in more than one third of the nation's local public health departments.² As such, nurses in public health settings play a critical role in maintaining and improving the public's health and maintaining a competent public health workforce.³ Several studies have identified

the shortage of public health nurses (PHN) as a key concern,⁴⁻⁷ but none has articulated or outlined the possible consequences of the PHN shortage for population health.

According to the American Nurses Association's *Public Health Nursing: Scope and Standards of Practice*⁸ public health nursing is distinguished by its focus on providing care focused at the population level. Population-focused care is an "approach to health care that operates at the population level of the ecological model."⁸ A similar definition has been used to guide the development of a system of population-based PHN interventions: population-based care "focuses on entire populations, is grounded in community assessment, considers all health determinants, emphasizes prevention, and intervenes at multiple levels."⁹ Intervening at multiple levels means that patients exist at multiple levels—from the individual and family levels to the population level. Correspondingly, issues of quality and safety of PHN practice occurs at multiple levels, including the population level.

In this article we seek to define safe provision of care when the nursing practice is population-focused and, subsequently, how safe practice of population-focused care might affect health outcomes of population-patients. We use the term *population-patient* to refer to a specific target or set of actual or potential recipients of PHN care, services or activities focused on or delivered to a population as the intended patient. We begin with an overview of the current context in which PHNs practice, specifically the current realities for public health organizations, to highlight the need for focusing on safe PHN practice. Next, we propose key characteristics of population-patient safety, specifically structural and process errors related to public health nursing practice and care. We briefly explore potential connections between PHN staffing and safety, and conclude with implications.

PUBLIC HEALTH NURSING PRACTICE AND ITS CONTEXT

PHN practice population-focused nursing care and are predominantly employed in the United States by local public health organizations or departments. The legal

L. Michele Issel, PhD, RN, is a Clinical Associate Professor at University of Illinois at Chicago School of Public Health, Chicago, IL.

Betty Bekemeier, PhD, MPH, RN, is an Assistant Professor at University of Washington School of Nursing, Seattle, WA.

Corresponding author: Dr. Michele Issel, University of Illinois at Chicago, School of Public Health, 1603 W. Taylor Street (MC 923), Chicago, IL 60612.

E-mail: issel@uic.edu

Nurs Outlook 2010;58:226-232.

0029-6554/\$ - see front matter

© 2010 Published by Mosby, Inc.

doi:10.1016/j.outlook.2010.06.001

responsibility for providing population health services and protecting the health of the public largely rests with these public health care organizations. Thus, the extent to which PHNs practice safely when providing population-focused care potentially has broad health and legal consequences. In the United States, several national developments in the public health sector make it imperative to further develop the concept of safe population-focused nursing practice, as a step toward addressing quality of care in public health settings. One of these developments is that public health organizations are downsizing or eliminating direct health care services and simultaneously increasing population-focused services.¹⁰ To achieve this strategic public health shift, fewer RNs are being hired into clinic positions and PHNs are being asked to more fully practice community level population-focused care. Such practice includes community assessment, disease surveillance, coalition-building, and health planning, among other interventions.

Another development affecting the ability of nurses to deliver safe population-based care is the severe budget deficit being experienced by public health organizations.¹¹ To adjust to diminished resources, these organizations are reconfiguring their human resources by hiring fewer RNs, lowering the educational requirement for PHN positions from the baccalaureate to the associate degree level¹² or converting positions to those with non-nursing requirements.¹³ Public and community health content and community-based clinical experience for nursing students, however, is addressed in baccalaureate of science in nursing (BSN) programs and not at the associate degree level. Hiring PHNs with less than a BSN runs counter to the ANA professional standard stating that the BSN is the “educational credential for entry into public health nursing practice.”¹⁴ Nurses who are not prepared at an appropriate educational level are mismatched in positions which require a higher skill set, critical thinking, and professional judgment needed to address complex population level health problems¹¹ with multiple determinants, and to safely practice population-focused care. Inadequate or inappropriate PHN staffing has the potential to affect population health, which leads to concerns over quality of care and, more imminently, safety of PHN practice with regard to population-patients.

