Published in final edited form as:

J Clin Nurs. 2008 December ; 17(24): 3317–3323. doi:10.1111/j.1365-2702.2008.02638.x.

An International Hospital Outcomes Research Agenda Focused on Nursing: Lessons from a Decade of Collaboration

Linda H. Aiken

Keywords

Hospital; Quality and Safety; International Health; Nursing

The nursing workforce and the organization of nursing care have long posed challenges for leaders in health systems worldwide, including recurring cycles of shortages and nurse unemployment. Concerns about quality and safety in health care and the connections between nurses' work conditions and patient outcomes have been growing in recent years, particularly as health care in acute care settings has become increasingly complex.

In the late 1990s, in the face of hospital reorganization and restructuring initiatives in a number of different western countries, the International Hospital Outcomes Study (IHOS) was launched by the University of Pennsylvania, USA (Sochalski and Aiken, 1999; Sochalski et al., 1997, 1999). The IHOS was initiated with seven interdisciplinary research teams located in the United States (Pennsylvania), Canada (Alberta, British Columbia, and Ontario), England, Scotland and Germany conducting a study of patient and nurse outcomes using parallel designs in each site. Soon after data collection, a team in New Zealand collected similar data. (See Table 1 for the numbers of nurses and hospitals involved.)

Subsequently, the IHOS survey was adapted for projects in at least 9 other countries (see Table 2). Additional extensions are either planned or are underway, including a study of staffing, work environments and outcomes in multiple U.S. states, a multicountry European collaboration in development, other Asian sites, and initiatives to pursue data collections in countries in Africa and the Middle East.

Whereas in the beginning of the collaboration, health care restructuring was a major theme that drove the study, over time the health policy issues have shifted to nurse shortages, quality of care concerns (including the rationing of nursing care), regionalization of care, and most recently nurse migration and global trends in health care organization. Interest in the design and in the tools that have been developed in the study continues to grow. This paper outlines some key elements of the design of the IHOS, highlights some of the methods and design innovations that have made the study unique, and summarizes some of the major patterns of findings that researchers in the collaboration have identified.

Design Components in the International Study

A key part of design of the study was a uniform core of nurse survey instruments used by each site. The survey data were merged with information about the structure/operations of the hospitals as well as data about the outcomes of patients in the hospitals where the nurses worked. Surveys in the original cohort of IHOS countries were completed in 1999. In the all of the original IHOS sites, and in most replications to date, there have been 3 types of data.

First, surveys were undertaken of hospital nurses involved in direct patient care. Nurses reported on their working conditions, work-related experiences and assessments of quality of care in a way that allows country-to-country and site-to-site comparisons (for instance, see Aiken et al., 2001). Further, the questionnaires used provide measures of key independent variables (nurse staffing and other characteristics of nurses' work environments) and outcomes (such as nurse job-related experiences, nurse reports about quality of care in their institutions) in a framework that tests the associations of the organization of care with outcomes. Measures of most of these variables have been difficult or impossible to obtain from other sources in reasonably standardized metrics. The surveys can therefore be used to study relationships of modifiable hospital or hospital unit characteristics to outcomes that have either not been examined before, as well as to study these relationships on a scale that was previously impossible.

A second type of data, more easily obtained from governmental or quasi-governmental agencies, provides information about the sizes of hospitals (in terms of number of beds or service volume), the types of technology available, whether the hospital is a teaching facility, and other general descriptive characteristics of hospitals. While the exact available and relevant variables in these datasets vary from country to country, these data allow for analyses that account for differences in patient and/or nurse types and experiences across institutions with different fundamental missions and responsible for varying types of patients. In some cases, these other data sources also provide complementary information about the structural hospital characteristics measured using surveys (such as staffing).

The third type of data source in the IHOS was information about hospital patients' outcomes. Standardized hospital discharge abstract databases, usually created for government purposes, have been used to measure patient outcomes in as many countries as possible. These abstracts are summaries of key data about each hospital stay in a specific time period, including the reasons for admission (medical condition and/or surgical procedures), length of stay, complications, and the patient's status at discharge (i.e. discharged alive or dead). When possible, these data have been linked to vital statistics records to calculate hospitals' death rates for specific conditions occurring within 30 days of admission death rates to account for deaths following discharge (i.e. in the community or in another hospital).

