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UNIVERSITY OF ALBERTA

HI:NC DATA ELEMENTS WITHIN ONE ALBERTA HOSPITAL: AVAILABILITY AND RELIABILITY

by

Shirley Anne Bestilny R.N. B.Sc.N ©

A thesis submitted to the Faculty of Graduate Studies and Research in partial fulfillment of the requirements for the Degree of Master in Nursing

Faculty of Nursing

Edmonton, Alberta
Spring, 1995

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research for acceptance, a thesis entitled HI:NC Data Elements Within One Alberta Hospital: Availability And Reliability submitted by Shirley Anne Bestilny in partial fulfillment of the requirements for the degree of Master of Nursing.

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Abstract

The Health Information: Nursing Components (HI:NC) is a 22 item data set proposed as a means of identifying and abstracting comparable nursing data wherever nursing care is delivered. A data collection instrument, developed by Werley, Devine, and Zorn (1992), was modified to examine the availability and reliability of HI:NC elements using a 400 health record sample in one Canadian hospital. The availability of nurse care related elements was high ranging from 73% to 94%. The nurse provider elements were never available and only some of the client elements had high availability. Intra-rater reliability was uniformly high. Of the 2,095 abstracted nursing diagnoses, only 57% were recorded according to the North American Nursing Diagnosis Association (NANDA) taxonomy. Of particular interest was the finding that for short-stay patients, the number of records in which NANDA diagnoses were relatively high was 32%.

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Last, but certainly not least, thank you to those who have shared with me the mysteries of computer systems. I could not have done this without you.

To all my colleagues: This thesis is for you. I sincerely hope that this and future work will assist in bringing recognition of the contribution that nurses provide towards the health of our patients.

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CHAPTER 1

Introduction

The development of automated information systems is of growing importance to health care organizations. Of particular interest to nurses are information systems that automatically process data to assist in the planning, provision, costing, and evaluation of nursing care (Study Group on Nursing Information Systems, 1983). A nursing information system uses standardized data bases to guide the collection of data to provide ongoing information about nurses' contribution to patient care (Bulechek & McCloskey, 1992). The choice of which data to collect, however, must first be consensually determined and standardized by the nursing profession prior to the construction of nursing information systems. The Health Information: Nursing Components data set in Canada and the Nursing Minimum Data Set in the United States have been endorsed by the Canadian Nurses' Association (C.N.A.) and the American Nurses' Association respectively as containing data indicative of nursing practice.

Studies have been conducted in the United States to test the availability of such minimum sets of nursing data in a variety of clinical settings. The present study is an extension of the work that has been done in the United States and is the first study of this nature in Canada.

Fiscal constraints are having a dramatic effect on the health care services that are being offered within Canada's acute care hospitals. Alberta and Ontario offer two examples. In Alberta, there will be a reduction in health care spending of approximately 734 million dollars over the 3 year period, 1994 to 1997 (Pedersen, 1995). In addition, half of the inpatient hospital beds across Alberta are slated to be closed over that period of time (Alberta Healthcare Association, 1994). In Ontario a total of 2,670 inpatient beds will be closed within metro Toronto alone (Priest, 1995). With the reduction in inpatient beds has been a concomitant move towards a significant increase in the volume of short-stay admissions, day surgery, and outpatient services.

As part of the dramatic shift in health care organization and delivery within Canada, the nursing profession is also undergoing major changes. There are a number of proposals before government that suggest that independent nursing services could be offered as a lower cost approach to the provision of health services (Update of AARN initiative, 1994). In addition, with a much greater emphasis on health promotion one would expect nurses to be able to offer a more effective and client-focused approach to the provision of health care services (Wright & Dorsey, 1994).

Countervailing this trend towards enhancing the status of the nursing profession is a perceived lack of understanding of just what it is that nurses do. This is leading to a scenario in which lower cost, less trained, non-nursing personnel may be used in many of the new opportunities. More than ever it is critical that clear objective data be collected that describe both the efficacy of nursing care in the care process and the cost of nursing personnel.

A common problem, regardless of the setting, is that most health care records consist of enormous quantities of textual information that is neither codified nor organized in any systematic manner. The result is that retrievability and thus comparability of documented nursing interventions and outcomes from one setting to the next is highly problematic. There have been many calls for uniform data sets to overcome the problems related to data retrievability and comparability (for examples see Murnaghan, 1978; Murnaghan & White, 1970; Newcomb, 1981; Werley & Grier, 1981). In the medical arena, this call has been largely driven by funding requirements with the result that adoption of uniformly collected data sets is fairly well advanced. Surprisingly little, however, has been achieved in the uniform collection of data that are directly applicable to nursing practice (Anderson et al, 1994).

Uniform data sets such as the Uniform Hospital Discharge Data Set have been proposed and implemented over the last 20 years in the United States. In Canada the main body for the collection of this information has been the Hospital Medical Records Institute (H.M.R.I.) which has been recently subsumed by the

Canadian Institute for Health Information (C.I.H.I.) (Lalonde, 1994a, 1994b). The C.I.H.I. is quickly becoming the central body for the collection and dissemination of uniform health information for Canada. The C.N.A. recognizes that for the advancement of the nursing profession a critical need for nursing data exists and that the C.I.H.I. would be the most efficacious body to collect, analyze, and disseminate this information.

Problem Statement

An essential first step in nursing information system development is the creation of data sets, that is, meaningful categories of data that organize information within standardized databases (Kiley et al., 1983). The data set, Health Information: Nursing Components (HI:NC), is one approach to the development of a uniform and standardized system for collecting and organizing nursing data in Canada. Although both the Canadian Nurses' Association (C.N.A.) and the Alberta Association of Registered Nurses (A.A.R.N.) support the implementation of the HI:NC (Alberta Association of Registered Nurses, 1990), the extent to which these data are currently documented by nurses and retained in health records is unknown. The purpose of this study was to examine the availability and reliability of the proposed HI:NC elements within the health records of one Alberta hospital.

Research Questions

Two research questions formed the basis for this study:

1. What is the extent of the availability of the HI:NC data elements as abstracted from the records of one of Alberta's acute care hospitals?
2. What is the intra-rater reliability of the HI:NC data elements as abstracted from the records of one of Alberta's acute care hospitals?

The importance of these research questions lies with the ability of nurses to identify their contribution to patient care. For this to occur, the data must be readily available and reliably measured.

It was originally planned to examine both the intra-rater and inter-rater reliability of the HI:NC data elements. Due to the cost of data abstraction, however, inter-rater reliability testing was not done.

It is suggested that inter-rater reliability testing be conducted with future studies related to the HI:NC data elements.

Definition of terms

Availability: Availability is the degree to which data are recorded and retained in the health record.

Reliability: Reliability is the degree of consistency and repeatability of the measurement of the data entered in the health record.

Assumptions

The collection of nursing minimum data sets assumes that one can characterize a process by the measurement of its subprocesses. Thus, the nursing care process is assumed to be measured by analyzing nurses' assessments, diagnoses, planning, interventions and outcomes (Tillman, 1990). Further, this study assumes that the HI:NC elements provide an unambiguous depiction of the work of nurses. As one example, the classification schemes that categorize nursing diagnoses, interventions, and outcomes are assumed to be well-defined, complete, and constructed of codes which are mutually exclusive.

Summary

The primary objective for conducting the present study was to examine the availability and consistency of retrieval, from health records, of the HI:NC data elements recently endorsed by the C.N.A.. While a number of research studies have examined such questions in the United States for a related NMDS, this study is the first of its kind in Canada.

CHAPTER 2

Literature Review And Frame of Reference

Review Of Relevant Literature

The purpose of this chapter is to summarize the accumulated knowledge concerning the health information: nursing components concept and to highlight important issues relative to implementation. All of the reviewed literature has been obtained through five search approaches. Listed in the order of use, the five search methods were: on-line computer searches, ancestry searches, invisible college approach, descendency searches, and abstracting services as defined by Cooper (1982). The integrative research review guidelines, as suggested by Cooper, were followed in reporting this literature review. Using this technique, future research is more repeatable. A total of 289 literary works were reviewed with publication dates ranging from 1976 to 1995. In addition, several seminal works were also reviewed dating from the time of Florence Nightingale.

The on-line computer search method provided the basis for the search for the HI:NC literature. The computer search was limited to the bibliographic data bases available at the John Scott Library, University of Alberta, Edmonton. Three bibliographic data bases were used: (a) Cumulative Index to Nursing and Allied Health Literature (CINAHL), (b) Medline, and (c) Health Planning and Administration (Health). The key terms and combined phrases as well as the resultant numbers of articles discovered using the CINAHL data base with publication dates between 1982 and December, 1994 were: (a) nursing minimum data set, 23 articles; (b) health information: nursing components, 4 articles; (c) health information: nursing components and nursing minimum data set, 1 article; (d) nursing diagnosis and nursing minimum data set, 5 articles; (e) client status and nursing minimum data set, 0 articles; (f) nursing intervention and nursing minimum data set, 2 articles; (g) nursing outcome and nursing minimum data set, 0 articles; (h) client outcome and nursing minimum data set, 0 articles; and (i) nursing intensity and nursing minimum data set, 1 article. The search of the Medline data base revealed the same 4 journal articles pertaining to HI:NC and 13 of the nursing minimum data set articles. The Health data base, for the period 1975 to February, 1995, revealed the same health information: nursing components articles and 20 of the nursing minimum data set articles.

The ancestry search approach produced the majority of the articles for the literature review. References from the articles obtained through the on-line computer searches extended the search process to include literature related to the nursing minimum data set concept. Topics such as the nursing process, nursing documentation, nursing taxonomy development, minimum data set development, and information technology systems provided background material. The invisible college approach provided more background information as well as several copies of conference proceedings that addressed the nursing minimum data set topic but were not listed in the bibliographic data bases.

Sources for the published and unpublished works that directly [illegible] the nursing minimum data concept are: 22 journal [illegible] edited books, 10 conference proceedings, 1 report, and 1 master's thesis. The majority of papers were descriptive and/or prescriptive in nature. Fourteen exploratory studies were reported. The fourteen American studies all examined the same aspect of the nursing minimum data set concept, the availability of the elements in nursing clinical practice documentation.

In summary, the literature review covers major works from 1976 to February, 1995 and important earlier related literature dating from the time of Florence Nightingale. Twenty-three articles obtained through a search of bibliographic data bases have provided the core nursing minimum data set and health information: nursing components literary works.

Minimum Data Sets

The history of the collection of uniform health data traces back to the beginning of organized modern nursing. In 1860, Florence Nightingale, an early proponent of collecting uniform categories of data, devised a system of gathering hospital statistics, such as yearly census, admissions, discharges, recoveries, deaths, and lengths of stay. This system, however, was not brought into general practice during her lifetime (Cohen, 1984). Indeed, work on the development of uniform health data sets did not begin in North America until the 1960s (Murnaghan, 1973; Murnaghan & White, 1970).

In an effort to develop standards and guidelines for the collection of national health data, Uniform Minimum Health Data Sets (UMHDS) have been developed in the United States (Abdellah, 1988; Murnaghan, 1978; Murnaghan & White, 1970; Werley, Devine, & Zorn, 1988). A UMHDS is defined as "a minimum set of items of information with uniform definitions and categories, concerning a specific aspect or dimension of the health care system which meets the essential needs of multiple data users" (Health Information Policy Council, 1983, p. 3). The primary purpose of a UMHDS is to permit the transfer of similar data between agencies.

Three UMHDSs that remain under development, in the United States, are the Uniform Hospital Discharge Data Set (UHDDS), the Ambulatory Medical Care Minimum Data Set (ACMDS), and the Long-Term Health Care Minimum Data Set (LHCMDS) (National Center for Health Statistics, 1980a, 1980b, 1981) (for UMHDS data elements see Appendix A, Tables A1 to A3). The UHDDS is a minimum data set that all hospitals should collect upon a patient's discharge from a hospital facility. The UHDDS consists of both patient demographic data and summary information of procedures and treatments that the patient received during an inpatient hospital stay as well as identifiers of the attending and operating physicians. The ACMDS consists of patient demographic data along with summaries of presenting problems, treatments, procedures, diagnostic services, and preventive services rendered as well as identification of the ambulatory treatment location and provider. The LHCMDS again includes patient demographic information but is related to long stay facilities. Health status and long-term care service summaries are also to be captured when using the LHCMDS data set. In the United States, the UHDDS is the only minimum health data set in widespread use at the present time (Werley, Devine, Zorn, Ryan, & Westra, 1992).

The primary reasons for the establishment of these data sets did not include the measurement of direct nursing care. As a result, none of the UMHDSs included the data needed to describe nursing practice (Anderson-Stewart, 1988). In Canada, the H.M.R.I. database has been used since 1977, on a voluntary basis, by acute care hospitals to gather patient demographic and medically-related health data for a national database (Podolak, 1993). Nursing-related data are also not included in the H.M.R.I. data set.

Nursing Minimum Data Set

To focus the collection of standardized, comparable, and retrievable nursing practice data in the United States, the term, Nursing Minimum Data Set (NMDS), was first coined and then developed largely through the efforts of Dr. Harriet Werley and her associates. A basic nursing data set was first identified in 1977 at a research conference on nursing information systems held in Chicago (Werley & Grier, 1981). It was not until 1985, however, that the NMDS movement was perpetuated through a conference held at the University of Wisconsin-Milwaukee School of Nursing (Werley, Lang, & Westlake, 1986).

The name, Nursing Minimum Data Set, was officially adopted by American nurses in 1986 (American Nurses' Association). When NMDS is used in this thesis, the acronym refers to the U.S. data elements as precisely identified in that set. Nurses in many other countries are developing minimum data sets unique to nursing. In doing so, they have used the American phrase, nursing minimum data set, while not necessarily including the same data elements as in the U.S. set.

The NMDS is defined as "a minimum set of items [or elements] of information with uniform definitions and categories, concerning a specific aspect or dimension of the health care system, which meets the essential needs of multiple data users" (Werley, Devine, Zorn, Ryan, & Westra, 1992, p. 88). The NMDS contains three data element categories: (a) nursing care data elements, (b) patient demographic data elements, and (c) service data elements (for specific NMDS elements see Appendix B, Table B1) (Werley & Devine, 1987). Nursing diagnosis, nursing outcome, and intensity of nursing care are the original elements in the nursing care data category; during the NMDS data collection instrument pilot testing phase, nursing intervention was added to this category (Werley & Lang, 1988). The NMDS is used to capture key aspects of nursing practice in retrospect; data are retrieved through health records review (Butera, 1990).

The implications of using a nursing minimum data set for nursing practice, administration, and research have been articulated many times in the literature (Devine, 1988; Halloran, 1988; Kraegel, 1988; Lant, 1988; McPhillips, 1988; Werley, Devine, Zorn, Ryan, & Westra, 1991; Werley & Zorn, 1988; Zielstorff, 1984). Of these, Werley and Devine (1987) provide the most succinct summary.

> For clinical and administrative personnel, a minimum data set for nursing will (a) stress complete, accurate documentation of nursing care according to the nursing process model; (b) emphasize the need for measuring nursing care and resources consumed; (c) develop computerized nursing information systems; (d) highlight the need to abstract core minimum nursing data across all care delivery systems; and (e) recognize the

> trends these core data can reflect about nursing practice and research needs" [seriation changed] (p. 548). For nursing researchers, a minimum data set for nursing will: "(a) promote descriptive research on nursing care of clients in varied settings; (b) stimulate efforts to compare nursing interventions for specific nursing diagnoses across settings -- locally, regionally, and nationally; (c) investigate the resolution status of nursing diagnoses and referrals for further nursing care; (d) assess the patterns of outcomes for various nursing diagnoses; (e) investigate the patterns of nursing care and costs in various types of care delivery settings; (f) develop new nursing resources allocation methodologies; and (g) describe the differential staffing patterns of nursing personnel across types of care delivery settings [seriation changed] (p. 548).

It has been assumed that all sixteen NMDS elements are used by the majority of nurses across all settings on a regular basis (Werley, 1987; Werley, Lang, & Westlake, 1986). The few studies that have been carried out in the United States would tend to support this assumption (Devine & Werley, 1988; Tillman, 1990). In 1989 questionnaires were sent to those people requesting copies of the NMDS data collection manual. Werley and Leske (1991a) found that while over one-third of the respondents (n = 46) used all of the elements, the majority used or intended to use the nursing care category elements. Only 31% of the respondents could readily retrieve all of the NMDS elements.

To determine whether or not nursing-specific data can be collected in a uniform, standard, reliable, and feasible manner, a nursing minimum data set data collection instrument and manual have been developed (Werley, Devine, & Zorn, 1992). Two studies, testing this instrument, have been conducted in the United States (Devine & Werley, 1988; Tillman, 1990). Werley and Devine's (1988) initial testing of the NMDS data collection instrument included four settings: a teaching hospital, a nursing home, a home health care agency, and two ambulatory clinics. They found that the majority of the NMDS elements were available in at least 85% of the sample records (n = 116). Reliability was acceptable overall, although it was determined that the definitions and procedures required refinement. Tillman (1990) replicated the study in a nursing center and found that the nursing care elements were available in the majority of the sample records (n = 60). The exception was the nursing outcome element, available in 67% of the sample records. The demographic elements' availability ranged from 0.0% to 100%. Of the service elements, only the unique record number and the admission date were available in all records.

San Antonio Conference: Studies in Progress

Since the onset of the present study, researchers from Illinois, Wisconsin, and Iowa have reported, at an International Nursing Informatics Conference held in San Antonio, Texas (Grobe & Pluyter-Wenting, 1994), ongoing investigations of the nursing minimum data set. In addition to testing availability, these studies examined comparability of the NMDS.

A pilot study testing the utility of the NMDS framework for data collection using an existing automated data base was reported (Kraft & Lang, 1994).

Fifty-four diagnoses and 624 interventions were found in the nursing care plans for 65 episodes of care on a spinal cord injury nursing service unit. This study is a project in progress with further data analysis not reported.