A third development at the national level relevant to public health nursing practice is the nascent accreditation system for public health organizations. Under the Public Health Accreditation Board (PHAB), a new system for accrediting local and state health departments has been established in the United States to “improve and protect the health of every community by advancing the quality and performance of public health departments.”^{15,16} The new emphasis on improving the quality of public health services has profound implications for nurse leaders and PHNs, as they constitute the majority of

licensed public health professionals working in local public health organizations, are often the lead executive, and are serving in organizations charged with the responsibility to safely serve and protect the health of their communities.

POPULATION-PATIENT SAFETY

Patient safety research has predominantly addressed hospital care and individual patient outcomes. Accordingly, patient safety, “freedom from accidental injury,”¹⁷ has become institutionalized as a cornerstone of quality care for acute care institutions and, subsequently, for other health care settings in which direct care is provided. This productive line of research has found that rates of errors vary with hospital unit characteristics.¹⁸ Specifically, lower patient error rates correlate with adequate staffing levels and higher education of RNs.¹⁹⁻²¹ The work has included the application of high reliability theory and normal accident theory³ to nursing work in health care settings. These theories delineate possible pathways by which safety is compromised and adverse events occur.

Unfortunately, the emphasis on studying and understanding safe nursing practice has not been extended to include the work environments of PHNs. Basic concepts considered critical to patient safety need to be redefined for application to population-patients, given that their nursing practice does not involve direct care. To develop the definition of safe practice of population-focused care, we draw from an extensive literature on medical errors and safety, which is arguably relevant to public health nursing practice.

The presentation of each concept, vis-à-vis population-patient and PHN practice, is organized around structure, process, and outcomes as outlined in the Donabedian framework.²² Donabedian applied a systems approach to understanding the quality of medical care by distinguishing among organizational and social structures for the delivery of care, processes involved in the delivery of care, and the health outcomes that resulted from those processes. This systems approach allows for a rudimentary classification of concepts related to safety of population-focused PHN practice (Table 1). As a classification scheme, this approach is consistent with existing theories of how adverse events occur, including high reliability theory and normal accident theory.²³

Failures Related to Structures

The structure of a healthcare organization and the way in which daily operations of the healthcare organization are structured can lead to errors. *Operational failures* are those structural aspects within the healthcare organization that make it impossible for healthcare workers to avoid making errors. Operational failures can also be described as problems leading to not having the necessary supplies or information.¹⁹ Operational failures contribute to disruptions, delays, risks and losses,

Table 1. Five Population-Patient Safety Concepts, Definitions and Public Health Examples for Personal Health Services

Concept	Definition	Public Health Nursing Examples
Structures		
Operational failures	Structural aspects of the healthcare organization that make it impossible for healthcare workers to avoid making errors	Improper staffing, insufficient staff training or supervision, insufficient or missing equipment or supplies, lack of safety culture
Systems failures	Structural aspects of inter-organizational and inter-agency networks that make it impossible for healthcare workers to avoid making errors	Untimely distribution of infectious disease reports among agencies, inability to obtain or communicate information across agency boundaries, personnel restrictions which limit or restrict PHN involvement in community coalitions
Processes		
Error by omission	Failure to engage in an act that would otherwise have prevented illness, distress or harm	Inadequate outbreak investigation, failure to conduct a community needs assessment, failure to effectively participate in a community collaborative, failure to conduct outreach to vulnerable populations, failure to identify best practices for population level practices
Error of commission	Engaged in an act that directly led to or caused illness, distress or unintentional harm	Over-publicized health consequences of an outbreak, implementing a health program shown to be harmful (eg, DARE ²⁶), providing inaccurate data or health information to community groups
Population-patient outcomes		
Population-patient safety	Freedom from accidental harm or injury or remaining unharmed or uninjured for all members of the population designated as the target recipient of PHN care	Population-patient of elderly receive flu vaccines (because PHN assured sufficient vaccine stockpile). Population-patient of homeless persons do not freeze during winter (because PHN conducted community assessment and worked with township to open a temporary winter shelter)