These three types of data are merged together and then patterns in these independent and dependent variables and the relationships between them are analyzed. The simplified description here could mislead readers about the scale of efforts involved—it was and continues to be substantial (Clarke 2004). As well as on-the-ground data collection, it was necessary for each team of investigators to obtain access to datasets with potentially sensitive information and to secure ethics approvals for the studies. Furthermore, approaches for archiving and processing very large datasets were needed. As a result, the demands of the study generated a number of innovations, including new measures and data and analysis approaches that made it possible to collect and process data on large numbers of hospitals, nurses, and patients at reasonable cost.

Design and Methods Innovations in the IHOS

Using Nurses as Informants about Care in Hospitals

At the heart of all research design is gathering data from representative members of a population of interest to understand an underlying concept or concepts. The sample studied must show sufficient variation on one or more of the features of interest in a study. The population of interest in the IHOS was hospitals. This required strategies for collecting data about either all hospitals or at least a representative sample of them from each country, province or state of interest. Many large studies of hospitals survey one administrator whose responses represent

the hospital. The IHOS took a different approach, one that assumed that nurses in direct patient care would be the most accurate informants about organizational attributes and their significance for patient care. Thus, while the focus of the study is hospitals, the primary data collection involved surveys of nurses at each hospital and the aggregation of their responses to reflect hospital level measures of important variables in the study such as the adequacy of nurse staffing, quality of care, the frequency of adverse patient events (Aiken et al. 1997).

Conventional means of gathering data from hospital nurses require approaching administrators at specific hospitals and requesting permission from them to conduct surveys. This can be quite time-consuming and lead to potential selection biases in the hospitals that end up in samples (in ways that are predictable as well as some that are less so) because not all administrators will agree to have their facilities participate. Institutions that accept the request to participate must be willing to provide lists of eligible staff on the types of units where the surveys are conducted (for instance from payroll lists, scheduling rosters etc.) Project staff (or contact/resource staff in the facility) must distribute the questionnaires, collect them (unless the questionnaires are to be returned to the research team's offices by mail) and somehow keep track of who has responded and who has not while protecting the confidentiality of the respondents. Some IHOS teams used this conventional method, for lack of alternative means of identifying and contacting nurses to survey.

However, in Canada and the United States, in addition to state and provincial legal requirements that key details of hospitalizations for all patients in all facilities be recorded in datasets available to researchers, an additional characteristic of the regulatory systems was leveraged to gain a larger and more representative sample of hospitals for study. By law, all nurses require current licenses in the state or province where a hospital is located in order to practice there. These licenses are renewed by nurses every one or two years, and nurses are required to inform the licensing body of changes of address as they occur. Furthermore, these licensing bodies generally allow researchers to obtain home mailing addresses of nurses for approved research studies. As a result, teams could mail surveys directly to nurses' homes to avoid having to contact nurses at their workplaces. Early questions in the Canadian and U.S. surveys determined or confirmed whether nurses worked in hospitals and if so, what facilities they were employed in. Nurses returned completed surveys to the research teams' offices using self-addressed stamped envelopes. When a country, province or state has a comprehensive mailing list of licensed nurses (or even better, of all nurses working in hospitals) that contains current, regularly updated addresses, this is an exceptionally effective way to proceed.

A common core of instrumentation

A study of acute hospital care for patients with HIV disease (Aiken et al, 1999) and a series of projects on Magnet hospitals conducted at the University of Pennsylvania (Aiken, 2002), all of which used survey tools, provided extensive groundwork for the IHOS core battery of instruments. These were supplemented with other items and tools. Key among these survey tools is a work environment measure, the Nursing Work Index—Revised. Because the NWI-R includes questions about a range of factors that are important for nurse job satisfaction and professional practice, each of the individual items can be analyzed and compared across (Aiken et al., 2001). However, even more powerfully, the NWI-R is also a psychometrically validated tool with internally-consistent scales (Aiken & Patrician, 2000; Lake 2002) that quantify the quality of practice environments for nurses beyond staffing in a way that had never been possible previously. linked to job satisfaction and quality of care and enable them to be compared across hospitals (and over time)