Sheil and Wierenga (1994) reported on the results of a study that tested the effectiveness of the NMDS in establishing comparability across populations. They used secondary analysis of computerized service data to examine nursing diagnoses, interventions, and outcomes in relation to selected Diagnostic Related Groups: diabetes as primary diagnosis, diabetes as secondary diagnosis, and normal delivery of a mother. Those patients with uncomplicated diabetes (n = 502) were reported to have fewer nursing diagnoses than did patients with complicated diabetes (n = 78). One limitation reported by the researchers was their need for more computer space than originally envisioned to organize, manipulate, and sort the data.

A progress report of the findings of seven studies that were conducted to examine the research value of the NMDS was provided by Delaney, Mehmert, Prophet, and

Crossley (1994). Employing a non-experimental ex-post facto design, seven data sets from computerized nursing care plans were analyzed; two data sets were manually retrieved (n = 200, n = 26) and five were electronically retrieved with sample sizes ranging from 211 to 4,248. One of the data sets contained 69,427 nursing diagnoses. NMDS availabilities ranged from 95.5 to 100% with the exception of the registered nurse provider element which is not available in the United States. Not only was availability measured but also the cost of data retrieval was reported. These costs ranged from $20.20 to $82.50 per patient record for manually retrieved records to $0.05 to $0.50 per patient record for those that were electronically retrieved. It is not clear from the report how these calculations were achieved. For instance, neither the type of personnel abstracting the records nor the abstraction times were described. In addition, the seven studies examined retrospective validation of defining characteristics for nursing diagnoses.

A descriptive study examining the use of the NMDS to characterize nursing clinical data was also described (Ryan, Coenen, Devine, Werley, Sutton, & Kelber, 1994). Data from a computerized nursing information system were used to determine frequencies of NMDS elements in relation to the five most frequently occurring primary medical diagnoses for medical and surgical patients. It was found that nursing diagnoses were similar within and across medical diagnostic categories with the selection of nursing interventions influenced by the related factors of the nursing diagnoses.

International Minimum Data Sets

Internationally, minimum data sets have been developed over the past decade. In the United Kingdom, the National Health Service, Department of Health and Social Security Steering Group (NHS/DHSS), chaired by Edith Korner, was formed in 1980 to examine data requirements related to hospital facilities, diagnostic services, paramedical services, community services, manpower, finance, and patient transport (Bryant, 1988). The NHS/DHSS Steering Group's minimum data set is facility centered and does not address nursing activities (Wheeller, 1991a; 1991b; 1991c).

Since 1985, researchers in Belgium have been testing a minimum data set of nursing activities (Sermenus, 1991; Vandewal & Vanden Boer, 1994). While the data set name and associated acronym are also termed Nursing Minimum Data Set and NMDS, the set is limited to nursing interventions and nursing intensity. The elements, nursing diagnosis and nursing outcome, are not included. Data collection of the Belgium nursing minimum data set has been legally mandated since 1988 for all general hospitals (Sermeus & Delesie, 1994).

Melbourne Conference

In 1991, at a Nursing Informatics Conference held in Melbourne, Australia, minimum data sets from Australia and the United States were presented. In Australia, a National Minimum Data Set has been implemented for institutional health services (Renwick, 1991). While the acronym for the Australian data set is NMDS, this set does not contain the nursing-related data elements found in the American nursing minimum data set which bears the same acronym, NMDS. At the conference, however, Turley (1991) described the development of a Community Nursing Minimum Data Set for Australia. This data set does contain elements related to nursing activities: (a) nursing problems, (b) nursing interventions, (c) nursing goals, (d) outcome of nursing care, (e) nursing resource utilization, and (f) primary nurse identifier. Since 1991, the Australian National Minimum Data Set for Community Nursing has advanced to the pilot stage of development (Foster & Conrick, 1994; Gliddon & Weaver, 1994).

From the United States, Werley and Leske (1991b) presented the NMDS work done in Wisconsin at the Australian conference. A retrospective analysis of a computerized data base from a free-standing, ambulatory clinic in Kentucky was also presented (Grier, Grier, Greiner, & Stanhope, 1991). It was reported that the majority of the NMDS elements were routinely collected by nurses and that a cost-savings could occur by reducing the collection of redundant and non-essential data.

Nursing Data Availability

Countless nursing hours are spent in gathering, assessing, recording, communicating, retrieving, and evaluating the data assembled throughout nurses' encounters with patients and their families. Unfortunately, in manual, paper-based health records, the majority of these data are recorded in an unstructured textual format that is neither easily retrievable nor amenable to computerized manipulation and analysis (Anderson-Stewart, 1988).

Prior to the inclusion of nursing-related data within an automated information system, two conditions are mandatory. To ensure the availability of the health record entries contributed by nurses, nursing-related data must first be summarized, abstracted and permanently retained. To meet the second condition, the essential requirements for automation must be upheld. That is, the content of free text documentation, such as nurses notes and nursing care plans, must first be classified into data elements, second, coded by element characteristics, and third, converted to the numeric symbols understood by automated systems (Gabrieli, 1991). In Canada, the HI:NC have been endorsed by the C.N.A. as a means of classifying key aspects of the nursing care provided by nurses into data elements (Alberta Association of Registered Nurses, 1990).

Currently, nursing-specific data elements are not incorporated into Canadian hospital discharge abstracts for entry into the H.M.R.I. database (Podolak, 1993). Several reasons for non-inclusion of nursing data within the abstracts have been suggested. First, nursing-specific data may not be permanently retained following patient discharge (O'Brien-Pallas & Giovannetti, 1993). Second, the data may not be found in a uniform location within the health record (P. Giovannetti, personal communication, November 25, 1993). Third, the data may not be in a format that is easily retrievable from the health record by medical records professionals (K.J. Hannah, personal communication, December 15, 1993). Fourth, a standardized nursing discharge abstract format does not exist in Canada (Mills, 1990). While the data may be presently unavailable, nurses have been informally invited to submit to the H.M.R.I. data elements that would structure the collection of nursing data. With an appropriate structure in place and data collection implemented, nursing-specific data would be visible for the first time in a national health data base (Podolak).

Several factors have influenced the need for increased visibility of nursing data within health care databases. Abdellah (1988) suggests that the conditions influencing NMDS development in the United States are (a) increased limitations on financial and personnel resources; (b) increased public concern about federal reporting and record keeping; and (c) the institution of Diagnostic Related Groups. In Canada, economic pressures such as reduced budgets for health care facilities have determined that information regarding nursing resource utilization is now critical (Alberta Association of Registered Nurses, 1992). Anderson and Hannah (1993; see also Besner, 1994; Hannah, 1993) have identified six influences on the movement toward collecting standardized nursing data in Canada: (a) the information revolution, (b) rising health care costs, (c) a trend towards patient specific costing, (d) Canadian health care reform, (e) a trend toward consumerism, and (f) nurses striving toward professionalism.

Canadian HI:NC Development

It is only within the last five years that dialogue on the nursing minimum data set concept has appeared in the Canadian nursing literature. At the C.N.A. Biennial Convention, held in 1990, resolutions were adopted which will lead to the establishment of a minimum nursing data set for Canada (Alberta Association of Registered Nurses, 1990). As a follow-up to the 1990 C.N.A. convention resolutions, a nursing minimum data set conference was held in Edmonton, Alberta in 1992 (Canadian Nurses Association, 1993). A provincial strategic plan was drafted in April, 1993 and an ad hoc committee was formed to guide the implementation of the plan (Anderson et al, 1994). Subsequently three workshops were held in June, 1993 in Edmonton (Duggleby, 1993a), in November, 1993 in Calgary (Reyes & Duggleby, 1994) and in Lethbridge in September, 1994 (Anderson et al, 1994) to explore the health information: nursing components concept in conjunction with Alberta's nurses. In October, 1994, a

"Think Tank" was held to examine existing nursing data classification systems with regard to gaps and similarities and to explore how the systems could be used to meet nurses' needs (Duggleby et al., 1995). In addition, the A.A.R.N. has commissioned a literature review of the research pertaining to client status, nursing interventions, and client outcomes (Anderson et al., 1995; Forbes, 1994).

The HI:NC is a Canadian term that is new but similar in meaning to the American NMDS. The HI:NC are conceptualized as "essential data elements defining nursing's contribution to the health of individuals and communities. HI:NC are a minimum set of items with uniform definitions and categories, which meet the needs for nursing information of multiple data users" (Duggleby, 1993b, p.8).

The nursing components under consideration by the A.A.R.N. consist of three categories (a) client elements, (b) nurse provider elements, and (c) nurse care related elements. The nurse care related elements consist of four sub-categories: (a) client status, (b) nursing interventions, (c) client outcomes, and (d) nursing intensity (Duggleby, 1993b). The nurse care related elements differ from the nursing care data elements of the NMDS in that (a) the term, client status, has been suggested as a substitution for the term, nursing diagnosis and (b) the term, client outcomes, has been substituted for the term nursing outcomes. The term, client status, expands the concept of nursing diagnosis to include the cultural situation that predicates the need for nursing services (Canadian Nurses Association, 1993). Twelve client related data elements, over and above those in the NMDS patient demographic data category, have been suggested by Canadian nurses for inclusion in the HI:NC data set (for a comparison between NMDS and HI:NC elements, see Appendix C, Table C1). Two of the NMDS patient demographic data elements, sex and date of birth, are excluded from the HI:NC. The HI:NC nurse provider category contains only two elements, unique nurse provider and principal nurse provider, in comparison to the seven elements found in the NMDS service element category. The degree of availability, comparability, and retrievability of the HI:NC elements has yet to be established (Anderson et al, 1994; Reyes & Duggleby, 1994). In addition, standardization of taxonomies for coding the data elements remains under-developed.

In summary, it appears that the important unresolved issues surrounding the HI:NC include (a) inclusion of particular data elements within the data set; (b) data element taxonomy development and testing; (c) taxonomy standardization; (d) data set availability, reliability, comparability, and retrievability; and (e) the need for the dissemination of the HI:NC concept. This study has examined only one of the identified unresolved issues. Establishing both the availability of the proposed data set within health records and the reliability of extracting the individual elements is a mandatory requirement for the development of HI:NC for Canadian hospitals.

Frame Of Reference

Development of the Theoretical Framework

Three of the minimum data set elements related to nursing care are nursing diagnosis, nursing intervention, and nursing outcome. These are sub-categories within the nursing process framework

(Werley, Devine, & Zorn, 1988; Yura & Walsh, 1978). The nursing process is a means of applying the scientific method to clinical nursing practice (Werley & Grier, 1981). While Orlando (1961) originally proposed a three step model involving the interactions of the patient's behavior, the nurse's reaction, and nursing actions, other steps have since been proposed. One of the first textbooks on nursing process used a four step model: (a) assessment, (b) planning, (c) implementation, and (d) evaluation (Yura & Walsh, 1967). Subsequent authors propose a five step process involving data collection, data analysis (or diagnosis), intervention planning, intervention implementation, and intervention (or outcome) evaluation (Brown, 1981; Hildebrand, 1978; Mitchell, 1984; Pinnell & de Meneses, 1986; Putzier & Padrick, 1984).

Henderson (1982, 1987) has questioned the applicability of the nursing process to clinical nursing practice. Areas of concern for Henderson include the role of (a) nurses' intuition, (b) interdisciplinary collaboration, (c) nurses' experience, (d) documentation of care, and (e) patients and family participation within the concept of the nursing process. In addition, the extent of the use of the nursing process sub-categories, such as nursing diagnosis, in clinical nursing practice is unknown (Werley, 1987).

The nursing process, however, has been established in Canada as a standard for patient care delivery for nurses. The A.A.R.N. (1980, 1991), for example, has established practice standards for Alberta nurses that advocate the use of nursing diagnosis, nursing interventions, and patient outcomes. The Canadian Council on Health Facilities Accreditation (C.C.H.F.A) (1990) has also established standards for the provision of patient care by nursing services. Two standards directly related to the institution of the HI:NC favor the use of nursing diagnoses, nursing interventions, and patient outcomes. Canadian hospitals, however, have not adopted a standardized system for the documentation of these three elements.

Summary

The results of a literature review for the period 1976 to 1995 have summarized in this chapter. Literary works pertaining to minimum data sets, nursing data availability, and Canadian HI:NC development were described. Minimum data sets for nursing have been prescribed in a number of countries. Almost all of these data sets have been termed, Nursing Minimum Data Sets, even though this term was first used in the United States to describe a nursing data set specific to that country. In Canada, a nursing minimum data set known as the Health Information: Nursing Components was introduced five years ago.

Most of the reviewed literature was prescriptive in nature. Recently in the United States, fourteen research studies concerning the availability of the NMDS were reported. Several of these studies were part of ongoing research projects and many of the results were preliminary. The clinical nursing data for the majority of the aforementioned studies were drawn from pre-existing computerized databases. The present study is the first to test the availability of the HI:NC in Canada.

One of the fundamental precepts of the nursing minimum data set concept is that it describes the nursing process. This precept forms the theoretical basis for the work that is reported in this thesis. There is some controversy as to how useful the various definitions of the nursing process are in describing the work that nurses do.

CHAPTER 3

Methods and Procedures

Methods

In this study the availability and the intra-rater reliability of abstracted HI:NC data elements within the acute care health records of one Alberta hospital were examined. The most appropriate method to answer these questions was determined to be a descriptive research design (Brink & Wood, 1989).

Setting

The St. Therese General Hospital located in St. Paul, Alberta was the setting for this study. This hospital is classified as a small, acute care facility with a bed capacity of 87 (Canadian Hospital Association, 1992). It has approximately 200 inpatient admissions and discharges per month (B. Hall-Petrie, personal communication, April 14, 1994). Five nursing units are located within this hospital: (a) acute care, (b) psychiatry, (c) long-term care, (d) alternate level of care, and (e) ambulatory care. Health records are retained for 10 years in their original paper-based format. In addition, the hospital uses an automated admitting, transfer, and discharge (ATD) system which runs on an International Business Machines' (IBM) AS/400 computer. With this ATD system, all of the hospital's health records are automatically assigned sequential record numbers with a visit number also assigned for each patient's encounter at the facility.

Registered nurses employed at this hospital have used the North American Nursing Diagnosis Association's classification system for recording nursing diagnosis since 1992. Also in place since 1983 is the Nursing Information System (NIS), a non-automated method of charting which was first developed in Saskatchewan (B. Hall-Petrie, personal communication, February 25, 1994). This form of charting was instituted on a pilot basis on the acute care unit (B. Hall-Petrie, personal communication, May 15, 1994) which has supplied the health records used in this study.

Sample Selection

Of the population of 2,449 health record numbers, for those subjects admitted to the hospital between April 1, 1992 and December 31, 1993, a sample of 400 acute care heath records was chosen. This was accomplished by using a random number table generated by the software package, SPSS-X Version 6.0. Data from the 400 health record sample were abstracted for analysis.

A random sample of 400 health records was taken as representing the population of records for the study time period. This sample size was calculated by using the standard error formula contained in Steel and Torrie (1976). It was required that there was a ninety five percent assurance that the proportion of times the HI:NC variables were recorded, for the sample, was within five percent of the proportion of times the HI:NC variables were recorded, for the whole population of records for 1992 to 1993. Therefore, even though data collection could not cover all of the health records from 1992 to 1993, the random sample was a very good representation of the total population. Statistical independence for each of the HI:NC variables was assumed.

Twenty-five records, chosen randomly from the last 375 abstracted records, were re-abstracted and re-entered by the principal investigator to measure intra-rater reliability. A sample size of 25 was determined to be sufficient to test whether there was intra-rater reliability through the calculation of sample correlation coefficients for each of the HI:NC elements. (Wetherill, 1981).

Instruments

A HI:NC data collection instrument, adapted by the investigator for Canadian hospitals from the U.S. NMDS data collection instrument, was used for this study. Permission to use the NMDS data collection instrument was obtained (H.H. Werley, personal communication, April 30, 1993). The HI:NC data collection instrument stipulates data elements over and above those proposed by Devine and Werley (1988). In order to enhance the comparison of data between this present study and that of previous American studies, the NMDS data elements not included in the HI:NC were added to the HI:NC data collection instrument (for data collection instrument definitions see Appendix E).

This was a retrospective health record review. Following abstraction, all data were entered into an automated, custom-designed, pre-coded, relational data base. The U.S. Nursing Minimum Data Set Data Collection Instrument (Werley, Devine, & Zorn, 1992) was modified both for a Canadian hospital setting and for automated data entry. This modified instrument consists of an automated data base application, constructed using the relational data base Microsoft Access Version 2.0. This product is available for use on IBM-compatible personal computers running under the Microsoft Windows Version 3.1 operating system environment (Prague & Irwin, 1993).

The data collection data base application consists of both a relational data base design and a series of screens for entering, viewing, reporting, and exporting data. The application was designed to, wherever possible, mirror the paper forms used in The Nursing Minimum Data Set (NMDS) Data Collection Manual (Werley, Devine, & Zorn, 1992). The data entry fields were keyed to the data elements under review; the data entry choices were pre-coded for data entry and analysis. The computer entry screens were grouped according to: (a) patient demographics; (b) basic episode information; (c) nursing diagnosis, interventions, and intensity; and (d) functional and lifestyle data. The data collection instrument and data base design specifications are contained in an 835 page document.

To take advantage of a relational data base structure as well as to improve the partitioning of the data presentation, four design features were stipulated for the data entry process. Specifically, the application first enables one to enter or to inquire on patient demographic data. Second, one chooses to enter data specific to an encounter, termed basic encounter information. Third, there are a series of data elements such as medical diagnoses, returned home dispositions, nursing diagnoses, and nursing interventions which allow multiple data entries. The multiple data elements are all entered on separate screens accessed from the basic encounter information screen. Nursing interventions are accessed from the nursing diagnoses screen due to the assumption that all nursing interventions will potentially be linked to an appropriate nursing diagnosis. One nursing diagnosis may have many nursing interventions associated with it.