all of which are costly to healthcare organizations¹⁹. Operational failures can also exist for organizations providing services at the population level. Examples include: insufficient vaccine supplies, PHN staff diverted from important routine activities to outbreak investigations, or lack of adequate internet access to search for best population-focused practices. A shortage of PHNs, especially those with a BSN, could be classified as an operational failure, particularly when insufficient training and education of nursing staff limits their decision-making capacity.

Operational failures may stem from factors not directly under the control of PHNs, although PHNs could be included in quality improvement efforts which would

address structural failures. Nonetheless, some operational errors could stem from how PHNs function within the organization, such as not providing timely data for use in health status monitoring or not sharing community referral resources needed by other staff to efficiently provide care. As local public health organizations are increasingly engaging in systematic quality improvement efforts through agency accreditation and other activities, PHNs have a significant role to play in identifying and correcting the sources of the operational failures.

Systems failures are those structural aspects of inter-organizational and inter-agency networks that make it impossible for health care workers to avoid making errors. System-level failures represent pathways across

organizations that either fail to exist or are dysfunctional. Examples of systems failures are lapses in ordering supplies needed for care delivery, lack of HIPAA agreements for patient data sharing and appropriate referrals, or patient “dumping” in inpatient settings. Systems failures can exist in public health, for example, when inter-agency communication networks have not been established for preparedness, agencies do not have standing inter-agency agreements for referrals of clients, or health statistics and community health assessment data are not shared across health and social service agencies. Given that linkage and referral are 2 core PHN interventions,⁹ systems failures could compromise the safe practice of population-focused care. System failures, like operational failures, are not caused by PHNs. Nonetheless, PHNs are community-based and population-focused and provide a significant amount of the leadership in public health organizations.² In this way, PHNs defacto create and maintain the social and interorganizational network²⁴ which could be crucial in avoiding systems failures. In this way, along with involvement in quality improvement efforts, PHNs have a potentially important role in minimizing some types of systems failures.

Errors Related to Processes

The types of errors health professionals directly make themselves are related to processes of care delivery, and can be categorized as essentially either errors of omission or errors of commission. *Errors of omission* are those actions which did not occur, thereby, creating adverse events for population-patients. A public health nursing example includes not fully assessing the specific populations at risk for missed vaccinations and the underlying reasons for a locally low or declining immunization rate, and then not advocating for and implementing a targeted population-focused vaccination campaign. As a consequence of these omissions—not working to correct the falling immunization rate with an appropriate campaign—the potential for preventable harm increases for the population. In contrast, *errors of commission* are those actions which did occur and resulted in adverse events or occurrences. The most widely recognized error of commission for RNs in clinical settings is a medication error. At the population-level, a PHN example would be distributing a poorly worded public announcement that warns against a health behavior, but which results in widespread panic or anxiety. Distributing an erroneous or misunderstood health message is an error of commission.

Errors of omission and commission fundamentally result from intra-personal or inter-personal human factors or processes, with numerous and varied causes.²⁵ Many aspects of population-focused practice involve collaborating with teams of health professionals in and throughout the community. These collaborations can lead to errors of process when intra- or inter-team activ-

ities are poorly conducted. For example, during committee reviews of health promotion materials or of mortality reports, PHNs may overlook or misinterpret key health indicators or opportunities for corrective action. Similarly, during community coalition decision-making PHNs may lack the leadership or facilitation skills to circumvent group-think and ultimately commit an error of commission by launching or maintaining a program known to be ineffective or harmful.²⁶ Causes of errors have yet to be studied for PHN’s population-focused practice, despite the potentially widespread consequences of these errors.