Key survey tools from the battery also included measures of staffing derived from nurses' self-reports of their workloads on the last shift they worked (Aiken et al 2002a, b; Clarke et al. 2002; Rafferty et al.2007). It also makes extensive use of nurse self-reports on a variety of

aspects of worklife from job experiences, including burnout (using the well-known Maslach Burnout Inventory (Maslach cites), job satisfaction and intent to leave, and percutaneous injuries with used sharps devices (“needlesticks”). Yet another set of questions deal with nurses perceptions of quality of care. In addition to questions about the quality of care in general, the surveys includes a unique series of items, adapted slightly in many of the sites, addressing key nursing tasks left undone for lack of resources (an approach that has spawned a tool that examines the rationing of nursing care (Schubert et al., 2007)), and the frequency of adverse events in patient care.

Patient outcomes measures

The expertise of outcomes researchers on the team led to decisions about the specific patient groups studied in the international study, specific endpoints to examine in these patient populations, and the general approach used to take differences in the underlying risks of the patients for poor outcomes into account. Mortality among patients admitted for groups of common medical and surgical were chosen for the study because inpatient death tends to be a reliably coded outcome with few, if any, validity issues across countries. Failure to rescue, a measure of mortality among patients with complications, that appeals to researchers as an outcome potentially sensitive to nursing (suggestive of delayed identification and/or ineffective treatment of complications) was used on a large scale in the IHOS (see Aiken et al. 2002; Clarke and Aiken 2003). In some sites, limitations in the sensitivity of coding of complications in discharge abstracts were discovered (see for instance McKee et al.1999); an adaptation of the failure to rescue algorithm used extended length of stay to flag patients who were likely to have experienced complications of care (Rafferty et al., 2007).

Patterns of Results from the IHOS and Subsequent Studies

Findings have been remarkably consistent across countries with very different cultures and health care systems. Three major themes have emerged: consistency across countries in the experiences of nurses, variation from hospital to hospital in the environments for the practice of nursing, the experiences of nurses on the job and of patients within countries, and associations between practice environments and various outcomes.

Consistency of nurses' experiences across and between countries

The IHOS has produced a great deal of evidence that the experience of being a nurse is remarkably similar and that hospitals are similarly organized across countries, despite cultural differences. Hospital nursing also seems to have similar trouble areas. While nurses believe that their fellow nurses are generally competent and rate relationships with physicians quite highly on average, ratings of the adequacy of staffing to meet patient needs have been quite low in nearly all surveys and nurses generally voice a lack of confidence that managers will respond to their concerns regarding quality of care. (Aiken et al. 2001) Furthermore, overall, burnout ratings and intent to leave current positions have been high across countries and job satisfaction ratings have been low, with interesting cross-national differences, and with U.S. nurses often (but not always) showing the greatest distress of those studied (Aiken et al. 2001) Needlestick injuries were an exception, with federal and state regulations mandating the use of safety-engineered equipment apparently leading to lowest rates of percutaneous injuries in the U.S. (Clarke et al. 2007). The magnitude of distress expressed by nurses as a group across countries is of great concern in the face of demographic trends that are expanding demand for nursing services while contracting nurse labor supply. Forces that lead nurses out of the jobs and the profession prematurely, such as poor and unsafe working environments and emotional distress, must be dealt with to ensure that health services are not jeopardized in the coming years.

Equally concerning but perhaps not surprising given consistent of widespread problems with safety and quality of care in hospitals internationally that began appearing in the late 1990s, international surveys also revealed that nurses in many countries generally reported low quality of care on their units and in their hospitals, including premature discharge of patients and problems delivering all care nurses deem necessary for patient well-being. They also consistently report alarmingly high occurrence of falls, errors and related adverse events. (Aiken et al., 2001)

Variation of hospitals within countries

While nurses reported common experiences across hospitals and across countries, IHOS researchers found that not all hospitals seem to be managed the same ways within countries or achieve the same levels of important practice environment characteristics such as staffing, education levels of staff, support from administrators for nursing practice and other characteristics. This is perhaps not surprising, since even in health systems where budgeting and control of hospital operations are relatively centralized, the community contexts, institutional histories, and the decisions made by leaders on short- and long-term horizons influence working conditions and practice environments. A range of staffing, practice environments and outcomes levels at the hospital level has been found in practically every IHOS study report (see for instance, Aiken et al. 2002a, b, 2003; Rafferty et al. 2007)