Fourth, a series of reference data screens are provided for standardized coding purposes. Wherever possible, data entry is coded. Data items are then chosen by "clicking" on a coded data entry in a "pop-up" window.

A data collection log was completed for the HI:NC data elements. The data collection log recorded (a) the health record page(s) from which the data were abstracted, (b) a memo recording data as entered on the health record for each page, and (c) whether there was agreement between the different pages as to the data within the memo field.

Procedures

Data Collection Procedure

Prior to the collection of data, approval was obtained from the ethical review committee of the Faculty of Nursing at the University of Alberta. Members of the St. Therese General Hospital board also provided their approval for data collection and analysis. The rights of the subjects were protected in several ways throughout all stages of this study. The hospital representatives were informed that the raw data will potentially be made available for both secondary analysis by authorized nursing researchers and for educational purposes by the principal investigator. They were also informed that the raw data will be destroyed after a period of seven years in the event that secondary analysis does not occur.

There was no contact between the researcher and the individual subjects and/or their health care providers. The raw data, a master list of all chart identifiers, and the sample code list were stored on the researcher's personal computer and secured with a security password. To protect the anonymity of the subjects, no subject names were recorded in the data base. An additional measure to protect the subjects' anonymity will be to refrain from publishing any information that could, potentially, identify individuals (Brink & Wood, 1988).

All data abstraction occurred in the health records department of the St. Therese Hospital. The data were directly recorded into the previously described data base.

Some data were coded from textual recordings. Significantly, nursing diagnoses were recorded as statements on a health record form entitled, "Individual Care Plan" under the heading, "Nursing Diagnosis". The statements were divided into three categories and abstracted as: (a) doctors' orders statements, (b) non-NANDA statements, and (c) NANDA nursing diagnoses. To classify the diagnoses statements as NANDA in character for data abstraction, it was required that the wording contained within the statements conformed to that of the approved NANDA taxonomy that was described in the Nursing Diagnosis Reference Manual (Sparks & Taylor, 1991). This manual was used in the study hospital both for the staff's nursing diagnosis educational sessions and as a reference document on the acute care nursing unit. The doctors' orders statements did not appear to be transformed into comparable nursing diagnoses in the health records.

Nursing interventions were associated with all three categories of diagnosis statements on the Individual Care Plan. The interventions were abstracted from statements made on the Individual Care Plan under the heading, "Nursing Action". Nursing action statements were classified according to both the 7 code scheme and the 16 code scheme that were provided by Devine and Werley (1988).

For this study, client outcomes were measured by the abstraction of documentation for the resolution of diagnosis statements. Resolutions of the diagnosis statements were recorded at the study hospital as either a procedural "sign-off" on the Individual Care Plan or as a continuation note on a health record form entitled "Discharge Care Plan".

Following abstraction of the first 100 health records, the first 25 records were re-abstracted and re-entered into a duplicate data base. Intra-rater reliability was examined. This process was completed to confirm consistency in data collection and coding methodologies. For the purpose of eliminating early learning problems, the initial abstraction of the first 25 records was treated as a pilot study and not included in the final analysis. Availability of the HI:NC data elements was checked after the abstraction of each incremental set of 25 health records. This was done to establish the degree of variability of the statistical sequences. After all 400 health records were abstracted and coded, a random sample of 25 records, taken from the last 375 health records, was re-abstracted to test intra-rater reliability.

It is not surprising that given the number of variables contained within the data collection instrument, an average of 38.6 minutes per record was required for data collection. A moving average of data collection time per health record, based on 25 record increments, showed no net change in data collection time over the study period. Data collection per record ranged from 9 minutes to 2 hours in length. This translates to a total of 255.5 hours required to collect data from 400 records. Assuming an average cost for data collection personnel of $18.00 per hour one can extrapolate to an approximate cost of $11.50 per health record for manual retrieval. This cost does not include any allowance for preparation times nor for the time spent in re-abstraction for the purpose of testing intra-rater reliability.

Data Analysis

Statistical data analysis of the demographic and descriptive variables was completed using the Windows and personal computer version of the statistical programming package, SPSS-X Version 6.0 as well as the personal computer spreadsheet package, Microsoft Excel Version 5.0. These packages contain support for graphical representation of the statistical results.

The strategy for data analysis was to determine availability as well as intra-rater reliability. Availability was tested by calculating the frequency, as a percentage of the total data elements, for the available data elements. Reliability is conceptualized as the degree of consistency and repeatability of the measurement of the data entered on the data collection instrument (Mishel, 1989). Intra-rater reliability was measured using percent agreement, Cohen's Kappa Coefficient, and Pearson's Product Moment Correlation calculations.

Percent agreement (Po) is the proportion of objects or persons consistently classified on both test and retest measurement occasions (Waltz, Strickland, &

Lenz, 1991). Cohen's Kappa Coefficient (K) is the proportion of objects or persons consistently classified in the same category on both test and retest measurement occasions beyond the amount that is expected from the marginal distributions (Fleiss, 1973; Waltz, Strickland, & Lenz). Therefore, Kappa, also referred to as Cohen's K, is percent agreement corrected for chance. Correlation is a means of measuring the direction and the degree of the relationship that exists between the variables; correlation coefficients express the magnitude and direction of the correlation (Pagano, 1981). Pearson's Product Moment Correlation Coefficient (r_{xy}) is a quantitative measure of the linear relationship between two sets of measurements (Waltz, Strickland, & Lenz).

Identification of Limitations

1. Study findings were limited to the hospital acute care health record sample under review.
2. To verify reliability, intra-rater reliability tests were conducted.
3. The data elements' operational definitions may not be generic to Alberta acute care hospitals or to Canadian acute care hospitals as a whole.

Summary

The setting for this study was the St. Therese hospital in St. Paul, Alberta. This facility is an accredited acute care hospital with 87 inpatient beds, managing approximately 200 inpatient admissions per month. A sample of 400 randomly selected health records were abstracted from a population of 2,449 health records that were recorded for acute care inpatient admissions between April 1, 1992 and December 31, 1993. The sample size of 400 was chosen from a standard error calculation using five percent significance levels. The nurses have used the NANDA classification scheme on the acute care unit.

A custom designed data base application was written, by the investigator, using the NMDS data collection manual by Werley and associates as a guide and the Microsoft Access Version 2.0 relational data base system as a tool. Because of the volume of data that was collected, each health record required on average 38.6 minutes for abstraction. Total data collection time was 255.5 hours. Data analysis was carried out by using the data base for queries and packages such as SPSS-X Version 6.0 for Windows and Microsoft Excel Version 5.0 for the statistical analysis and the plotting of graphs.

Subject anonymity was respected throughout the study. No subjects were approached by the researcher and no subject names were abstracted from the health records to the data base.

CHAPTER 4

FINDINGS AND CONCLUSIONS

In this chapter the findings that have resulted from the study will be described. The results were obtained by using a large number of Microsoft Excel spreadsheets and the SPSS-X statistical package to analyze the data contained in the customized Microsoft Access data base. The analysis will generally follow the approach of Tillman (1990) and Devine and Werley (1988).

Sample Characteristics

Four hundred records were randomly selected from a population of 2,449 health records. The sample was drawn from all subjects admitted to the acute care unit between April 1, 1992 and December 31, 1993. The characteristics of this sample are illustrated in Figures 1 through 3. On their admission date to hospital, the subjects ranged in age from 14 to 96 years old with a mean age of 43.5 years (n = 398). The vast majority of subjects were female (72.0%). Ninetyeight percent of the subjects were residents of the province of Alberta at the time of their admission.

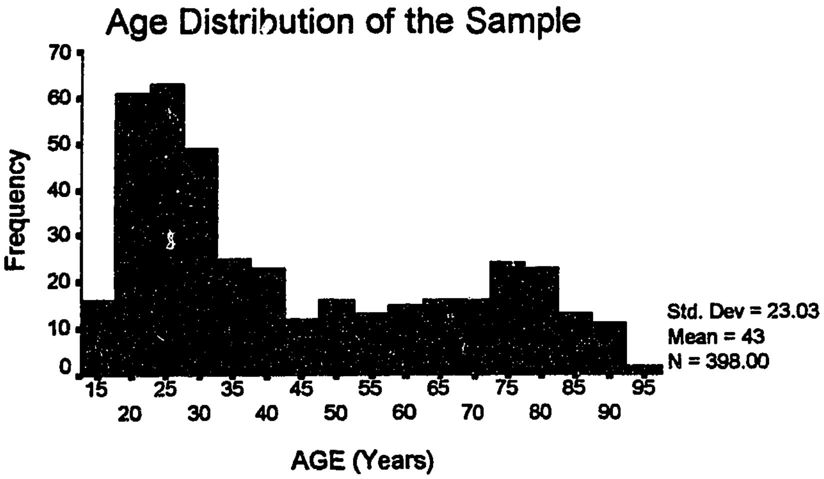


Figure 1. Age distribution for the sample

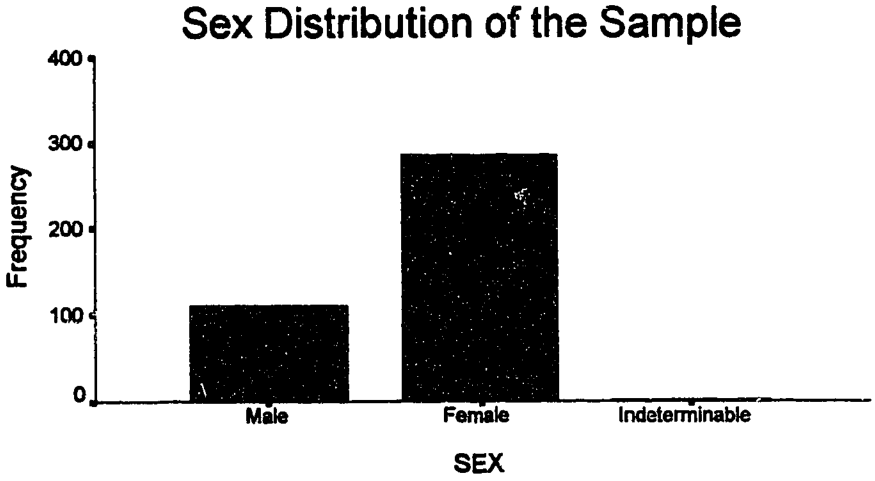
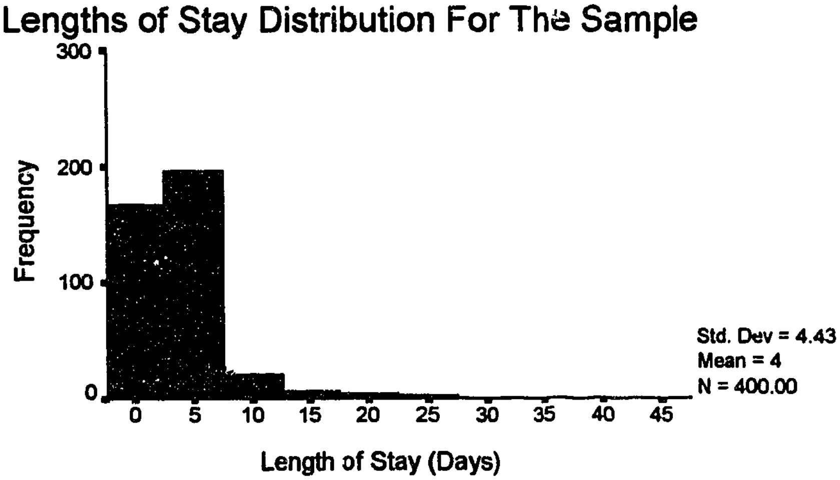


Figure 2. Sex distribution for the sample

The lengths of stay within hospital for these subjects ranged from less than 24 hours to 44 days with an average length of stay of 3.9 days. The mean length of stay for subjects whose Individual Care Plans contained <u>only</u> the diagnostic statement termed, "doctors' orders", was 1.28 days (n = 25).



<u>Figure 3.</u> Lengths of stay distribution for the sample

Short-term stay records, for this study, are defined as records concerning those subjects with a length of stay that is less than or equal to 2 days.

Short-term stay records constituted 41.75% of all of the sample records. Thus, a high proportion of short-term stay records appeared to be a significant characteristic of the acute care population within the study hospital.

Sample Characteristics: Nursing Diagnoses

For the sample as a whole, there were 2,095 statements under the heading, nursing diagnoses, abstracted from the Individual Care Plans. There was an average of 5.2 diagnosis statements abstracted per health record. Of the total number of statements recorded under the heading, nursing diagnosis, 56.7% were recorded according to the NANDA classification system. A high proportion (43.3%) of the diagnosis statements were recorded either as "doctors' orders" or as other non-NANDA statements. (See Appendix E, Table E1 for the ten most frequently used diagnostic statements that could not be classified according to the NANDA taxonomy).

For those subjects with lengths of stay less than or equal to 2 days there were 676 nursing diagnoses recorded in the health records. Of these nursing diagnoses, only 46.2% were according to the NANDA classification scheme (n = 312). Fifty-four percent of the diagnostic statements were either doctors' orders or non-NANDA statements. Further, the percentage of short-term stay records in which either the nursing diagnosis was missing or in which the two statement categories of doctors' orders and non-NANDA diagnoses were equal to or more prevalent than NANDA nursing diagnoses was 68.3%. Therefore, for short-term stay subjects, a significant proportion of nursing diagnoses were non-NANDA in character. The pattern was generally evident for all subjects but more so for short-term stay subjects. This pattern could suggest that, in acute care cases, nursing diagnosis classification schemes, such as NANDA, may have to be augmented in order to reflect interdependent nursing practice. Sheil and Wierenga (1994) found that uncomplicated medical diagnoses were associated with fewer nursing diagnoses than for those with complicated medical diagnoses. In view of this research, it could also be suggested that the short-term stay subjects may have had less complicated medical diagnoses and thus fewer nursing diagnoses were recorded for their episode of care.

Sample Characteristics: Nursing Interventions

Two coding schemes were provided by Devine and Werley (1988) for the recording of nursing interventions (see Appendix F, Tables F1 and F2 for nursing intervention coding schemes). Using the 7 code scheme, there were 2,498 interventions recorded in the sample health records. Using the 16 code scheme, there were 2,607 interventions recorded. An average of 6.25 and 6.52 interventions per health record, respectively, were recorded for the 7 and 16 coding schemes. For each nursing diagnosis, there was an average of 1.19 and 1.24 interventions recorded, respectively, for the 7 and 16 coding schemes. For those health records with only the diagnostic statement, doctors' orders, recorded under the heading, nursing diagnosis, there was an average of 2.5 interventions documented. Thus, there appeared to be twice as many nursing interventions recorded for the diagnostic statement, doctors' orders, in comparison to the number of interventions recorded for the NANDA nursing diagnoses.

Sample Characteristics: Client Outcomes

Of the total aggregate of statements that were recorded under the heading, nursing diagnoses, 23% (n = 511) were recorded on the Discharge Care Plan as persisting following the subjects' discharge from the hospital. The remaining 1,736 statements did not have a "sign-off" on the Individual Care Plans nor were they referred to on the Discharge Care Plan. Further, the recording of client outcomes occurred much more frequently for the diagnostic statement, doctors' orders, than for other nursing diagnoses.

Sample Characteristics: Medical Diagnoses

The number of medical diagnoses for each subject ranged from 1 to 14; the median was 2 medical diagnoses per subject. The six most frequently occurring "most responsible" medical diagnoses in descending order of occurrence were (a) vaginal delivery with perineal tears; (b) abdominal symptoms, (c) normal delivery; (d) congestive heart failure; (e) sterilization; and (f) asthma.

Sample Characteristics: Lifestyle Factors and Functional Health Status

A nursing history of the subjects' lifestyle habits was taken at the time of their admission to hospital. The nursing history addressed the following areas: (a) smoking habits; (b) alcohol consumption; (c) sleeping problems; (d) family support; (e) concerns with personal, home, or work arrangements impacting upon the subjects' hospitalization; and (f) diversional activities. Thirty-nine percent of the subjects (n = 156) reported smoking cigarettes. Those subjects who reported some degree of alcohol consumption consisted of 26% of the sample (n = 105). Upon admission to hospital, 43% of the sample (n = 172) reported having some difficulty sleeping at night. Ninety percent of the sample (n = 358) reported having family and friends available for support at the time of admission. The percentage of the sample who had concerns about their personal, home, and/or work arrangements during the hospital admission was 9% (n = 37). Fifty-five percent (n = 219) of the sample reported enjoying diversional activities such as watching television and/or reading.

An assessment of the subjects' ability to function in terms of self-care, personal hygiene devices, nutrition, elimination and voiding difficulties, physical disabilities, and mobility devices was also completed as part of the nursing admission history. Of the 400 subjects, 17.5% (n = 70) reported having some degree of difficulty caring for themselves prior to admission. Personal hygiene devices, such as glasses and dentures, were used by 63.5% (n = 254) of the subjects. For nutritional concerns, the use of specific diets was reported by 18.3% (n = 73) of the sample and 28% (n = 112) reported that particular foods disagreed with them. Concerns with bowel and bladder functioning were reported by 28.5% (n = 114) for bowel-related difficulties and by 18.3% (n = 73) for urinary problems. Physical disabilities were reported by 13% (n = 52) of the sample and the use of mobility devices such as a cane and/or a wheelchair were reported by 11.5% (n = 46).

Operational Definitions

The operational definitions of the individual data elements of the HI:NC are catalogued in Appendix D. Also shown in Appendix D is the source within the acute care health records of the particular data elements.

This was the first examination of how the availabilities for the HI:NC elements would appear if they were adopted as set out in the original A.A.R.N. proposal. It must be noted that, prior to this present study, only some of the HI:NC data elements were assigned operational definitions. The progress in operationally defining the data elements appears to be related to the extent of their availability and retrievability from health records. Recent articles pertaining to the HI:NC have all focused on the nurse care related elements category (Anderson et al, 1994). The remaining elements, service and client demographics, have received little attention since the C.N.A. NMDS conference held in 1992.