Population-Patient Outcomes: Harm/Safety

The consequences of these 4 major errors and failures exist at the population level for public health organizations. If no errors or failures occur, then population-patient safety is preserved. *Population-patient safety* is the freedom from accidental harm or injury or remaining unharmed or uninjured¹⁷ from care/practice provided to or focused on members of a population. Essentially, safety is the absence of harm; *preventable harm* is an adverse occurrence or event that results from insufficient vigilance or lack of prudence or forethought on the part of individual providers.¹⁷ In the context of public health, the population-patient experiences the adverse event and the provider, rather than being an individual, is the public health provider team which includes PHNs. Safety, therefore, is conceptualized as a possible outcome for population-patients when no errors or failures of practice occur. When harm is averted, safety is present (Figure 1).

Preventable harm, in the context of public health organizations, can be seen most clearly when considering preventive services. Loveland-Cherry²⁵ found studies of preventable harm related to preventive screening ranged from harm from the test itself (eg, x-rays from mammography) to various forms of psychological distress from false positives. Preventive and screening services are provided by a majority of public health organizations and most often require licensed health professionals, specifically RNs, for screenings such as skin tests for tuberculosis or blood draws to test for lead poisoning. Thus, preventable harm can be averted when PHN staff is well trained and when supportive systems are in place. When population-focused practice and actions diminish the possibility of errors and failures, the practice contributes to population-patient safety. Population-patient safety becomes an outcome of PHN practice itself.

DISCUSSION

The concept of safe practice of population-focused care provided by PHNs is complex and worthy of further attention. When providing public health nursing care to the population-patient, structural failures and errors

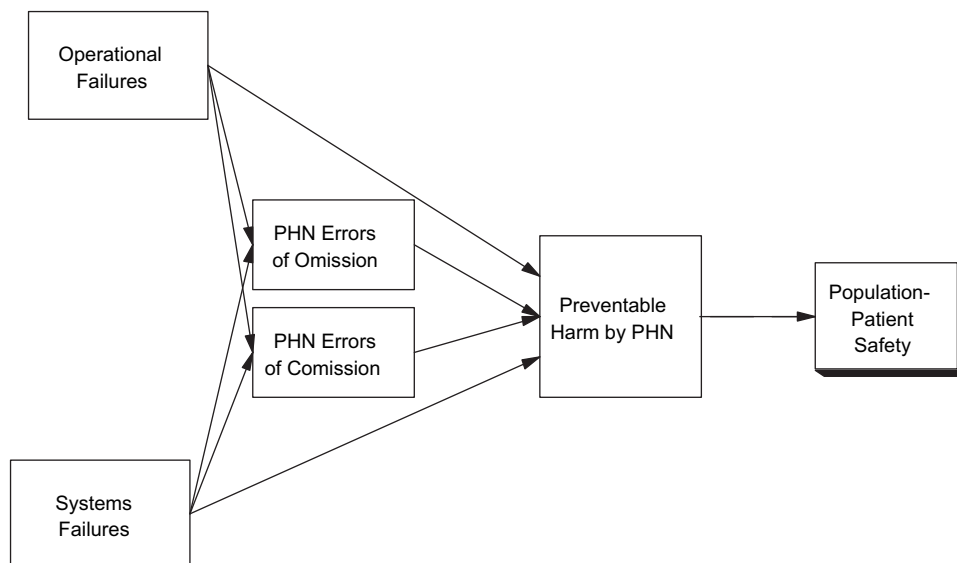


Figure 1. Basic Diagram of Safety Concepts for Population-Patient Safety and Public Health Nursing.

could lead to poor health outcomes and accidental harm. Indeed, for the population-level care provided by PHNs, errors and system failures can have broad negative consequences, affecting far more lives than when these concepts are applied at the individual level for nursing care. As such, the well-developed and clinically researched concepts of errors and failures in acute care settings could have valuable utility for informing and improving public health nursing practice and thus contribute to improving the public's health.