Connections between staffing, work environments and outcomes

The third major group of findings across the studies is the most critical for health care system stakeholders, particularly leaders and policymakers. It is that variations on organizational properties such as staffing levels, relations with physicians, and perceived support from front-line and top-level managers, have been consistently linked to critical nurse and patient outcomes. Not only is the experience of nurses similar across countries, but what makes a hospital a favorable place for nurses to work and patients to be treated appears remarkably similar across countries. This suggests that an innovation such as the Magnet Recognition Program that improves the work environment and outcomes in any country might be applicable in other countries as well.

Hospitals with more favorable nurse-to-patient ratios had lower mortality rates and lower failure to rescue rates in surgical patients as well as lower job dissatisfaction and burnout among nurses (Aiken et al. 2002; Rafferty et al. 2007; Sheward et al., 2005). When the IHOS was being developed, a very limited body of research was available on the influence of nurse staffing on hospital patients (Wunderlich et al. 1996). Findings of the IHOS contributed importantly to what is now a very large body of findings linking staffing to acute care hospital outcomes (Kane et al. 2007).

Another very important finding from the IHOS is that nurses' education makes a difference for patient outcomes. Hospitals which had a larger proportion of bedside care nurses with bachelor's or higher degrees had significantly lower mortality (Aiken et al. 2003; Estabrooks et al. 2005; for a study using a very similar method drawing on the IHOS methods see Tourangeau et al. 2007).

Perhaps the most impressive breadth of findings across sites has linked practice environments characteristics beyond staffing and skill mix measured with the Nursing Work Index to a range of outcomes in many different countries. In multiple countries, practice environment characteristics associated with: mortality among medical and surgical patients, failure to rescue in surgical patients (Aiken et al. in press, 2008; Estabrooks et al. 2005); nurse rated quality of care (Aiken et al. 2002a; Gunnarsdottir et al, 2007; Laschinger et al., 2001); burnout, job dissatisfaction, and other negative nurse job and health outcomes (Aiken et al 2002; Budge et

al., 2003; Gunnarsdottir et al. 2007; Laschinger et al. 2001; Shamian et al 2002; Sheward et al. 2002, 2005) and needlestick injuries in nurses (Clarke, 2007). Taken together these findings suggest that across very differently organized health care systems hospitals that invest in educated nursing staff, manage their workforces effectively, and shape positive environments for the practice of nursing have healthier, more satisfied nurses, and show more favorable patient outcomes. These extensively-replicated findings have clear implications for health care leaders working to ensure high-quality care for patients in their systems and point to specific areas in which new or renewed commitments of resources are necessary.

Conclusions: Future Directions

The work of the IHOS continues in the United States, among the original collaborators, and in other countries that are geographically distant and culturally distinct from the original IHOS partners. These countries are adapting the original study questionnaire and overall study design to study nurse workforce issues as well as factors influencing quality of care in their societies. This is fascinating work that probes differences in the organization and practice of nursing, weaving health system differences and the story of the evolution of the nursing profession in different countries together to provide insights for managers and policymakers attempting to deal with the growing challenges of nurse shortage, patient safety risks, and international nurse migration.

Strikingly high burnout levels in Japanese nurses, dissatisfaction with salaries in U.K. nurses and needlestick injuries (along with low burnout) in German nurses, among many other contrasting multinational findings in the IHOS, deserve further probing. Findings connecting the organization of nursing care in hospitals with patient outcomes need to be replicated and refined outside acute care, particularly since key aspects of health care delivery are increasingly delivered in settings other than traditional Western-style hospitals. New and evolving phenomena, including medical tourism and other forms of health care across borders, nurse migration, and safety and quality issues created by natural, man-made and demographic crises deserve investigation.

Interestingly, while many expansions on the IHOS concept have been conducted and remain to be carried out, the core message remains the same: Investments in improved nurse staffing, a better educated nurse workforce, and improved nursing work environments are levers for improving quality of patient care and retaining a qualified and committed nurse workforce. Now that the IHOS researchers and others have produced a critical mass of evidence supporting this statement, a new form of research and leadership are needed to pull hospitals and other health care organizations forward worldwide and to gauge their success managing their nurse workforces to optimize patient outcomes.