Although client status has been stated as including the situation that predicates the need for nursing services (Canadian Nurses Association, 1993), this extended concept was not operationally defined prior to this study. Indeed for this study, the term, nursing diagnosis, and the operational definition provided by Devine and Werley (1988) were used in lieu of operationally defining client status. Nurses at the study hospital chose the NANDA classification scheme as their preferred method for recording nursing diagnoses. No equivalent to the idea of an expanded client status concept was found in this setting. Nevertheless only half of all nursing diagnosis statements were recorded according to the NANDA scheme. The investigator found it necessary to augment the data collection instrument's nursing diagnosis code set, particularly for short-term acute medical cases and for surgical patients.

To examine the availability of nursing interventions both the 7 and 16 code sets, as provided by Devine and Werley (1988), were used. As with Tillman (1990) the major discovery was that the 16 code scheme contained a number of codes which were not mutually exclusive. For example, both the code 1, Monitoring and/or Surveillance, and the code 15, Maintaining Nutritional and Fluid Balance, could pertain to monitoring a patient who was restricted in fluid intake. Another difficulty was experienced when the nursing interventions associated with the diagnostic statements, termed doctors' orders and non-NANDA, were abstracted. It was difficult to map the textual entries for these nursing interventions to the 7 and 16 code schemes. It was decided not to augment the 7 and 16 codes since no readily available alternatives were apparent. This did not affect the availability of the nursing intervention data element. Instead, it will affect conclusions that could be drawn by cross referencing nursing intervention codes with other data elements such as nursing diagnosis or medical diagnosis.

The nursing outcome definition, as used in this study, had a number of problems associated with it. Unfortunately, the only method of ascertaining that a nursing diagnosis had been resolved was through a procedural "sign-off" on the Individual Care Plan or a notation on the Discharge Care Plan. As a result, there was not one instance of a diagnostic statement being recorded as having been resolved. This would indicate one of three possibilities: (a) the nursing diagnoses could not be resolved in the acute care setting, (b) the nursing outcome definition may be inadequate, or (c) the unacknowledged nursing diagnoses were resolved but remained unrecorded.

The patient acuities were recorded for many of the days of the subjects' hospitalization although not for all of the days. Definition of patient acuity, at the study hospital, is according to a 1 to 4 level scale. No attempt was made to determine if the scale was being used appropriately. The staff mix and standard hours of care were recorded on a staffing worksheet. While provision was made to record the daily acuity for each patient *bed number* on the staffing worksheets, no provision was made for linking this acuity back to a specific patient. It was not possible to verify the identity of the patient assigned to each bed number; names associated with discharges, admissions, and patient transfers did not appear to be updated on the worksheets. In addition, the nursing staff mix, on a per shift basis, was recorded for the entire nursing unit. Patient assignments for individual nursing staff members were not available. Therefore, even though an average workload for the nursing unit could be calculated patient-specific workload measurement was unavailable.

A number of difficulties were experienced with the definitions of the client demographic elements of the HI:NC. Data elements, such as unique geographical location which was mandated for collection as part of another data set, the H.M.R.I., are all available and well-defined. A large number of the client demographic data elements, however, do not as yet have well-defined classification schemes. For example, race and ethnicity were recorded by noting if the individual patient was a member of an Indian Treaty band. Occupation was defined by using the Statistics Canada definitions. It became apparent that the main reason for recording occupation was for the purpose of processing Workers' Compensation Board claims. At the same time, the Statistics Canada occupation codes were not found in the health record. Data items that were not well-defined such as, responsible caregiver upon discharge, burden on care provider, living arrangement, home environment, and work environment, were all abstracted by reading through the health record textual material and then attempting to infer a code. These data elements were very seldom available. Assessment of the patient's level of schooling appeared to be made solely for pediatric subjects and usually in response to factors that may have effected the subjects' hospitalization. While income level can be very well defined, this question and response were never found in the sample records possibly because of a concern for patient privacy. It could be suggested that it is unlikely that patients would see a direct correlation between acute care episodes and their income level.

The element, unique nurse identifier, was never recorded in the health record even though it has been suggested that provincial nursing registration numbers could be used. It was difficult to determine the data element, principal nurse provider. The study hospital uses a team approach in providing nursing care and did not specify a particular nurse as the principal provider of care for a specific patient. The nurses, in their documentation, used either signatures or initialing for self-identification. The initials were seldom uniquely identifiable.

The NMDS elements, date of birth, sex, facility number, health record number, admission and discharge dates, discharge disposition, discharge status, and expected payer are all well-defined as part of the H.M.R.I. data set for acute care hospitals. Consequently, these data elements are all highly available and easily retrievable.

Findings: Availability of HI:NC elements

The first research question addressed the extent of the availability of the HI:NC data elements within the health records. The sample of 400 health records was used to determine availability of each of the data elements. Prior to data collection, a minimum criterion for availability was determined as one discovery of individual elements within each record.

The availabilities for each of the HI:NC elements are provided in Table 1. These availabilities will be summarized under the three main categories of data elements that have been proposed by the C.N.A. and

A.A.R.N. In addition, the elements not contained in the HI:NC but included in the NMDS data set are summarized in Table 2. Availability is defined as the number of health records in which the specific data element was recorded. Availability does not take into account the actual value that was recorded for each data element. It is purely a measure of existence or non-existence of the data element.

Availability: Client Demographic elements

Availability of the client demographic elements varied from being never available to being 99.[illegible] available. The client elements that were available for the vast majority of the sample were the (a) unique geographical location; (b) Alberta Health Care Number; (c) language; (d) functional health status; and (e) lifestyle data. The client elements: (a) race and ethnicity; (b) occupation; (c) living arrangement; (d) home environment including physical structure; (e) responsible caregiver upon discharge; (f) burden on care provider; and (g) educational level all had low availabilities. The client elements that were never available in the sample health records were as follows:

(a) unique lifetime identifier; (b) literacy level; (c) work environment; and (d) income level. An overall criterion for availability of 80% or more was established prior to data analysis. According to this criterion, the only data elements, within the client demographic element category, that could be classified as available for this sample were the geographical location, Alberta Health Care Number, language, functional health status, and lifestyle elements.

Availability: Nurse Provider elements

Not surprisingly, the nurse provider elements, unique nurse identifier and principal nurse provider, were not available in the sample records. The study hospital used a team nursing approach to providing nursing care.

Availability: Nurse Care Related elements

Availability within the nurse care related group of elements ranged from 38 to 94.5 percent. Client status was available in 94.4% of the records (n = 378). If the diagnostic statement, doctors' orders, was excluded, then the percentage of client status occurrences dropped to 88.3% (n = 353).

Nursing interventions were available in 94.0% of the health records (n = 376). If the interventions linked with the diagnostic statement, doctors' orders, were excluded, then nursing interventions were available in 85.3% of the health records (n = 341).

Client outcomes were available in 73.3% of the health records (n = 293). If those client outcomes that were linked with the diagnostic statement, doctors orders', were excluded, then client outcomes were available in 38.3% of the health records (n = 153). There was not one instance of a diagnostic statement being reported as having been resolved.

Staff mix data were available for 456 calendar days or 71.3% of the days for the study period. Staff mix for the entire nursing unit was available for 75.3% of the health records (n = 301). Patient acuity data were available in 89.5% of the health records (n = 358).

Availability: NMDS elements

The NMDS client demographic and service data elements, which have not been incorporated into the HI:NC data set, were all available. Those elements which appeared in 100% of the health records were sex, unique facility or service agency number, unique client health record, and episode admission and discharge dates. Transfer disposition was available in 99.8%, date of birth in 99.5%, expected payer for the hospital bill in 99.0%, and discharge status in 97.5% of the health records.

Table 1

Availability of the HI:NC Data Elements

	Element	Frequency	Percent
	CLIENT ELEMENTS		
1.	Race/Ethnicity	117	29.3
2.	Unique Geographical Location (Postal Code)	398	99.5
3.	Unique Lifetime Identifier (Personal Health Number)	0	0.0
4.	Alberta Health Care Number	392	98.0
5.	Language	376	94.0
6.	Occupation	53	13.3
7.	Living Arrangement	32	8.0
8.	Home Environment Including Physical Structure	22	5.5
9.	Responsible Caregiver Upon Discharge	11	2.8
10.	Functional Health Status	397	99.3
11.	Burden On Care Provider	8	2.0

table continues

	Element	Frequency	Percent
12.	Educational Level	2	0.5
13.	Literacy Level	0	0.0
14.	Work Environment	0	0.0
15.	Lifestyle Data	396	99.0
16.	Income Level	0	0.0
	NURSE PROVIDER ELEMENTS		
17.	Unique Nurse Identifier	0	0.0
18.	Principal Nurse Provider	0	0.0
	NURSE CARE RELATED ELEMENTS		
19.	Nursing Diagnosis (With Dr.'s Orders)	378	94.5
20.	Nursing Diagnosis (Without Dr.'s Orders)	353	88.3
21.	Nursing Interventions (With Dr.'s Orders)	376	94.0
22	Nursing Interventions (Without Dr.'s Orders)	341	85.3

table continues

	Element	Frequency	Percent
23.	Client Outcomes (With Dr.'s Orders)	293	73.3
24.	Client Outcomes (Without Dr.'s Orders)	153	38.3
25.	Nursing Intensity (Staff Mix)	301	75.3
26.	Nursing Intensity (Acuities)	358	89.5

Table 2

Availability of the NMDS Data Elements

	Element	Frequency	Percent
	CLIENT DEMOGRAPHIC ELEMENTS		
27.	Sex	400	100.0
28.	Date of Birth	398	99.5
	SERVICE ELEMENTS		
29.	Unique Facility or Service Agency Number	400	100.0
30.	Unique Health Record Number of Client	400	100.0
31.	Episode Admission or Encounter Date	400	100.0
32.	Discharge or Termination Date	400	100.0
33.	Disposition of Patient or Client (Transfer Disposition)	399	99.8
34.	Discharge Status	390	97.5
35.	Expected Payer for Most of this Bill (Anticipated Financial Guarantor for Services)	396	99.0

Discussion

There are several factors that lead to some data elements being more routinely available than others. First, the collection of some data elements has been mandated by external bodies. In acute care hospitals, in Alberta, any data element that is part of the H.M.R.I. data set will be highly available. These data elements have been mandated for collection by the Alberta government for overall health planning purposes.

With regard to the HI:NC and NMDS data elements one would presume that unique geographical location (postal code), individual identifier (Alberta health care number), sex, date of birth, facility number, health record number, admission and discharge dates, disposition on discharge, and discharge status would all have very high availabilities. This is the case because these data elements are all part of the H.M.R.I. data set that is sent to the C.I.H.I..

Second, there are data elements which are required by a third party for funding purposes or by the facility, itself, for organizational budgeting purposes. These data elements would be expected to have high availabilities. For the HI:NC and NMDS data sets the data elements, expected payer, occupation, and race all affect funding. The data element, expected payer, was required to bill out of province patients, occupation was required for Workers' Compensation Board cases, and race (and ethnicity) was determined by the Indian Treaty band member number field to identify those patients for whom the federal government had direct funding responsibilities. In Canada, specific health care items for designated Indian Treaty band members were the responsibility of the federal government. For the study hospital the nursing intensity data elements, staff mix and patient acuity, were used to determine retrospective staffing levels for budgeting purposes. It is interesting to note that even though the patient acuity data element was found to be available for a high proportion of the sample health records, the data element was seldom recorded for every day of a patient's stay in hospital. For example, it appeared that the dates of admission and dates of discharge were two instances when these data were more likely to be unavailable.

Third, there are the data elements that are intrinsic to the care process, itself. Nurses have traditionally been responsible for few of the data elements that are permanently retained in the health record. For example, the kardex system on which nursing care plans have been documented are seldom retained after the patient has been discharged from hospital. Fortunately, for the present work, the nursing administration in the study hospital introduced both the NANDA classification system and the NIS recording system for nursing diagnoses documentation and trained their nurses in their use. Therefore, the availabilities of nursing diagnoses and nursing interventions were uniformly high for the study sample. Also it is possible that, the element, language, was available for 94.0% of the sample health records because the community is a mixed English and French community. It appeared that the language data element was available in a high proportion of the cases in order for interpretive services to be available if required.

Even though data elements related to the nursing care process were generally highly available, for this hospital, there were some unexpected patterns which were noted. For short-term stay patients, a significant proportion of nursing diagnoses were non-NANDA in character. Further, nursing interventions were recorded twice as frequently for the two diagnostic statements, doctors' orders and non-NANDA nursing diagnoses, as for the NANDA nursing diagnoses. Finally, even though outcomes were only reported in the negative sense, that is, as not resolved, the recording occurred much more frequently for the diagnostic statements termed doctors' orders than for other nursing diagnoses. It could be suggested that nurses documented responses to doctors' orders in a different manner to their documentation of NANDA nursing diagnoses. For this study, it appeared to be particularly the case for short-term acute medical cases and for surgical patients. Therefore, it is suggested that the interdependence and independence of nursing diagnoses in acute care hospitals be a topic for future study. In the future, acute care hospital stays may experience a shortening of patients' lengths of stay, a reduction in nursing staffing levels, and the use of alternate personnel to Registered Nurse staff. Will it be the case that there will be less tendency to document independent nursing assessments, diagnoses, interventions, and outcomes in the future? Both the paucity of documentation of client outcomes and the use of the "not resolved" category, for the study hospital, raises the question of relevancy for this client outcome measure for acute care episodes. It is suggested that additional studies be undertaken to examine the link between client outcomes and nursing diagnoses.

Examination of the data elements that are relevant to the nursing care process emphasizes the need to extend nursing documentation through the entire spectrum of patient care. Many of the nursing diagnoses may not be capable of resolution within the time frame of an acute care hospital stay. Unless the person is referred to community health nursing services, either the nursing diagnoses are left to resolve themselves or the person, family, and significant others assume responsibility for them.

Fourth, the design and implementation of health record documentation itself appears to be related to the extent of the availability and retrievability of the data elements. In the case of the study hospital a number of the data elements were available because there was a pre-set field provided on a standardized health record form. In addition, if a well-organized format for the health record is adhered to, then it appears to be more likely that the data elements will be available in a recognizable form. At the study hospital a well-organized manual documentation system had been in place, for nursing documentation, for a number of years. In the case of some of the American studies automated nursing documentation systems were available. These automated systems again have pre-set fields with, it is assumed, well-defined coding systems for the individual data elements.

For the HI:NC and NMDS data elements, in the study hospital's records, it could be predicted that race and ethnicity (as measured by the field Indian Band Treaty identifier); unique geographical location (postal code); language; functional health status; lifestyle status; client status (as measured by nursing diagnosis); nursing intervention; patient acuity; unique personal identifier (as measured by Alberta health care number); date of birth; sex; health record number; admission and discharge dates; expected payer (as measured by provincial health care number); and disposition of patient would all have high availabilities by virtue of the existence of defined places on the health care record to document the data elements. This was the case with the exception of the patient acuity element. In the case of race and ethnicity, the use of the preset field was only designated for individuals with treaty band member numbers. Therefore the low overall availability does not necessarily negate a conclusion that there appears to be a link between pre-set fields and data element availability.

Sample Size: Variability of the data series

The sample size of 400 randomly selected health records was calculated according to a theoretical maximum number for standard error that was set prior to data collection at the 5% significance level. In order to determine the degree of variability within the data series, the availabilities of each of the HI:NC and NMDS elements have been plotted at intervals of 25 samples.

Variability: HI:NC elements

The variability of HI:NC elements, within the client demographic elements category, rapidly decreased with increasing sample size (for depiction of client element variability with increasing sample size see Appendix G, Figures G1 through G11). This would suggest that the sample size has been chosen conservatively.

With the exception of the language data element, variation in availability for the client elements, from sample number 200 forward, consisted of either a gradual approach to the final value at sample number 400 or small cyclical deviations from the final value.

For the language data element, there was substantial variation up to approximately sample number 275 (see Appendix G, Figure G11). After number 275, availability for the language data element followed the pattern shown for the other client demographic data elements.

Literacy level, work environment, and income level are not depicted as figures. These elements were never available and therefore the availability value is consistent at zero percent.

For the last two categories of data elements, similar patterns were seen. The two nurse provider data elements, unique nurse identifier and principal nurse provider, were never available. As with the literacy level, work environment, and income level elements, a graph showing variation of availability would reveal a straight line at zero percent.

All of the nurse care related elements, with the exception of the acuity data element, exhibited variability patterns in availability similar to that found for the client demographic data element category (for depiction of nurse care related element variability with increasing sample size see Appendix H, Figures H1 through H4). Small variations, from the final availability value at sample number 400, occurred from approximately sample number 150 forward.

The acuity data element showed significant variation even at sample number 400 (see Appendix H, Figure H4). In terms of whether the acuity element was deemed to be available or not, that is, present in 80% or more of the health records, the variability is not of concern. In all of the segments, availability of the acuity element exceeded 80%.

Variability: NMDS elements

In general, the variation in availability for the NMDS elements followed the same pattern as that of the HI:NC elements (for depiction of NMDS element variability with increasing sample size see Appendix I, Figures I1 through I5). The NMDS client demographic data elements showed little variation in availability. The Alberta Health Care number and date of birth elements (see Appendix I, Figures I1 and I2) showed the greatest variation although in these sets the availability value, from sample number 175 forward, was very close to the final value at number 400. The sex data element was always available and thus no variability figure is included.

Of the service data elements, only disposition of the patient and expected payer showed variation in availability. Disposition of the patient is characterized by two data elements, discharge status and transferred disposition. The availability of disposition of patient data shows convergence to the final availability value in the case of discharge status and little variation from sample number 75 forward in the case of the transferred disposition element (see Appendix I, Figures I3 and I4). The expected payer data element, likewise, shows convergence to the final availability value from sample number 150 forward (see Appendix I, Figure I5). All other service elements, with the exception of the NMDS unique number of the principal registered nurse provider, were always recorded; none of these elements is depicted.