Recommendations for research

PHN practice in complex bureaucratic structures that vary across public health organizations with regard to programs offered and the processes of care delivery. These and other structural and contextual factors influence not only the practice of public health nursing but also which interventions are used and with which population-patient. These variations and external factors suggest that population-patient care indicators must be highly and specifically sensitive to PHN population-focused care so that a change in population-patient indicators could be detected with changes in PHN practice, staffing or competency levels.

The science of quality of care and measurement has progressed dramatically in recent decades. Unfortunately, this science has rarely been applied to PHN practice for population-patients. This dearth in research means we do not yet know whether higher education of the public health nursing workforce would lead to higher safety as reflected in fewer errors for population-patients. Questions of whether increased use of evidence-based population-focused practice would improve safety remain unanswered. We also need to know more precisely how and which quality improvement activities related to PHN population-focused practice might actually lead to safer practice for population-patients.

Before these questions can be answered, population-patient indicators which are PHN-sensitive need to be identified.²⁷ The phrase “population health indicators” is used in public health to measure overall health status of a population, without the health status being linked or associated with specific processes of care delivery or to a specific health profession. We prefer the term *population-patient care indicator* as the measure of PHN-sensitive outcomes for population-patients. Population-patient care indicators could be used to study the effects of safe population-focused nursing practice²⁷ by detecting changes in population-patient outcomes which are related to errors and failures.

An established national PHN research agenda is needed that outlines and prioritizes the possible research streams in this area. Currently, the Agency for Healthcare Research and Quality has funded the first author to conduct a national conference of invited experts in the field of nursing care quality research.²⁸ The October 2010 conference will bring together experts in PHN practice, public health systems, and safety and quality of care in order to set a national research agenda regarding the relationships among PHN practice, population-patient outcomes, and the safety and quality of PHN practice. The research stimulated by this conference ought to lead to a greater understanding of the contribution of quality PHN care—as population-focused interventions—to health outcomes at a population level.

Recommendations for Public Health Nursing Practice

Nurses provide the top level leadership in 34% of the nation's local public health agencies and make up an average of 30% of the staff in those agencies.² Given that the leadership in public health agencies is “key to executing the assessment and resultant quality improvement process” in public health systems,²⁹ nursing leaders in

public health organizations are in a position to be innovators in studying the structures, processes, and outcomes that relate to the safe practice of population-focused care. Doing so clearly falls within their responsibilities and scope of nursing management practice. Unfortunately, PHNs rate themselves as not being competent with regards to conducting *evaluation* and *research*.^{30,31} Both of these competencies are necessary for nurses to actively engage in quality improvement activities aimed at assuring safety. Additionally, PHNs with higher education attainment report higher competency in these 2 areas.³⁰ The gap between the current level of competencies and the future need must be addressed through a variety of approaches, including increasing the educational degree required of PHNs and providing on-site or distance education.

Contextual factors, such as state and local public health statutes, local political complexities, categorical funding streams, and the nature of local partnerships also affect the safety of PHN practice. Some pathways function at the practitioner level, resulting in errors, while other pathways exist at the systems level, resulting in failures—both pathways can impede effective PHN practice. The identification of PHN-sensitive outcome indicators will enable discourse about the effects of PHN staffing and competence to move from speculation to reasoned hypothesis testing. These hypotheses ought to incorporate existing theories, such as high reliability theory and normal accident theory,²³ neither of which have been applied to public health or public health nursing. Using available data collected for administrative and surveillance purposes, population-patient care indicators can be used in public health nursing quality improvement processes in local public health organizations.²⁷ Data elements might also be identified to use for monitoring nursing practice changes and the effects of those changes on the health and safety of population-patients.