Acknowledgements

Funding for the original International Hospital Outcomes Study was provided by the National Institute of Nursing Research, NIH; The Commonwealth Fund of New York; The Nuffield Trust and other in-country sources. Subsequent studies have been funded by an extensive range of international too numerous to list here. The ongoing coordination and dissemination efforts in relation to this international work at the University of Pennsylvania have been supported in part by the Center for Nursing Outcomes Research (Grant P30NR05043, L.H. Aiken, Director, National Institute of Nursing Research, NIH).

References

- Aiken, L.H. Superior outcomes for Magnet hospitals: The evidence base. In: McClure, ML.; Hinshaw, AS., editors. *Magnet Hospitals Revisited: Attraction and Retention of Professional Nurses*. American Nurses Publishing; Washington DC: 2002. p. 61-81.

- Aiken LH, Clarke SP, Cheung RB, Sloane DM, Silber JH. Education levels of hospital nurses and surgical patient mortality. *Journal of the American Medical Association* 2003;290:1617–1623. [PubMed: 14506121]
- Aiken LH, Clarke SP, Sloane DM. Hospital staffing, organization, and quality of care: Cross-national findings. *International Journal of Quality in Health Care* 2002a;14:5–13.
- Aiken LH, Clarke SP, Sloane DM, Sochalski JA, Busse R, Clarke H, Giovannetti P, Hunt J, Rafferty AM, Shamian J. Nurses' reports on hospital care in five countries. *Health Affairs* 2001;20(3):43–53. [PubMed: 11585181]
- Aiken LH, Clarke SP, Sloane DM, Sochalski J, Silber JH. Hospital nurse staffing and patient mortality, nurse burnout, and job dissatisfaction. *Journal of the American Medical Association* October 23/30;2002b 288:1987–1993. [PubMed: 12387650]
- Aiken LH, Patrician PA. Measuring organizational traits of hospitals: The Revised Nursing Work Index. *Nursing Research* 2002;49:146–153. [PubMed: 10882319]
- Aiken LH, Sochalski J, Lake ET. Studying outcomes of organizational change in health services. *Medical Care* 1997;35(11 Supplement):NS6–NS18. [PubMed: 9366875]
- Aiken LH, Sloane DM, Lake ET, Sochalski ET, Weber AL. Organization and Outcomes of Inpatient AIDS Care. *Medical Care* 1999;37:760–772. [PubMed: 10448719]
- Budge C, Carryer J, Wood S. Health correlates of autonomy, control and professional relationships in the nursing work environment. *Journal of Advanced Nursing* 2002;42:260–268. [PubMed: 12680970]
- Clarke SP. International collaboration in nursing research: The experience of the International Hospital Outcomes Study. *Applied Nursing Research* 2004;17(2):134–136. [PubMed: 15154127]
- Clarke SP. Hospital work environments, nurse characteristics and sharps injuries. *American Journal of Infection Control* 2007;35(5):302–309. [PubMed: 17577476]
- Clarke SP, Aiken LH. Failure to rescue. *American Journal of Nursing* 2003;103(1):42–47. [PubMed: 12544057]
- Clarke SP, Rockett J, Sloane DM, Aiken LH. Organizational climate, staffing, and safety equipment as predictors of needlestick injuries and near-misses in hospital nurses. *American Journal of Infection Control* 2002;30:207–216. [PubMed: 12032495]
- Clarke SP, Schubert M, Körner T. Sharps injuries to hospital nurses in four countries. *Infection Control and Hospital Epidemiology* 2007;28:473–478. [PubMed: 17385155]
- Estabrooks CA, Midodzi WK, Cummings GG, Ricker KL, Giovannetti P. The impact of hospital nursing characteristics on 30-day mortality. *Nursing Research* 2005;54(2):74–84. [PubMed: 15778649]
- Gunnarsdottir S, Clarke SP, Rafferty AM, Nutbeam D. Front-line management, staffing and nurse-doctor relationships as predictors of nurse and patient outcomes. A survey of Icelandic hospital nurses. *International Journal of Nursing Studies*. 200710.1016/j.ijnurstu.2006.11.007(In press) Epub available —January 15, 2007
- Kane RL, Shamliyan TA, Mueller C, Duval S, Wilt TJ. The association of registered nurse staffing levels and patient outcomes: systematic review and metaanalysis. *Medical Care* 2007;45:1195–1204. [PubMed: 18007170]
- Lake ET. Development of the Practice Environment Scale of the Nursing Work Index. *Research in Nursing and Health* 2002;25:176–188. [PubMed: 12015780]
- Laschinger HS, Shamian J, Thomson D. Impact of magnet hospital characteristics on nurses' perceptions of trust, burnout, quality of care, and work satisfaction. *Nursing Economics* 2001;19(5):209–219.
- Maslach, C.; Jackson, SE. *Maslach Burnout Inventory Manual*. 2nd. Consulting Psychologists Press; Palo Alto, CA: 2006.
- McKee M, Coles J, James P. 'Failure to rescue' as a measure of quality of hospital care: The limitations of secondary diagnosis coding in English hospital data. *Journal of Public Health Medicine* 1999;21:453–458. [PubMed: 11469370]
- Rafferty AM, Ball J, Aiken LH. Are teamwork and professional autonomy compatible, and do they result in improved hospital care. *Quality in Health Care* 2001;10:ii32–ii37. [PubMed: 11700377]
- Rafferty AM, Clarke SP, Coles J, Ball J, James P, McKee M, Aiken LH. Outcomes of variation in hospital nurse staffing in English hospitals: Cross-sectional analysis of survey data and discharge records. *International Journal of Nursing Studies* 2007;44:175–182. [PubMed: 17064706]