Findings: Intrarater Reliability of HI:NC elements

The second research question sought to determine the intra-rater reliability of the HI:NC data elements within the health records. A sample of 25 health records were re-abstracted to determine reliability.

The intra-rater reliability of the HI:NC and NMDS data elements are primarily measured by the percentage agreement between each of the 25 sample data sets. To correct for chance agreement Cohen's Kappa coefficient was calculated where applicable. Also, Pearson's correlation coefficient was calculated to determine if there were underlying patterns which would not be evident from the percentage agreement numbers. The calculation of Cohen's Kappa and Pearson's correlation coefficient follows the approach of Tillman (1990) and Werley and Devine (1988). The results are shown in Tables 3 and 4.

The percentage agreements obtained for the client elements and nurse provider elements, of the HI:NC data set, were uniformly high with the exception of the occupation data element. Percentage agreements ranged from 99.3% to 100%. Percentage agreement for the occupation data element was 88%.

The percentage agreement for the occupation data element may have been less than those for the other client elements due to two factors. First, the occupation data were found in a variety of locations throughout the health records. Second, occupation data were usually contained within free-text narratives such as medical histories.

For the nurse care related elements, percentage agreements for nursing diagnosis was in a satisfactory range of 94.7% to 96.2%. For nursing interventions, percentage agreement ranged from 76.8% to 87.0%. Reliability for nursing interventions was calculated for two situations; for all occurrences of nursing interventions and for nursing interventions excluding those linked with the diagnostic statement, doctors' orders. Reliability of nursing intervention recording, when the 7 scheme code was used, followed the same pattern whether the diagnostic statement, doctors' orders, was included or not. The percentage agreement for the 16 code scheme for all nursing interventions was 87% and the percentage agreement where there was exclusion of those interventions linked with the diagnostic statement, doctors' orders, was 79.9%. This difference is significant. The 16 code scheme for nursing interventions contained codes which were not mutually exclusive. It was therefore more likely that a different code would be chosen with repeated abstractions. Finally, client outcomes agreed approximately 84% of the time between the two samples.

What is surprising is the low rate of agreement between the values recorded for the two samples for the nursing intensity data elements. In the case of these data elements there were two sources of data. One source of data consisted of patient acuity data that were recorded in the health record itself. The other source consisted of worksheets which were used to determine nursing unit staffing levels. It was the latter source which showed the least reliability when data were abstracted. The percentage agreement for patient acuities abstracted from the health record for the two 25 sample data sets was 95.3%. However, for the acuities abstracted from the worksheets, the percentage agreement for the two 25 sample data sets was only 43.0%. If both sources of data were grouped the agreement was 65.1% because of the weighting of the acuities abstracted from the worksheets. The format of the worksheets and the type of worksheet form itself, that is loose sheets, contributed to poor consistency in data abstraction. The worksheets were designed for the purpose of departmental budgeting and the determination of nursing unit staffing levels.

There was perfect agreement between the two 25 sample data sets for those NMDS data elements that are not included in the HI:NC data set.

Pearson's correlation coefficient and Cohen's Kappa coefficient are also depicted in Tables 3 and 4. In general the reliability results for the client demographic and nurse care provider elements of the HI:NC are not unexpected. Neither functional health status nor lifestyle data were amenable to the calculation of coefficient statistics because they are composites of other sub-elements. For the calculation of Cohen's Kappa and Pearson's correlation coefficient an assumption of statistical independence of each of the sub-elements with one another would need to be made. Because of the form of documentation, that is tick charting with comments made on the same page, statistical independence could not be assumed.

The one client demographic data element for which there was some disagreement between the two samples was occupation. Cohen's Kappa for this data element could not be calculated since not all codes were present in both of the samples. That is, the number of rows was not equal to the number of columns in the resulting Kappa table. There was a low Pearson's coefficient and a relatively high percentage agreement. This suggested that there were only a few values which did not agree between the two samples and that these disagreements were far apart in terms of their code values.

No values were recorded for the nurse provider elements in either sample. Therefore, the coefficient statistics could not be calculated.

There was slightly greater variation in the reliability results for the nurse care related elements. Cohen's Kappa could not be calculated for the nursing diagnosis data element because of the large number of code values present in both of the samples. Also, there were not the same number of code values present in both the samples; again the number of rows did not equal the number of columns in the Kappa table. Pearson's correlation coefficient was not calculated because the NANDA code set was augmented with non-NANDA code values. No attempt could be made to preserve the groupings found in the NANDA code set. A calculation of Pearson's correlation coefficient, therefore, would result in a spurious number.

For the nursing intervention data element, there were relatively high values for percentage agreement and the Kappa coefficient and low values for the Pearson's correlation coefficient. This suggested that there was high agreement, between the two samples. The values which disagreed were relatively far apart in terms of their code values. The coefficients for the client outcome data element were interesting in that there were very low values for both the Kappa and Pearson's correlation coefficients. Examination of the samples showed that there were two code values recorded. The majority were coded as "not resolved".

There were only a few "missing" values present. The value of Kappa, therefore, indicated that the agreement between the two samples could be expected due to chance alone. Two factors led to a small Pearson's correlation coefficient in this instance. There were few "missing" values and the code values assigned to "missing" and "not resolved" were relatively far apart.

Only Pearson's correlation coefficient could be calculated for the patient acuity data element. The high Pearson's correlation coefficient value, for patient acuity data originating from the health record, emphasized the reliability of that source of data. Interestingly, the value for Pearson's correlation coefficient, for the patient acuity data originating from the worksheets, was not as small as expected. On examination of the data series it was discovered that there were some consistent disagreements between the two samples.

For those NMDS elements in Table 4, the values of the coefficient statistics were as expected. That is, the percentage agreements were all 100%.

It appears that percentage agreements may provide more meaningful information when examining intra-rater reliability. The use of the Kappa coefficient was useful in those situations where chance agreement was significant. Pearson's correlation coefficient, likewise, seemed to be most useful if there was a good chance that consistent disagreement was likely. For this study, neither of these conditions were apparent. Also, with the exception of the NANDA nursing diagnosis codes, the underlying code sets for the data elements were not designed using closely related groups of codes.

Table 3

Intra-rater Reliability of HI:NC Data Elements

	Element	Percent Agreement	Kappa Coefficient	Pearson's Correlation
	CLIENT ELEMENTS			
1.	Race/Ethnicity	100.0	1.00	1.00
2.	Unique Geographical Location (Postal Code)	100.0	1.00	1.00
3.	Unique Lifetime Identifier (Personal Health Number)	100.0	b	b
4.	Alberta Health Care Number	100.0	a	1.00
5.	Language	100.0	1.00	1.00
6.	Occupation	88.0	c	0.46
7.	Living Arrangement	100.0	1.00	1.00

table continues

	Element	Percent Agreement	Kappa Coefficient	Pearson's Correlation
8.	Home Environment Including Physical Structure	100.0	1.00	1.00
9.	Responsible Caregiver Upon Discharge	100.0	1.00	1.00
10.	Functional Health Status	99.3	a	a
11.	Burden On Care Provider	100.0	1.00	1.00
12.	Educational Level	100.0	1.00	1.00
13.	Literacy Level	100.0	b	b
14.	Work Environment	100.0	b	b
15.	Lifestyle Data	100.0	a	a
16.	Income Level	100.0	b	b

table continues

	Element	Percent Agreement	Kappa Coefficient	Pearson's Correlation
	NURSE PROVIDER ELEMENTS			
17.	Unique Nurse Identifier	100.0	b	b
18.	Principal Nurse Provider	100.0	b	b
	NURSE CARE RELATED ELEMENTS			
19.	Nursing Diagnosis (With Dr.'s Orders)	96.2	a	a
20.	Nursing Diagnosis (Without Dr.'s Orders)	94.7	a	a
21.	Nursing Interventions (with Doctors orders 7 scheme)	76.8	.71	.16

table continues

	Element	Percent Agreement	Kappa Coefficient	Pearson's Correlation
22.	Nursing Interventions (without Doctors orders 7 scheme)	79.4	.74	.21
23.	Nursing Interventions (with Doctors orders 16 scheme)	76.4	c	.45
25.	Nursing Interventions (without Doctors orders 16 scheme)	79.9	c	.46
26.	Client Outcomes (With Dr.'s Orders)	83.3	-.09	-.09
27.	Client Outcomes (Without Dr.'s Orders)	84.0	-.06	-.08

table continues

Element	Percent Agreement	Kappa Coefficient	Pearson's Correlation
28. Nursing Intensity (Staff Mix)	a	a	a
29. Nursing Intensity (Acuities - Grouped)	65.1	c	.60
30. Nursing Intensity (Acuities - health records)	95.3	c	.91
31. Nursing Intensity (Acuities - worksheets)	43.0	c	.39

[a] Not applicable

[b] Not available in any of the health care records

[c] Kappa cannot be computed because row values did not equal column values

Table 4

Intra-rater Reliability of NMDS Data Elements

	Element	Percent Agreement	Kappa Coefficient	Pearson's Correlation
	CLIENT DEMOGRAPHIC ELEMENTS			
32.	Sex	100.0	1.00	a
33.	Date of Birth	100.0	a	1.00
	SERVICE ELEMENTS			
34.	Unique Facility or Service Agency Number	100.0	a	1.00
35.	Unique Health Record Number of Client	100.0	a	1.00
36.	Episode Admission or Encounter Date	100.0	a	1.00
37.	Discharge or Termination Date	100.0	a	1.00

table continues

Element	Percent Agreement	Kappa Coefficient	Pearson's Correlation
38. Disposition of Patient or Client (Transfer Disposition)	100.0	1.00	1.00
39. Discharge Status	100.0	1.00	1.00
40. Expected Payer for Most of this Bill (Anticipated Financial Guarantor for Services)	100.0	a	1.00

[a] Not applicable

[b] Not available in any of the health care records

Factors Affecting Data Element Abstraction Consistency

This study used intra-rater reliability percentage agreements to provide a measure of consistency for the data collection instrument. Generally, there was high percentage agreement between the two samples used to determine intra-rater reliability. The only exception was for patient acuity because of poor reliability of abstraction from the staffing worksheets.

The highly consistent data abstraction was due primarily to the well-organized state of the health records at the study hospital. The required data elements were almost always to be found in pre-determined places in the health record. There were separate consistency problems with patient acuity and with the nursing interventions data element. For the nursing interventions element there was some ambiguity in mapping the textual interventions, recorded in the health record, to the 7 and 16 code sets.

The health records at the study hospital were well-structured. Less secondary coding was therefore required than would have been the case if less structured health records were maintained.

Comparisons: Tillman and Werley and Devine Studies

There were a number of differences between the present study and those conducted by Tillman (1990) and Devine and Werley (1988). First, the just completed work was the first Canadian study to examine the availability of the HI:NC data elements. Second, the present study's results reflected Canadian institutional arrangements. That is, there were a number of data elements which were voluntarily collected on a routine basis, by Canadian hospitals, as part of a national database. In many provinces, this information collection was mandated by the central government health care funding agency. This information was widely available for use by acute care institutions in Canada.

The third difference was that the present study focused on the HI:NC, the Canadian equivalent to the American NMDS. While there were some elements that were shared by the two data sets, there were a number of differences as well. Thus, comparisons between the present study and the earlier American studies could not be conclusive.

The fourth difference between the previous American studies and this study was that progress towards operationally defining the NMDS data elements may have been more advanced than for that of the HI:NC elements. The NMDS data elements, with the exception of the nursing care and principal nurse provider elements, were drawn from the Uniform Hospital Discharge Data Set (UHDDS). The UHDDS data elements were operationally defined prior to the American NMDS studies. The HI:NC data set contained some of the same elements as appear in the NMDS and UHDDS. There were, however, a number of other data elements such as occupation and living arrangement, that were added at the 1992 CNA conference. The latter data elements were not operationally defined at that time.

The fifth difference between the present study and that of Tillman (1990) and Devine and Werley (1988) is that the present study involved the detailed collection of a significant sample of the acute care health records of the study hospital. As such the criterion for choosing sample size was somewhat more stringent than those of the two previous studies. The sample size was chosen by use of a standard error calculation with no assumptions made regarding population proportions. Also, data availability proportions were calculated after every group of 25 health records. These cumulative proportions were then plotted to determine the extent of convergence toward a single availability value. Rather than a single number for data availability being reported, it was possible to visualize the degree of variability of the data availability series.

With the above caveats noted the availability results of this study may be compared with the work of Tillman (1990) and Devine and Werley (1988) (for comparisons between the three studies see Appendix I, Table I1 and Appendix K, Table K1). The latter two studies were American studies and therefore only the NMDS elements could be compared. The comparisons were of interest but were inconclusive because of the differences in geographical and health care settings.

For the three studies, there was very little difference in the availabilities of the data elements, sex, date of birth, health record number, admission date, and postal codes. Similarly, there was concurrence between the results of the present study and that of Devine and Werley (1988) for the data elements, nursing diagnosis, nursing intervention, unique facility number, discharge date, patient disposition, and expected payer. There were differences, however, between the results of Tillman (1990) and Devine and Werley for the latter data elements.

The differences in the American studies could be explained by noting the variation in the nursing settings that were studied. Tillman studied the health records of a nursing center. It may be expected that the availability of the nursing diagnosis element would be very high in this setting. Further, the data elements, unique facility number and expected payer, were not applicable to the nursing center since it was not a Medicare funded facility. Patients were not discharged from the nursing center as they were all seen on an outpatient basis. Devine and Werley (1988) averaged their results over four nursing settings which included traditional inpatient facilities. All of the four facilities were funded by Medicare, therefore, the elements, unique facility, expected payer, discharge date, and patient disposition were highly available.

What is interesting, in comparing the results of the three studies, were the data elements that reflect different patient groups or data collection practices between the two countries. For example, the data element, race, was collected in a much higher proportion of the cases in the United States than in St. Paul, Alberta, Canada. For both this study and that of Tillman (1990) ethnicity was deemed to be equivalent to race. Devine and Werley (1988) did attempt to code ethnicity but the very low availability value may indicate that this data element's definition required further development.

Of the data elements related to unique patient identifier and patient discharge status, the effect of mandatory data collection requirements were evident. In Alberta, both the unique patient identifier and the patient discharge status were required for the H.M.R.I. acute care data set. The nursing center studied by Tillman (1990) was not required to keep this information. The low availability of the Social Insurance Number (SIN) element for the Devine and Werley (1988) study emphasized that they averaged their availability results across a number of care settings. Some of these settings used SIN numbers to index their health records while others did not.

The availability results for the data elements associated with nursing intensity reflected the fact that patient-specific staff mixes were available in the two American studies. This did not appear to be the case with the present study. Further, patient-specific acuities were also somewhat less available in the present study. Again, this may reflect either the data recording practices or the rationale for recording this data. Neither patient acuity nor staff mix seemed to be recorded at the present study's hospital for dynamic staffing adjustments. The staffing appeared to be very stable throughout the time period studied.

Finally, it should be noted that there was fairly low availability for the data element, nursing outcome, for all [illegible] studies. The present study, however, had, by far, the lowest availability for nursing outcome, of all of the three studies. This, again, may reflect on the nature of the setting for the present study. The present work examined an acute care setting for which all nursing diagnoses that had an outcome recorded were deemed to be "not resolved". This may indicate that many nursing diagnoses could not be resolved in the relatively short-stay environment of an acute care setting. It may also, however, reflect a lack of [illegible] data element definition or ambiguous data recording practices.

Significance of Study

The purpose of this study was to advance existing knowledge related to nurses' use of the Health Information: Nursing Components data elements in the documentation of their nursing practice. There were four reasons why this study was significant for the advancement of nursing knowledge. The primary contribution of this study was that it was the first in Canada to consider the availability of data elements that were directly related to nursing practice. Of secondary significance was that this study considered a substantial number of health records in an acute care setting. The third significance of this work was through a noteworthy finding. It was found that even in a setting whereby the primary diagnosis recording system was that of NANDA, a high proportion (43.3%) of the diagnostic statements were recorded either as "doctors orders" or non-NANDA terms. This was particularly the case for short stay admissions lasting less than 2 days whereby 53.8% of the diagnostic statements were recorded either as "doctors orders" or non-NANDA terms. This suggests that with an increased trend towards shorter lengths of stay in acute care hospitals that nursing diagnosis classification systems may need to be augmented. The fourth significance is that considerable work remains to be done concerning the operationalization of the definitions for the HI:NC data elements.

Conclusions

A number of conclusions can be drawn from the findings of this study. In the strictest sense, the results can only be extrapolated from the sample to the population of the study hospital. There are, however, implications for other acute care institutions.

For this study, a pragmatic view was taken when operationalizing the definitions of many of the client demographic and service elements. In many cases it was decided to abstract from the health record that which could possibly describe the data elements. It still was the case, however, that very few of the client demographic elements were available. There is an urgent need for clear operational definitions of the race and ethnicity, living arrangement, home environment, functional health status, burden on care provider, educational level, literacy level, work environment, and lifestyle data elements. It is not sufficient to define the elements from a functional perspective as this leaves too much to interpretation by those abstracting the data. It is suggested that code lists be consensually developed by nurses from diverse settings. It is also suggested that for each code, a set of parameters be developed which describes when the code could be used for individual settings. This would permit refinement of the coding schemes over time. At present, if the results of this study can be extrapolated to other acute care hospitals, it would be concluded that the majority of the client demographic elements that are not related to the H.M.R.I. data set would not be available.

Even if data element definitions were refined, there are a number of other factors which could also lead to greater data availability. For example, it is suggested that data collection should, wherever possible, be mandated and collected for a third party agency. It may be preferable if the third party agency was mandated by governmental decree. In Canada, the C.I.H.I. would seem to be the natural body to collect and to disseminate this data.