Nursing leaders at the practice level are eager to participate in research and data monitoring that might help them better examine and improve the quality of their programs, make the case for resources and policies that support PHN recruitment and retention and, most importantly, prevent unnecessary suffering and harm in their communities. A participatory research approach to studying safety and harm could lead to novel and important insights into improving the practice of PHNs.

Policy Implications

Two interrelated policy implications can be anticipated. One policy concerns the precedent set in 2009 when Medicare adopted a set of hospital patient outcomes, called hospital acquired conditions, as indicators of the quality of patient care. Each outcome is a type of preventable harm. Medicare no longer provides additional reimbursement for care related to the 10 hospital-acquired conditions, on the assumption that

sufficient evidence exists for how to prevent the 10 hospital-acquired conditions.³² Given this precedent, along with the accrediting of local public health organizations, future health policymakers could implement indicators of quality of public health services. In anticipation of such a health policy, PHNs and public health nursing scholars ought to advocate for structural systems changes necessary to prevent failures and thus prevent harm to population-patients.

The other policy implication concerns establishing the minimum educational requirement for practicing as a PHN. As a matter of health policy and professional self-regulation, policy advocacy ought to focus on state nurse practice acts. Ideally, policy would lead to a national requirement and system-wide support for PHNs to have a BSN, a step known to improve safety in other health care settings.³³

In summary, with PHNs comprising the largest portion of the professional public health workforce, indicators will need to be sensitive to PHN interventions. In addition, PHN leaders will need to be prepared to advocate on behalf of their workforce by making the case between public health service quality and the health of the populations they serve.

The authors extend sincere thanks to Sarah Forrestal for insightful comments on an earlier draft. Funded in part by AHRQ Conference Grant: 1 R13 HS018852.

REFERENCES

1. Gebbie K, Rosenstock L, Hernandez LM, editors. Who will keep the public healthy? Educating Public Health Professionals for the 21st Century. Washington, DC: National Academies Press; 2002.
2. Bekemeier B, Jones M. Relationships between local public health agency functions and agency leadership and staffing: A look at nurses. *J Public Health Manag Pract* 2010;16:E8-16.
3. Gebbie KM, Merrill J. Enumeration of the public health workforce: developing a system. *J Public Health Manag Pract* 2001;7:8.
4. Quad Council. Public health nursing shortage: A threat to the public's health; 2006, 2007. Available at: <http://www.apha.org/NR/rdonlyres/D3EB89A3-9727-45B9-9C83-5596626BCA74/2484/QCPHNShortage207.pdf>. Accessed on September 20, 2008.
5. National Association of City and County Health Officials. Resolution to Support Education and Recruitment of Public Health Nurses. Washington, DC: NACCHO; 2005. Available at: <http://www.naccho.org/advocacy/positions/>. Accessed on September 28, 2008.
6. Association of State and Territorial Officials. State public health employee worker shortage report: A civil service recruitment and retention crises; 2004. Available at: <http://astho.org/pubs/WorkforceShortageReportFinal.pdf>. Accessed on April 25, 2006.
7. Association of State and Territorial Health Officials. 2007 State public health workforce survey results; 2008. Available at: <http://www.astho.org/pubs/workforcereport.pdf>; Accessed on September 25, 2008.