- Schubert M, Glass TR, Clarke SP, Schaffert-Witvliet B, De Geest S. Validation of the Basel Extent of Rationing of Nursing Care instrument. *Nursing Research* 2007;56:416–424. [PubMed: 18004188]
- Shamian J, Kerr MS, Laschinger HS, Thomson D. A hospital level analysis of the work environment and workforce health indicators for registered nurses in Ontario's acute-care hospitals. *Canadian Journal of Nursing Research* 2002;33(4):35–50. [PubMed: 11998196]
- Sheward L, Hunt J, Hagen S, MacLeod M, Ball J. The relationship between UK hospital nurse staffing and emotional exhaustion and job dissatisfaction. *Journal of Nursing Management* 2005;13:51–60. [PubMed: 15613094]
- Sochalski J, Aiken LH. Accounting for variation in hospital outcomes: A cross-national study. *Health Affairs* 1999;18:256–259. [PubMed: 10388223]
- Sochalski J, Aiken LH, Fagin CM. Hospital restructuring in the United States, Canada, and Western Europe: An outcomes research agenda. *Medical Care* 1997;35(10 Suppl):OS13–OS25. [PubMed: 9339773]
- Sochalski J, Estabrooks CA, Humphrey CK. Nurse staffing and patient outcomes: Evolution of an international study. *Canadian Journal of Nursing Research* 1999;31:69–88. [PubMed: 10696170]
- Tourangeau AE, Doran DM, McGillis-Hall L, O'Brien-Pallas L, Pringle D, Tu JV, Cranley LA. Impact of hospital nursing care on 30-day mortality for acute medical patients. *Journal of Advanced Nursing* 2007;57:32–44. [PubMed: 17184372]
- Tourangeau AE, Giovannetti P, Tu JV, Wood M. Nursing-related determinants of 30-day mortality for hospitalized patients. *Canadian Journal of Nursing Research* 2002;33:71–88. [PubMed: 11998198]
- Wunderlich, GS.; Sloan, F.; Davis, CK. *Nursing staff in hospitals and nursing homes: is it adequate.* National Academy Press; Washington, DC: 1996.

Table 1

Participating sites and hospitals and nurses represented in the initial round of the International Hospital Outcomes Study

	Hospitals	Nurses
U.S. – Pennsylvania	210	14,145
Ontario	209	8,778
British Columbia	97	2,838
Alberta	109	6,558
England	32	5,006
Scotland	27	5,238
Germany	29	2,738
New Zealand	24	4,882
TOTAL	737	50,183

Table 2
Collaborative Sites with Completed Data Collections

-
- Switzerland
 - Iceland
 - Russia
 - Armenia
 - Belgium
 - Australia
 - Japan
 - Korea
 - Thailand
-