It appears that data elements which are required by a third party for funding purposes or by the facility for organizational budgeting purposes tend to be readily available. It may be the case that this conclusion also has a counterproductive effect. For instance, in this study, the data element occupation appeared to be only collected for Workers' Compensation Board cases. The main reason for data collection seemed to be for funding purposes.

It is assumed that data elements that have an intrinsically important part to play in the care process, itself, will tend to be readily available. However, the finding that only about half the diagnostic statements were recording according to the NANDA classification scheme suggests three things. First, the recognition of independent nursing diagnoses and their concomitant interventions and outcomes may be under-developed. Second, in acute care settings, a considerable amount of nursing work may be predicated on medical conditions. If this is true then classification schemes such as NANDA must be extended. Third, independent nursing functions may not exist in short stay acute care settings. It would appear that nurses treat diagnostic statements termed doctors' orders and non-NANDA diagnoses in a different manner to independent nursing diagnoses. On the basis of this study, it was particularly the case for short-stay acute medical and surgical patients.

As with Tillman (1990) the abstraction of nursing interventions was subject to error through the use of the 7 and 16 schemes. There were two problems. First, the 16 scheme contains categories which are not mutually exclusive. Second, both coding schemes do not appear to cover all interventions that are present in actual practice. For these reasons, it is suggested that further studies of nursing intervention classification schemes be conducted.

The paucity of data on outcomes suggests that more work needs to be done to link nursing outcomes with nursing diagnosis. In settings other than acute care hospitals the provision of nursing care may be more causally related to the outcome of the care process. But, again, definition of client outcomes and the link to diagnosis and intervention needs to be studied. It may be that examining only the acute care portion of the nursing care episode has biased the results since many of the nursing diagnoses encountered may not have a resolution in the time frame of an acute care stay. In this case there is a need to carry nursing documentation through the entire care spectrum.

For the most part, hospital information systems have been facility-specific. It may be that the efficacy of nursing care will not be sufficiently demonstrated by the review of data that is specific to one facility. As Canada moves to a seamless health care system, manifested by shortened inpatient lengths of stay, increased community services, and more extensive home-based care, it seems increasingly evident that there will be a need for nursing data from all settings. Therefore, client-focused databases will be required rather than the current facility-specific databases. The client-focused databases will potentially form one component of a comprehensive national health database as described using the Health Information Template that is being developed by the C.I.H.I. (National Task Force on Health Information, 1991; Wolfson, 1992).

A final conclusion is that the design and implementation of health record documentation appear to have a great influence on the availability and reliability of abstraction for the data elements. In the case of the study hospital a number of the data elements were available because there were pre-set fields provided on health record forms.

In terms of the availability and reliability of data recording, comparisons between American and Canadian studies are of interest but are not conclusive. Instead of a single number for data availability being reported, an investigator may wish to demonstrate the degree of variability for the data availability series with increasing sample size. From this study it may be concluded that, to determine availability for the majority of the data elements, it should be unnecessary to abstract the large number of health records dictated by standard error calculations. The cost of abstraction is, of course, minimized if automated documentation systems are available.

Finally, intra-rater and inter-rater reliability tests are hampered by the bias that is introduced by the researcher. A more stringent test would separate the collection of the comparison data sets further in time and would use more traditional data collection personnel to abstract the data series.

Recommendations for Further Study

1. The client demographic elements, for the HI:NC, should be operationally defined on a consensual basis. This study has presented one set of operational definitions that could be used in future studies. Further availability studies should then be conducted to refine the definitions.
2. Further studies of the availability of the HI:NC elements should be undertaken. Rather than focusing only on the acute care episode, the patient's record up to and including home care visits should be abstracted. A study in an ambulatory setting should also be carried out to determine the availability of the HI:NC elements in outpatient clinic documentation.
3. The NANDA nursing diagnosis classification scheme should be augmented to allow for interdependent nursing assessments and diagnoses.
4. Nursing intervention schemes other than the 7 and 16 code sets used in this thesis should be investigated for applicability.

5. Workshops to determine links between nursing diagnoses, nursing interventions, and nursing outcomes should be conducted.
6. The collection and analysis of HI:NC data by the C.I.H.I. should be pursued.
7. A standard nursing documentation format should be adopted and disseminated. In particular, a standard nursing discharge abstract should be developed. The NIS structure used at the study hospital should be standardized and examined for potential use. Studies could then be conducted to determine the forms of documentation that currently exist and the degree of comparability with the NIS structure.
8. The study of the HI:NC, as well as the recording and analysis of the data elements, should be made a central part of all nursing education.

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Appendix A

Minimum Data Set Elements

Table A1

Uniform Hospital Discharge Data Set Elements

NUMBER	ITEM
1.	Personal Identification
2.	Date of Birth
3.	Sex
4.	Race and Ethnicity
5.	Residence
6.	Hospital Identification
7.	Admission Date
8.	Discharge Date
9.	Physician Identification; Attending
10.	Physician Identification; Operating
11.	Diagnoses
12.	Procedures and Dates
13.	Disposition of Patient
14.	Expected Principal Source of Payment

Table A2

Uniform Ambulatory Medical Care Minimum Data Set Elements

NUMBER	ITEM
	PATIENT DATA ITEMS
1.	Personal Identification
2.	Residence
3.	Date of Birth
4.	Sex
5.	Race and Ethnic Background
	PROVIDER DATA ITEMS
6.	Provider Identification
7.	Location or Address
8.	Type of Practice
9.	Profession
	ENCOUNTER DATA ITEMS
10.	Date and Place of Encounter

table continues

NUMBER	ITEM
11.	Patient's Reason for Encounter
12.	Diagnostic Services
13.	Problem, Diagnosis, or Assessment
14.	Therapeutic Services
15.	Preventive Services
16.	Disposition
17.	Expected Principal Source of Payment
18.	Total Charges

Table A3

Long-Term Health Care Minimum Data Set Elements

NUMBER	ITEM
	DEMOGRAPHIC ITEMS
1.	Personal Identification
2.	Sex
3.	Birth Date
4.	Race and Ethnicity
5.	Marital Status
6.	Usual Living Arrangement
7.	Court-ordered Constraints
	HEALTH STATUS ITEMS
8.	Vision
9.	Hearing
10.	Communication
11.	Basic Activities of Daily Living
12.	Mobility

table continues

NUMBER	ITEM
13.	Adaptive Tasks
14.	Behavior Problems
15.	Disorientation or Memory Impairment
16.	Disturbance of Mood
17.	Primary and Other Significant Diagnoses
	SERVICE ITEMS
18.	Provider Identification
19.	Last Principal Provider
20.	Date of Admission
21.	Direct Services
22.	Principal Source of Payment
23.	Charges
24.	Discharge or Termination of Service

Appendix B

Nursing Minimum Data Set Elements

Table B1

Nursing Minimum Data Set Elements

Number	Item
	Nursing Care Elements
1.	Nursing Diagnosis
2.	Nursing Intervention
3.	Nursing Outcome
4.	Intensity of Nursing Care
	Patient or Client Demographic Elements
5.	Personal Identification
6.	Date of Birth
7.	Sex
8.	Race and Ethnicity
9.	Residence

table continues

Number	Item
	Service Elements
10.	Unique Facility or Service Agency Number
11.	Unique Health Record Number of Patient or Client
12.	Unique Number of Principal Registered Nurse Provider
13.	Episode Admission or Encounter Date
14.	Discharge or Termination Date
15.	Disposition of Patient or Client
16.	Expected Payer for Most of This Bill (Anticipated financial Guarantor for Services)

Appendix C

Comparison of NMDS and HI:NC Elements

Table C1

Comparison of NMDS and HI:NC Elements

HI:NC ELEMENTS[1]	NMDS ELEMENTS[2]	Agree
CLIENT ELEMENTS	CLIENT DEMOGRAPHIC ELEMENTS	
Race and Ethnicity	Race and Ethnicity	X
Unique Geographical Location	Residence	X
Unique Lifetime Identifier	Personal Identification	X
Language	Sex	
Occupation	Date of Birth	
Living Arrangement		
Home Environment Including Physical Structure		

table continues

HI:NC ELEMENTS[1]	NMDS ELEMENTS[2]	Agree
Responsible Caregiver Upon Discharge		
Functional Health Status		
Burden On Care Provider		
Educational Level		
Literacy Level		
Work Environment		
Lifestyle Data		
Income Level		
NURSE PROVIDER ELEMENTS	**SERVICE ELEMENTS**	
Unique Nurse Identifier	Unique Number of Principal Registered Nurse Provider	X
Principal Nurse Provider	Unique Facility or Service Agency Number	
	Unique Health Record Number of Client	

table continues

HI:NC ELEMENTS[1]	NMDS ELEMENTS[2]	Agree
	Episode Admission or Encounter Date	
	Discharge or Termination Date	
	Disposition of Patient or Client	
NURSE PROVIDER ELEMENTS	**SERVICE ELEMENTS**	
	Expected Payer for Most of this Bill (Anticipated Financial Guarantor for Services)	
NURSE CARE RELATED ELEMENTS	**NURSING CARE ELEMENTS**	
Client Status (Nursing Diagnosis)	Nursing Diagnosis	X
Nursing Interventions	Nursing Intervention	X
Client Outcomes	Nursing Outcome	X
Nursing Intensity	Intensity of Nursing Care	X

Note[1]. From "The nursing minimum data set: Abstraction tool for standardized, comparable, essential data." by H.H. Werley, E.D. Devine, C.R. Zorn, P. Ryan, and B.L. Westra, 1992. In J.H. van Bemmel & A.T. McCray (Eds.), Yearbook of medical informatics 1992: Advances in an interdisciplinary science (pp. 87-92). New York: Schattauer Verlagsgesellschaft.

Note[2]. From "Papers from the Nursing Minimum Data Set Conference, Edmonton, Alberta." by the Canadian Nurses Association, 1993, Ottawa: Author.

Appendix D

Data Collection Instrument Definitions
HI:NC Definitions

1. Nursing Diagnosis: A clinical judgment made by a nurse about a human response to an actual or potential health problem, the intervention for which nurses are accountable. This item refers to all nursing diagnoses, as defined by NANDA, that are recorded during the Episode of Care Under Review. This item may be found on sheets: (a) Individual Care Plan and (b) Individual Care Plan Post Partum under the column title, Nursing Diagnosis, as well as in free text format recorded on the Patient Progress Notes sheet.
2. Nursing Intervention: An action, intended to benefit the patient, for which nurses are responsible. This item refers to all nursing interventions that are recorded during the Episode of Care Under Review. This item will be found on sheets: (a) Individual Care Plan under the column title, Nursing Action, (b) Individual Care Plan Post Partum under the column title, Nursing

Action, (c) Needs Assessment and Record of Care under the column title, Patient's Needs, and (d) in free text format recorded on the Patient Progress Notes form.

3. Nursing Outcome: Nursing outcome is an aspect of patient health status that is influenced by nursing intervention and recorded at specific times for an episode or encounter of care. This will be measured by the resolution status of each nursing diagnosis as (a) resolved (b) not resolved, or (c) not recorded. On the (a) Individual Care Plan and (b) Individual Care Plan Post Partum, nursing diagnoses are marked as resolved if and only if there is BOTH a yellow highlight line drawn through the handwritten Nursing Diagnosis and Nursing Action AND a date recorded under the Date Discontinued column title. If (a) NEITHER of these notations are present and (b) the nursing diagnosis is recorded on the Discharge Care Plan, then the nursing diagnosis is unresolved. If (a) a yellow highlight line is NOT drawn through the handwritten Nursing Diagnosis,

(b) a date is NOT recorded in the Date Discontinued column, AND (c) the Nursing Diagnosis is NOT recorded on the Discharge Care Plan, then the nursing diagnosis is measured as unrecorded.

4. Intensity of Nursing Care: The total time and staff mix of nursing personnel resources consumed by an individual subject during the encounter of care. The hours of care are based on standard measures related to patient classification and staff mix. The intensify of nursing care is determined by (a) the hours of nursing care provided to the subject, and (b) the ratio of the types of nursing personnel, such as Registered Nurse, Certified Nursing Aide, and Other Personnel, who are involved in providing the subject's care.

Intensity of Nursing Care - Hours: The total hours of nursing care is the total time spent in consumption of nursing resources for an individual subject during the Episode of Care Under Review. The subject's acuity category is located on the Needs Assessment and Record of Care sheets. The data collector will record the acuity categories for each day of the individual's episode of care on the *Acuity Category* field of the Episode Acuities screen. The hours of care are predetermined for each acuity level. The computer program will automatically calculate the hours of care for each day of the Episode of Care Under Review and will automatically sum the daily hours of nursing care and then record the total hours of nursing care in the appropriate table. If one day's information is missing, the data collector will record Missing in the *Acuity Category* field of the Episode Acuities screen.

Intensity of Nursing Care - Staff Mix: Staff Mix is the numbers and types of personnel actually assigned to a nursing unit each day. This would be located on the *Workload and Staffing Daily Record* sheets that are stored separate from the subject's health record. The data collector would record the type of personnel as well as the numbers associated with each type for each day of the Episode of Care Under Review on the Episode

Staff Mix screen. The computer program will automatically calculate the staff mix for each day of the Episode of Care Under Review and will automatically sum the daily staff mix and then record the percentage of each type of personnel participating in the nursing care of the individual in the appropriate table. If this information is not available, the data collector would record Missing in the Staff Type field as well as on the Number of Personnel field on the Episode Staff Mix screen.

5. Unique Lifetime Identifier: The unique number, assigned to each person for their lifetime within a specific geographical location such as a province, which distinguishes and separates one individual from another. This is the subject's nine-digit personal health number and would be available on the Discharge Summary sheet.
6. Race: The class of people, unified by physical characteristics such as skin color or facial features, to whom the individual belongs. The race of the subject would appear on the Discharge

Summary, History Sheet, Nursing Data Base -- Basic, Nursing Data Base -- Obstetrics, and/or Patient Progress Notes sheets.

7. Ethnicity: The class of people, unified by cultural ancestral characteristics such as language, to whom the individual belongs. The ethnicity of the subject would appear on the Discharge Summary, History Sheet, Nursing Data Base -- Basic, Nursing Data Base -- Obstetrics, and/or Patient Progress Notes sheets.
8. Unique Geographical Location: The designation of the primary place in which the subject usually resides. This is recorded as the postal code of the subject's primary residence. The postal code is six-characters and is usually located on the Discharge Summary sheet.
9. Nursing Diagnosis Classification System: The numerical diagnostic coding system used for the classification of nursing diagnoses. The classification system used for nursing diagnosis documentation is obtained through discussion with members of the facility.

10. Unique Nurse Identifier: The unique number, assigned to all registered nurses, that distinguishes and separates those who were responsible for caring for the subject during the episode of care under review. The A.A.R.N. registration numbers of all registered nurse providers who provide nursing care for the subject. This would be recorded on the Nursing Data Base -- Basic, Nursing Data Base -- Obstetrics, and/or Patient Progress Notes sheets.
11. Principal Nurse Provider: The unique number, assigned to the registered nurse, that distinguishes and separates the registered nurse who was primarily responsible for caring for the subject during the episode of care under review. The A.A.R.N. registration number of the principal registered nurse provider. This would be recorded on the Nursing Data Base -- Basic, Nursing Data Base -- Obstetrics, and/or Patient Progress Notes sheets.
12. Language: The mother tongue and the home tongue of the subject. This would be recorded on the

Nursing Data Base -- Basic or Nursing Data Base -- Obstetrics sheets.

13. Occupation: The kind of work that people do. This would be recorded on the Discharge Summary, History Sheet, Nursing Data Base -- Basic and/or Nursing Data Base -- Obstetrics sheets.

14. Responsible Caregiver Upon Discharge: The person(s) who is (are) primarily responsible for providing service for the subject which is essential for the his or her well-being and/or safety following discharge from the facility. The range of possible responsible caregivers includes the subject, family members, neighbors, and/or other unpaid and unsupervised individuals. This would be recorded on the Discharge Summary, History Sheet, Discharge Care Plan, Nursing Data Base -- Basic and/or Nursing Data Base -- Obstetrics sheets.

15. Burden on Care Provider: The extent of the impact of providing care on the person principally responsible for providing care for the subject following his or her discharge from the facility.

This would be recorded on the Discharge Summary, History Sheet, Discharge Care Plan, Nursing Data Base -- Basic and/or Nursing Data Base -- Obstetrics sheets..

16. Living Arrangement: The usual composition of the subject's household. This would be recorded on the Discharge Summary, History Sheet, Discharge Care Plan, Nursing Data Base -- Basic and/or Nursing Data Base -- Obstetrics sheets.

17. Home Environment Including Physical Structure: The home environment is limited to the type of dwelling at the subject's primary residence. This does not include the presence or absence of safety hazards. This would be recorded on the Discharge Summary, History Sheet, Discharge Care Plan, Nursing Data Base -- Basic and/or Nursing Data Base -- Obstetrics sheets.

18. Educational Level: The highest level of education obtained by the subject. The number that identifies the highest level of education obtained by the subject. This would be recorded on the Discharge Summary, History Sheet, Discharge Care

Plan, Nursing Data Base -- Basic and/or Nursing Data Base -- Obstetrics sheets.

19. Literacy: The ability to be able to read and write. This would be recorded on the Discharge Summary, History Sheet, Discharge Care Plan, Nursing Data Base -- Basic and/or Nursing Data Base -- Obstetrics sheets.

20. Income Level: The self-reported level of an individual's annual income. This would be recorded on the Discharge Summary, History Sheet, Discharge Care Plan, Nursing Data Base -- Basic and/or Nursing Data Base -- Obstetrics sheets.

21. Work Environment: This is the absence or presence of safety hazards in the work environment. This would be recorded on the Nursing Data Base -- Basic and/or Nursing Data Base -- Obstetrics sheets. This item is captured in the composite variable, Lifestyle Data section, under sub-variable "Personal/home/work arrangements that concern the patient".