8. American Nurses Association. Public Health Nursing Scope and Standards of Practice. Washington, D.C.: American Nurses Association; 2007.
9. Keller LO, Stroschein S, Lia-Hoagberg B, Schaffer, MA. Population-based public health interventions: Practice-based and evidence-supported. Part I. *Public Health Nurs* 2004;21:453-68.
10. NAACHO. 2010 LHD budget cuts in the media. Available at: http://www.naccho.org/press/coverage/budgetcuts/results_all.cfm. Accessed on April 12, 2010.
11. NACCHO. 2010 Local Health Department Budget Cuts in the News. Available at: <http://www.naccho.org/press/coverage/budgetcuts/>. Accessed on April 12, 2010.
12. Zahner SJ, Gredig QB. Public health nursing practice change and recommendations for improvement. *Public Health Nurs* 2005;22:422-8.
13. Quad Council. The public health nursing shortage: A threat to the public's health; 2006. Available at: <http://www.astdn.org/downloadablefiles/Final%20Nursing%20Shortage%20Paper.pdf>. Accessed on October 10, 2008.
14. Robertson JF. Does advanced community/public health nursing practice have a future? *Public Health Nurs* 2004;21:495-500.
15. Public Health Accreditation Board. 2010a. Home. Available at: <http://www.phaboard.org/>. Accessed on April 8, 2010.
16. Public Health Accreditation Board. 2010b. FAQs. Available at: <http://www.phaboard.org/index.php/about/faq/#history>. Accessed on April 8, 2010.
17. Institute of Medicine. Crossing the Quality Chasm. Washington, DC: National Academy Press; 2001.
18. Edmondson AC. Learning from mistakes is easier said than done: Group and organizational influences on the detection and correction of human error. *J Appl Behav Sci* 2004;40:66-90.
19. Tucker AL. The impact of operational failures on hospital nurses and their patients. *J Oper Manag* 2004;22:151-69.
20. Friese CR, Lake ET, Aiken LH, Silber JH, Sochalski J. Hospital nurse practice environments and outcomes for surgical oncology patients. *Health Serv Res* 2008;43:1145-63.
21. Van den Heede K, Lesaffre E, Diya L, Vleugels A, Clarke SP, Aiken LH, et al. The relationship between inpatient cardiac surgery mortality and nurse numbers and educational level: Analysis of administrative data. *Int J Nurs Stud* 2009;46:796-803.
22. Donabedian A. The quality of care. How can it be assessed? *JAMA* 1988;260:1743-8.
23. Tamuz M, Harrison MI. Improving patient safety in hospitals: Contributions of high reliability theory and normal accident theory. *Health Serv Res* 2006;41:1654-76.
24. Wholey DR, Gregg W, Moscovice I. Public health systems: A social networks perspective. *Health Serv Res* 2009;45:1842-62.
25. Loveland-Cherry C. Prevention-Safety and quality. In: Hughes RG, editor. *Patient Safety and Quality, 2008 Quality: An Evidence Based Handbook for Nurses*. AHRQ Publication Number 08-0043; 2008. Available at: <http://www.ahrq.gov/qual/nurses handbook>. Accessed on September 16, 2008.
26. Pan W, Bai H. A multivariate approach to a meta-analytic review of the effectiveness of the D.A.R.E. program. *Int J Environ Res Public Health* 2009;6:267-77.
27. Issel LM, Bekemeier B, Baldwin K. Three population patient indicators for public health nursing: Results of a consensus project. *Public Health Nurs* 2010 (In press).
28. Issel LM. 2009. Quality of Public Health Nursing Population-Focused Care: Prioritizing Research Agency for Healthcare Research and Quality Conference Grant: 1 R13 HS018852-01.
29. Scutchfield FD, Knight EA, Kelly AV, Bhandari MW, Vasilescu IP. Local public health agency capacity and its relationship to public health system performance. *J Public Health Manag Pract* 2004;10:204-15.
30. Issel LM, Baldwin K, Lyons R. Competency of public health nurses and faculty: Two assessment studies. *Public Health Nurs* 2006;23:168-77.
31. Zahner SJ, Gredig QB. Public health nursing practice change and recommendations for improvement. *Public Health Nurs* 2005;22:422-8.
32. Centers for Medicare and Medicaid Services. Hospital-Acquired Conditions (Present on admission Indicator). Available at: http://www.cms.hhs.gov/HospitalAcqCond/06_Hospital-Acquired_Conditions.asp#TopOfPage. Accessed on March 11, 2010.
33. Needleman J, Buerhaus P, Mattke S, Stewart M, Zelevinsky K. Nurse staffing levels and the quality of care in hospitals. *N Engl J Med* 2002;346:1757-66.