22. Functional Health Status: An assessment, completed by a registered nurse and a subject, of

the subject's self-care competencies and nutritional practices. This item refers to all competencies in self-care and nutritional practice assessments that are recorded during the Episode of Care Under Review. This composite variable would be recorded on the Nursing Data Base -- Basic and/or Nursing Data Base -- Obstetrics sheets. This will be extracted in the following manner.

22.1. Difficulty caring for self: The difficulty caring for self selection choices are provided in the data base design specifications. A Comment section will be added to record free text.

22.2. Personal hygiene devices used: The personal hygiene devices used selection choices are provided in the data base design specifications. A Comment section will be added to record free text.

22.3. Difficulty with bowels: The difficulty with bowels selection choices are provided in the data base design specifications. A Comment section will be added to record free text.

22.4. Urinary problems: The urinary problems selection choices are provided in the data base design specifications. A Comment section will be added to record free text.

22.5. Specific Diet: The specific diet selection choices are provided in the data base design specifications. A Comment section will be added to record free text.

22.6. Foods That Disagree: The foods that disagree selection choices are provided in the data base design specifications. A Comment section will be added to record free text.

22.7. Physical Disabilities: The physical disabilities selection choices are provided in the data base design specifications. A Comment section will be added to record free text.

22.8. Mobility Devices Used: The mobility devices used selection choices are provided in the data base design specifications. A Comment section will be added to record free text.

23. Lifestyle Data: An assessment, completed by a registered nurse and a subject, of the subject's practice of personal behaviors and habits related to the use of cigarettes, alcohol consumption, sleep patterns, and stress management. This composite variable would be recorded on the Nursing Data Base -- Basic and/or Nursing Data Base -- Obstetrics sheets. This will include the elements lifestyle data and work environment and will be extracted in the following manner:

23.1. Personal/home/work arrangements that concern the patient. The personal/home/work arrangements that concern the subject selection choices are provided in the data base design specifications. A Comment section will be added to record free text.

23.2. Religious/cultural aspects that affect care: The religious/cultural aspects that affect care selection choices are provided in the data base design specifications. A Comment section will be added to record free text.

23.3. Family/friends for support now: The family/friends for support now selection choices are provided in the data base design specifications. A Comment section will be added to record free text.

23.4. Diversional activities: The diversional activities selection choices are provided in the data base design specifications. A Comment section will be added to record free text.

23.5. Smoker: The smoker selection choices are provided in the data base design specifications. A Comment section will be added to record free text.

23.6. Alcoholic beverages: The alcoholic beverages selection choices are provided in the data base design specifications. A Comment section will be added to record free text.

23.7. Difficulty sleeping at night: The difficulty sleeping at night selection choices are provided in the data base design specifications. A Comment section will be added to record free text.

NMDS Definitions

1. Date of Birth: The month, day, and year of birth. This item is usually located on the Discharge Summary sheet.
2. Sex: The subject's gender. This item is usually located on the Discharge Summary sheet.
3. Unique facility or Service Agency Number: A number that identifies the organization through which the subject was provided nursing care. This item is obtained through discussion with a designated member of the facility's administration.
4. Unique Health Record Number of Subject: The unique number, assigned to each subject within a health care facility, that distinguishes and separates one subject record from another in that facility. This item is usually located on the Discharge Summary sheet.
5. Episode Admission or Encounter Date: The date of initiation of Episode of Care Under Review expressed in month, day, and year. This item is usually located on the Discharge Summary sheet.

6. Discharge or Termination Date: The date of termination of an episode of care expressed in month, day, and year. This item is usually located on the Discharge Summary sheet.
7. Disposition of Patient: The plan for continuing health care made upon discharge or termination. The plans may include discharge to home, referrals to community agencies, and transfers to other health care facilities. This item is usually located on the Discharge Summary and/or Discharge Care Plan sheets.
8. Discharge Status: The discharge destination and the type of transfer facility. This item is usually located on the Discharge Summary and/or Discharge Care Plan sheets.
9. Expected Payer for Most of This Bill (Anticipated Financial Guarantor for Services): The single major source that the subject expects will pay for her or his bill. This item is usually located on the Discharge Summary sheet.

Other Variable Definitions

1. Machine Type: The number(s) that identifies the type of computer hardware and the associated pre-set computer clock speed that is used to run the data collection software. This item is the Central Processing Unit (CPU) type or model number concatenated with the computer clock speed. This item is usually found on the computer hardware.
2. Alberta Health Care Insurance Number: The number that identifies the subject's coverage under the Alberta Health Care Insurance Plan. This is recorded as the twelve digit number that appears on the Discharge Summary sheet.
3. Visit Number: The number that identifies the specific occurrence of the subject's episode of care under review at the facility. This is recorded as a number sequentially allocated to each episode of care starting from 0001. This item is usually located on the Discharge Summary sheet.
4. Data Collection Time: The amount of time from start of data collection to end of data

collection. This is a time in 24 hour format that identifies the begin and end times of data collection for a particular health record. This is automatically assigned by the computer triggered by the data collector clicking a Data Collection Time command button.

5. Nurse Care Related Elements Data Collection Time: The amount of time required to collect data for the nursing care related data elements from the subject's health record. This is a time in 24 hour format that identifies the begin and end times of data collection for the nursing care related data elements for a particular health record. This is automatically assigned by the computer triggered by the data collector clicking a Nurse Care Related Elements Data Collection Time command button.

6. Medical Diagnosis Coding System: The numerical diagnostic coding system used for the classification of medical diagnoses. The classification system used for medical diagnosis documentation is obtained through discussion with

a designated member of the facility's administration. This item is usually the ICD-9 CM coding system for medical diagnoses.

7. Most Responsible Medical Diagnosis: The clinical judgment made by a physician about the primary medical reason that the subject was admitted to the facility. This item is the first hand-written medical diagnosis ICD-9 CM code appearing on a list of medical diagnoses on the Discharge Summary sheet.

8. Case Mix Group: The number that identifies a grouping of similar medical cases from a resource utilization perspective. This item would be provided by the facility and is not usually located on the health record.

9. Discharge Medical Diagnoses: The clinical judgment made by a physician upon a subject's discharge from the facility, about a subject's medical problem, the intervention for which physicians are accountable. This item consist of the subsequent hand-written medical diagnosis ICD-

9 CM codes appearing on a list of medical diagnoses on the <u>Discharge Summary</u> sheet.

10. <u>Subject's Nursing Unit and Room Number</u>: The numbers that identify the location, within the facility, of the subject's assigned bed, during the episode of care under review. This item is usually located on the <u>Discharge Summary</u> sheet.

Appendix E

Diagnostic Statements

Table E1

Diagnostic Statements: Percent of Non-NANDA statements

Code	Diagnostic Statement	Percent
PB0002	Doctors' Orders	12.2%
PB0003	ARF Altered V/S	7.3%
PB0008	Mobility - Routine	2.6%
PB0025	Observations & Measurements - Other	1.9%
PB0007	Personal Hygiene - Routine	1.7%
PB0021	Personal Hygiene - Other	1.6%
PS0005	Potential Post-Op Complications	1.4%
PS0003	Altered Peristalsis	1.3%
PS0002	Possible Anesthetic Complication	1.3%
PS0001	Post-Op Dependence	1.3%

Appendix F

Nursing Intervention Schemes

Table F1.

Nursing Interventions: 7 Scheme System

Number	INTERVENTION
1.	Surveillance and/or Observation
2.	Supportive Measure
3.	Assistive Measure
4.	Treatment and/or Procedure
5.	Emotional Support
6.	Teaching
7.	Coordination

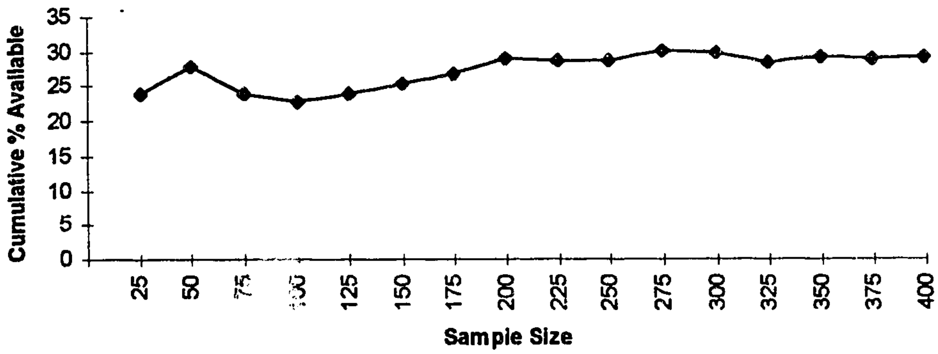
Table F2

Nursing Interventions: 16 Scheme System

Number	INTERVENTION
1.	Monitoring and/or Surveillance
2.	Activities of Daily Living
3.	Comfort
4.	Airway Maintenance
5.	Applications and/or Treatments
6.	Medications
7.	Invasive Insertions
8.	Emotional Support and/or Counseling
9.	Teaching
10.	Coordination and Collaboration of Care
11.	Protection
12.	Assisting Other Providers
13.	Preventive Services
14.	Providing a Therapeutic Environment
15.	Maintaining Nutritional and Fluid Balance
16.	Therapeutic Activities

Appendix G

Client Elements: Variations in Availability



<u>Figure G1.</u> The cumulative percent available for the race data element was 29.3% at sample number 400 (n = 117).

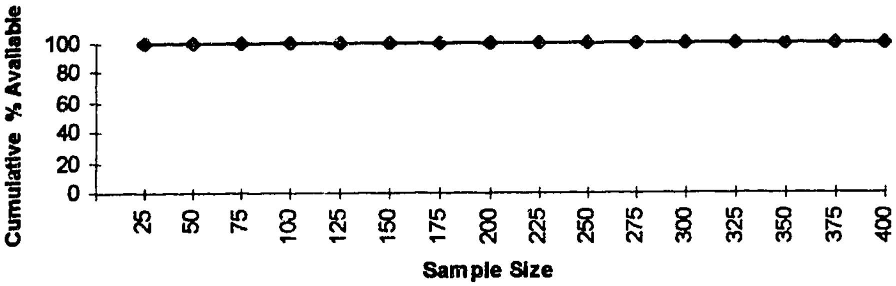


Figure G2. The cumulative percent available for the postal code data element was 99.5% at sample number 400 (n = 398).

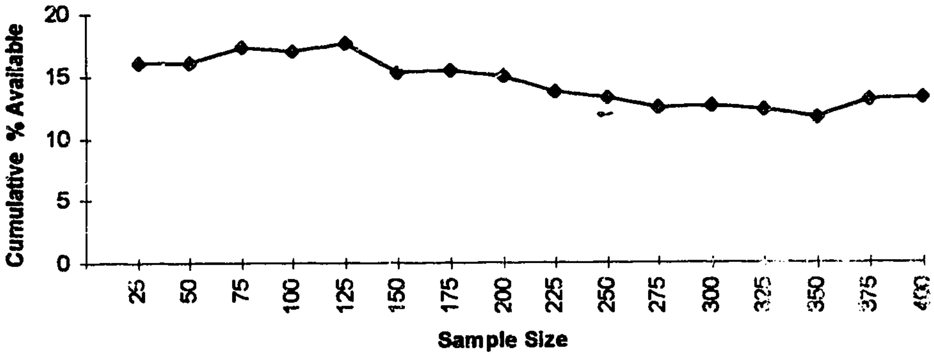


Figure G3. The cumulative percent available for the occupation data element was 13.3% at sample number 400 (n = 53).

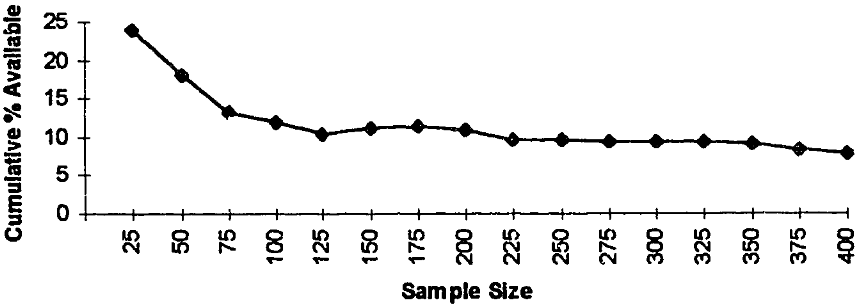


Figure G4. The cumulative percent available for the living arrangement data element was 8.0% at sample number 400 (n = 32).

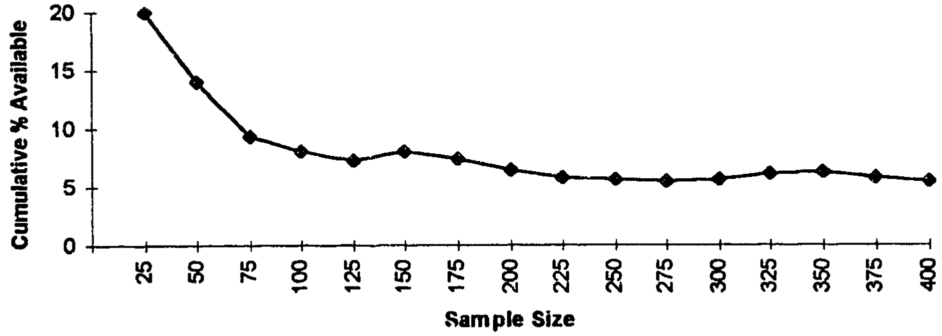


Figure G5. The cumulative percent available for the home environment data element was 5.5% at sample number 400 (n = 22).

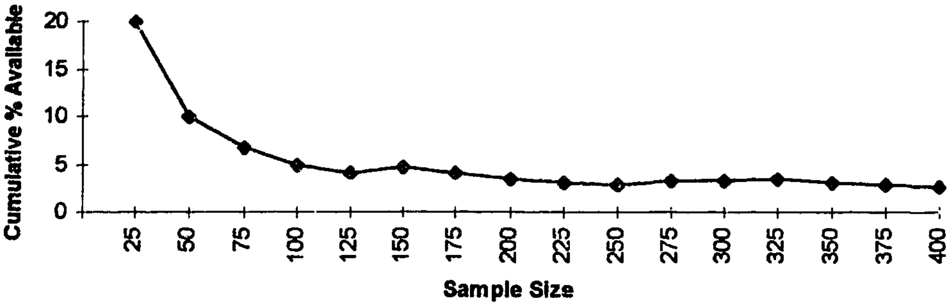


Figure G6. The cumulative percent available for the responsible care provider data element was 2.8% at sample number 400 (n = 11).

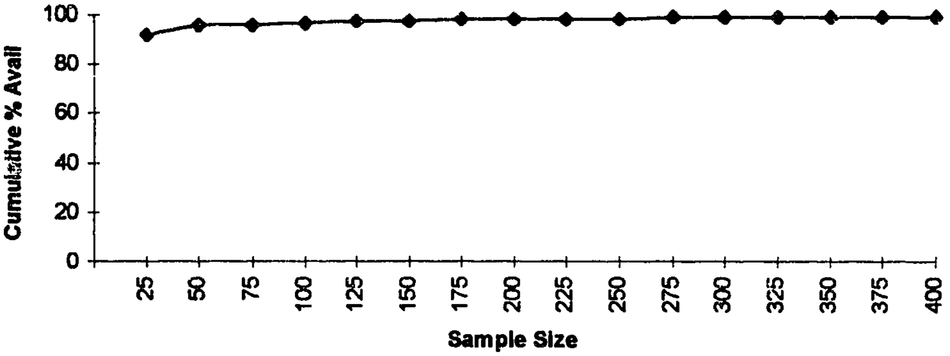
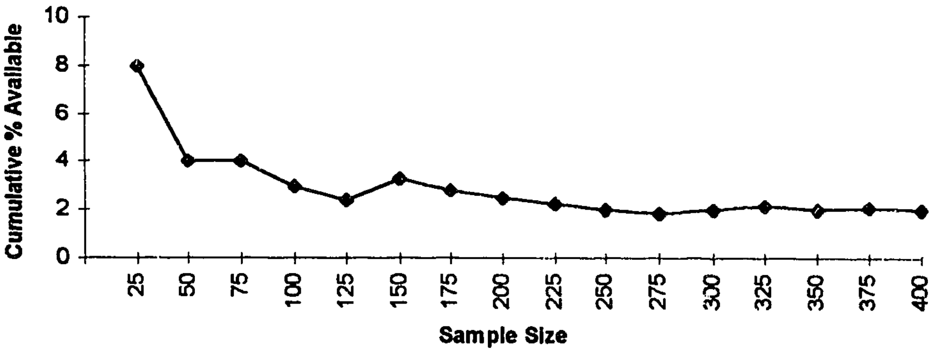
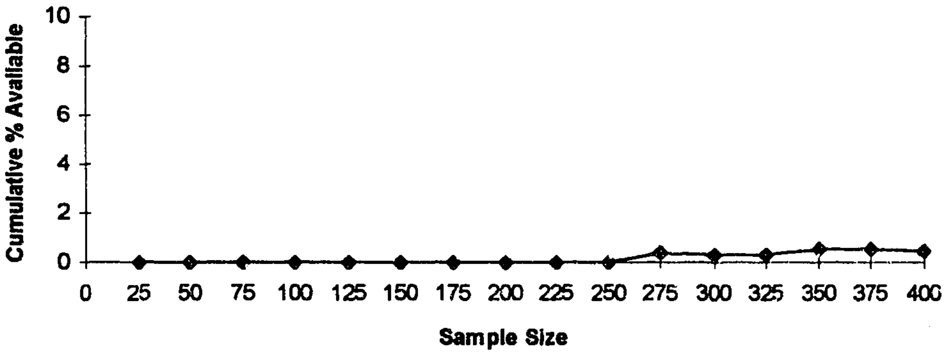


Figure G7. The cumulative percent available for the functional health status data element was 99.3% at sample number 400 (n = 397).



<u>Figure G8.</u> The cumulative percent available for the burden on care provider data element was 2.0% at sample number 400 (n = 8).



<u>Figure G9.</u> The cumulative percent available for the educational level data element was 0.5% at sample number 400 (n = 2).

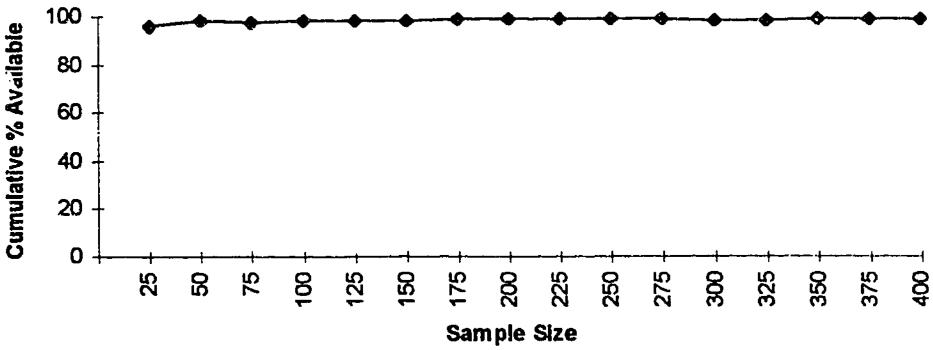


Figure G10. The cumulative percent available for the lifestyle data element was 99.0% at sample number 400 (n = 396).

Figure G11. The cumulative percent available for the language data element was 94.0% at sample number 400 (n = 376).

Appendix H

Nurse Care Related Elements: Variations in Availability

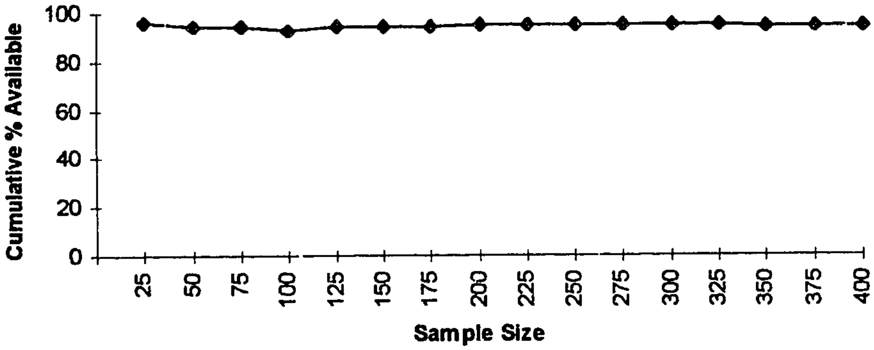


Figure H1. The cumulative percent available for the nursing diagnoses data element was 94.5% at sample number 400 (n = 378).

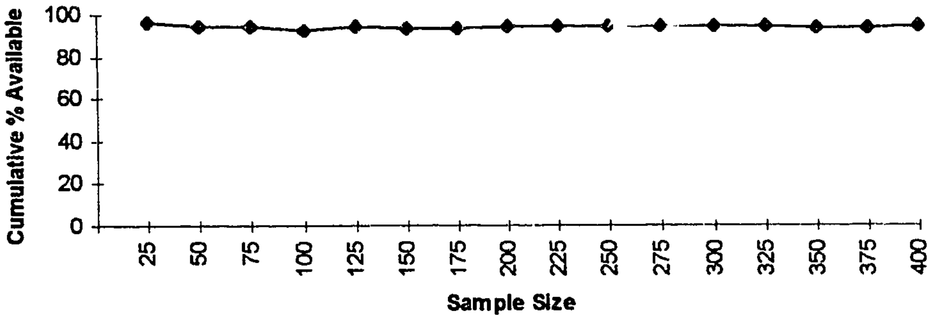
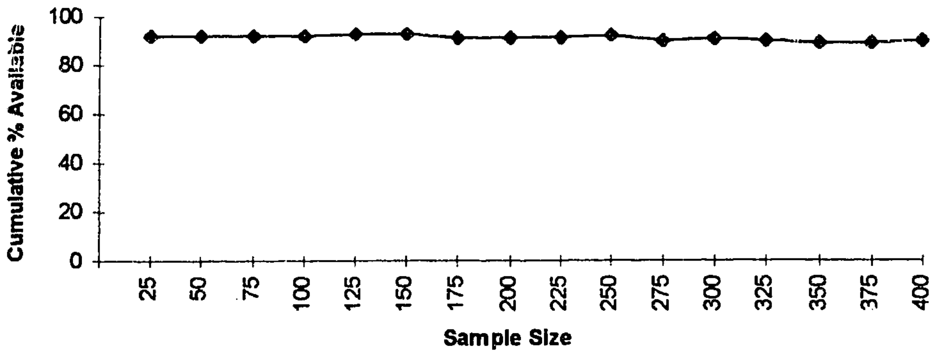


Figure H2. The cumulative percent available for the nursing interventions data element was 94.0% at sample number 400 (n = 376).

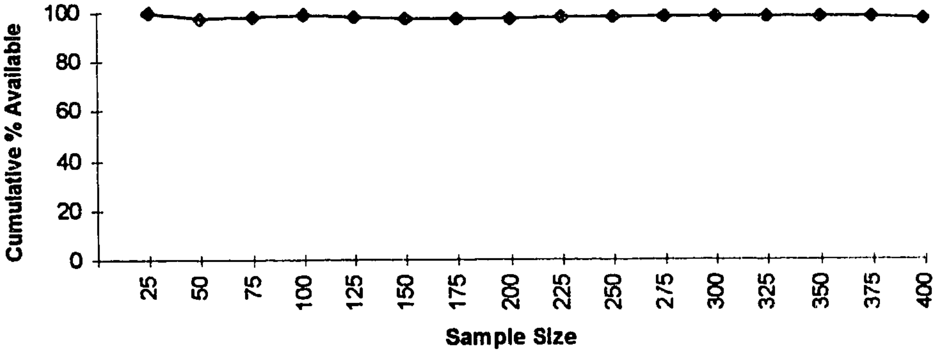
Figure H3. The cumulative percent available for the client outcomes data element was 73.3% at sample number 400 (n = 293).



<u>Figure H4.</u> The cumulative percent available for the patient acuity data element was 89.5% at sample number 400 (n = 358).

Appendix I

Other Elements: Variations in Availability



<u>Figure I1.</u> The cumulative percent available for the Alberta Health Care Number data element was 98.0% at sample number 400 (n = 392).

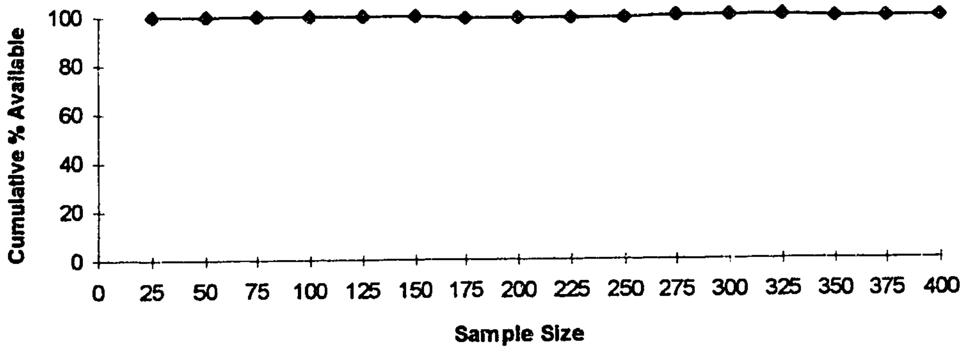


Figure I2. The cumulative percent available for the date of birth data element was 99.5% at sample number 400 (n = 398).

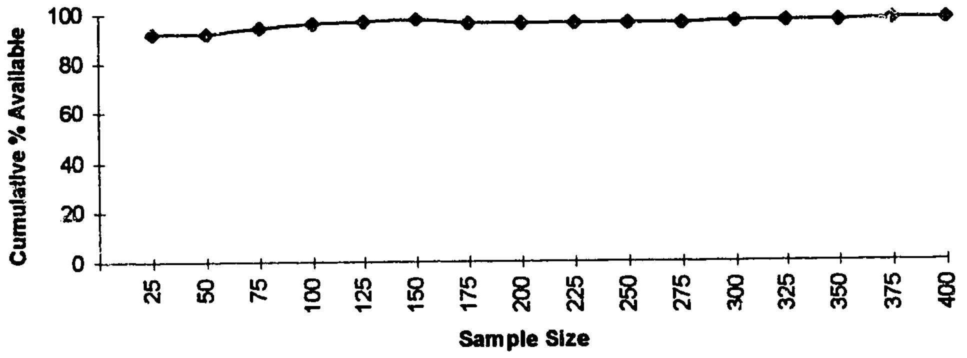


Figure I3. The cumulative percent available for the discharge status data element was 97.5% at sample number 400 (n = 390).

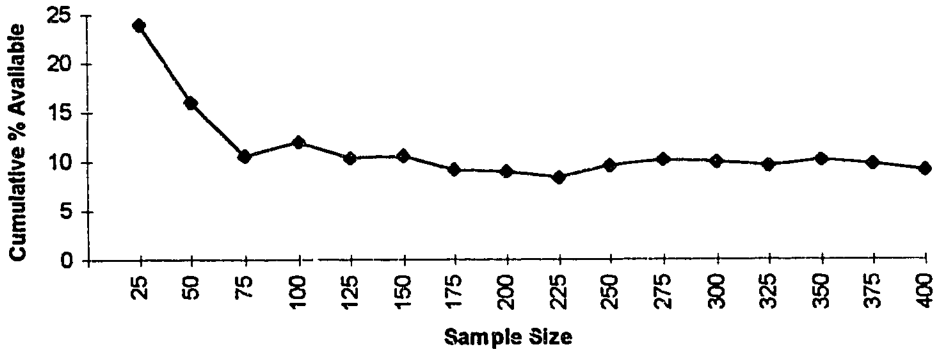


Figure I4. The cumulative percent available for the transferred disposition data element was 99.8% at sample number 400 (n = 399).

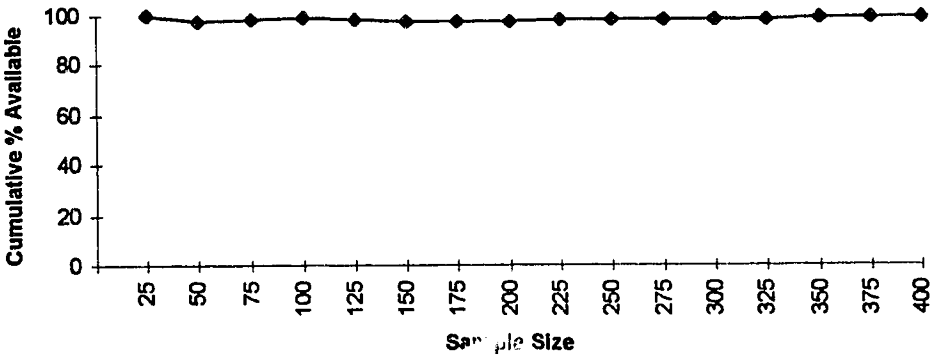


Figure I5. The cumulative percent available for the expected payer data element was 99.0% at sample number 400 (n = 396).

Appendix J

Percent Availability: Comparison Between Studies

Table J1

Comparison Between HI:NC Study and NMDS Studies Data Percent Availability

	Element	Present Study (1995)	Tillman (1990)	Devine & Werley (1988))
	CLIENT ELEMENTS			
1.	Race	29.3	76.7	71.0
	Ethnicity	29.3	76.7	9.0
2.	Unique Geographical Location (Postal Code)	99.5	10.0	100.0

table continues

	Element	Present Study (1995)	Tillman (1990)	Devine & Werley (1988))
3.	Unique Lifetime Identifier (Personal Health Number)	0.0	a	a
4.	Alberta Health Care Number	98.0	a	a
5.	Social Security Number	a	0.0	86.0
6.	Language	94.0	a	a
7.	Occupation	13.3	a	a
8.	Living Arrangement	8.0	a	a
9.	Home Environment Including Physical Structure	5.5	a	a
10.	Responsible Caregiver Upon Discharge	2.8	a	a

table continues

	Element	Present Study (1995)	Tillman (1990)	Devine & Werley (1988))
11.	Functional Health Status	99.3	a	a
12.	Burden On Care Provider	2.0	a	a
13.	Educational Level	0.5	a	a
14.	Literacy Level	0.0	a	a
15.	Work Environment	0.0	a	a
16.	Lifestyle Data	99.0	a	a
17.	Income Level	0.0	a	a
	NURSE PROVIDER ELEMENTS			
18.	Unique Nurse Identifier	0.0	a	a
19.	Principal Nurse Provider	0.0	0.0	0.0

table continues

	Element	Present Study (1995)	Tillman (1990)	Devine & Werley (1988))
	NURSE CARE RELATED ELEMENTS			
20.	Nursing Diagnosis (With Dr.'s Orders)	94.5	b	b
21.	Nursing Diagnosis (Without Dr.'s Orders)	88.3	96.7	85.3
22.	Nursing Interventions (With Dr.'s Orders)	94.0	b	b
22.	Nursing Interventions (Without Dr.'s Orders)	85.3	96.7	c

table continues

	Element	Present Study (1995)	Tillman (1990)	Devine & Werley (1988)
23.	Client Outcomes (With Dr.'s Orders)	73.3	b	b
24.	Client Outcomes (Without Dr.'s Orders)	38.3	66.9	79.0
25.	Nursing Intensity (Staff Mix)	75.3	96.7	98.0
26.	Nursing Intensity (Acuities - Grouped)	89.5	c	c
	CLIENT DEMOGRAPHIC ELEMENTS			
27.	Sex	100.0	100.0	100.0
28.	Date of Birth	99.5	73.3	100.0

table continues

	Element	Present Study (1995)	Tillman (1990)	Devine & Werley (1988)
	SERVICE ELEMENTS			
29.	Unique Facility or Service Agency Number	100.0	0.0	100.0
30.	Unique Health Record Number of Client	100.0	100.0	100.0
31.	Episode Admission or Encounter Date	100.0	100.0	100.0
32.	Discharge or Termination Date	100.0	0.0	100.0

table continues

Element	Present Study (1995)	Tillman (1990)	Devine & Werley (1988)
33. Disposition of Patient or Client (Transfer Disposition)	99.8	0.0	100.0
34. Discharge Status	97.5		
35. Expected Payer for Most of this Bill (Anticipated Financial Guarantor for Services)	99.0	0.0	100.0

[a] Not collected

[b] Not specified

[c] Not available

Appendix K

Percent Agreement: Comparison Between Studies

Table K1

<u>Comparison Between HI:NC Study and NMDS Studies Percent Agreement</u>

	Element	Present Study (1995)	Tillman (1990)	Devine & Werley (1988)
	CLIENT ELEMENTS			
1.	Race	100.0	100.0	96.0
	Ethnicity	100.0	100.0	83.0
2.	Unique Geographical Location (Postal Code)	100.0	c	83.0

table continues

	Element	Present Study (1995)	Tillman (1990)	Devine & Werley (1988)
3.	Unique Lifetime Identifier (Personal Health Number)	100.0	a	a
4.	Alberta Health Care Number	100.0	a	a
5.	Language	100.0	a	a
6.	Occupation	88.0	a	a
7.	Living Arrangement	100.0	a	a
8.	Home Environment Including Physical Structure	100.0	a	a
9.	Responsible Caregiver Upon Discharge	100.0	a	a
10.	Functional Health Status	99.3	a	a

table continues

Element	Present Study (1995)	Tillman (1990)	Devine & Werley (1988)
11. Burden On Care Provider	100.0	a	a
12. Educational Level	100.0	a	a
13. Literacy Level	100.0	a	a
14. Work Environment	100.0	a	a
15. Lifestyle Data	100.0	a	a
16. Income Level	100.0	a	a
NURSE PROVIDER ELEMENTS			
17. Unique Nurse Identifier	100.0	a	a
18. Principal Nurse Provider	100.0	c	c

table continues

	Element	Present Study (1995)	Tillman (1990)	Devine & Werley (1988)
	NURSE CARE RELATED ELEMENTS			
19.	Nursing Diagnosis (With Dr.'s Orders)	96.2	b	b
20.	Nursing Diagnosis (Without Dr.'s Orders)	94.7	87.2	82.0
21.	Nursing Interventions (7-item scheme)	79.4	78.8	78.0
22	Nursing Interventions (16-item scheme)	79.9	72.5	84.0

table continues

	Element	**Present Study (1995)**	**Tillman (1990)**	**Devine & Werley (1988)**
23.	Client Outcomes (With Dr.'s Orders)	83.3	b	b
24.	Client Outcomes (Without Dr.'s Orders)	84.0	85.3	82.0
25.	Nursing Intensity (RN Staff Mix)	c	100.0	83.0
26.	Nursing Intensity (Acuities - Grouped)	65.1	c	c
	CLIENT DEMOGRAPHIC ELEMENTS			
27.	Sex	100.0	100.0	100.0
28.	Date of Birth	100.0	100.0	96.0

table continues

	Element	Present Study (1995)	Tillman (1990)	Devine & Werley (1988)
	SERVICE ELEMENTS			
29.	Unique Facility or Service Agency Number	100.0	c	c
30.	Unique Health Record Number of Client	100.0	100.0	100.0
31.	Episode Admission or Encounter Date	100.0	100.0	100.0
32.	Discharge or Termination Date	100.0	b	93.0
33.	Disposition of Patient or Client (Transfer Disposition)	100.0	93.0	b

table continues

Element	Present Study (1995)	Tillman (1990)	Devine & Werley (1988)
34. Discharge Status	100.0	93.0	b
35. Expected Payer for Most of this Bill (Anticipated Financial Guarantor for Services)	100.0	b	96.0

[a] Not collected

[b] Not specified

[c] Not available