NURSING INFORMATICS FOR THE NURSE OF THE FUTURE:

ARE OUR GRADUATES PREPARED?

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ABSTRACT

The healthcare environment and the way healthcare is provided are changing. Similarly, nurses’ roles are changing and nurses need to be proficient in information technology to provide safe and effective healthcare. Furthermore, graduating nurses need to be prepared for the changing healthcare environment. This study identifies whether the graduates from one polytechnic are prepared for the changing healthcare environment.

Five Directors of Nursing and six graduates were interviewed using semi-structured interviews and a focus group. The graduates completed a five-point scale rating the learning outcomes taught in their undergraduate education for usefulness for practice. According to interviewees, the current learning outcomes are appropriate for future nurses. The Directors of Nursing recommended including management systems, whereas the graduates suggested patient information systems. Other factors identified that affected nurses using information systems were access, attitude, and transition to practice. These were linked to patient safety and evidence-based practice. The findings could inform curriculum development.
CHAPTER 1 INTRODUCTION

The healthcare environment and the way healthcare is provided are changing. Information technology has a key role in this with the introduction of electronic health records, electronic monitoring devices, and telecommunications. Communication with patients and the relationship between the health professional and patient are also changing. A wider range of healthcare and more complex care is occurring in the community environment and it is anticipated that individuals and families will take more responsibility for their own healthcare (Ministerial Taskforce on Nursing, 1998).

Consequently, nurses' roles are changing and nurses need to be proficient in information technology to provide safe and effective healthcare. Part of their role is to ensure their patients have access to relevant and reliable health information and information technology could provide easier access to this. However, it has been suggested that the current international shortage of nurses and the aging workforce may also affect how nurses use information technology in their practice (Richards, 2001).

Changes in Healthcare

In 1998, Towle proposed, “the greatest change in health services over the next decade is likely to be as a result of computers and telecommunications technology” (Towle, 1998). Remote monitoring, online consultations, and health information on the Internet are already occurring. Changes have also occurred in the patient-health professional relationship where patients may search the Internet for the best treatment regime for a particular health problem and the health professional who is able to provide that treatment (Carlile & Seifon, 1998). Patients have come to
expect access to their health professional via email or videoconferencing. Health education must, therefore, prepare health professionals for this changing environment.

Although the Internet was “thought to be an equalizer”, the gap between those who have and those who don’t have access to this information is increasing (Coverdell & Utley, 2005). This disparity may mean differences in health consumers receiving the most appropriate treatment and their ability to manage their own health. A 2001 poll by Harris Interactive showed that 68% of online adults in the United States (US) search for health information (Carty, 2001). In 2004, 60% of New Zealanders indicated they were Internet users (Social Statistics Division of Statistics New Zealand, 2004). However, income, educational qualifications and household structure were shown to affect whether Internet access was available in the home. This implies that there is an information gap in New Zealand too. Essentially this means that health information must continue to be available in both electronic and paper-based modes and health professionals need to ensure their patients have access to appropriate and reliable information in the different modes.

Coverdell and Utley (2005) proposed that nurses could be the main link between “disconnected” patients (that is, those who don’t have access to online information) and health information. To be able to be effective brokers of this information then nurses need to keep themselves up to date with current nursing knowledge and research, have the skills and knowledge to evaluate the information (KPMG Consulting, 2000), and be able to share this knowledge with their “disconnected” patients.
Safe and Effective Healthcare

Any person who interacts with the healthcare system expects a safe and effective service. Accordingly, the Committee on Healthcare proposed that safe and effective healthcare will develop from using information technology in healthcare (Institute of Medicine, 2001) and that an informatics competent workforce is necessary to ensure patient safety (Bakken et al., 2004; Rigby, 2004). Carlile and Sefton (1998) supported this by adding that graduates must be able to review and evaluate relevant health information sites and therefore, be able to advise their patients about where to access reliable information.

Health professionals are employed for their clinical expertise and often the health information systems have developed around them. Effken and Carty (2002) recommended that nurses are involved in the development of health information systems to ensure that the data input interface logically matches their practice. This would reduce the likelihood for data entry error, again ensuring patient safety.

However, only 5% of US hospitals have full electronic medical records and issues of patient safety can arise where electronic and paper-based systems are used complementarily. These dual systems can lead to “confusion, communication breakdown, and the opportunity for errors” (Abrahamsen, 2003, p.48) as often handwritten patient notes lack important data and don’t consistently document patient care, again compromising patient safety (Bakken et al., 2004). The WAVE (Working to Add Value through E-information) Advisory Board survey found that 57% of general practices in New Zealand used electronic record systems. However, within three years they expected up to 89% of practices would have electronic health records (Health Workforce Advisory Committee, 2002). There are dual systems in many New Zealand hospitals also.
Some patients have voiced concerns about health professionals’ competence at using information systems and have sought assurance that their data would not be misused, and would be kept secure (Rigby, 2004). In accordance with the Health Information Privacy Code 1994, New Zealand health professionals have a responsibility to keep a patient’s health information secure (Privacy Commission, 1994). Nurses, therefore, need the knowledge and skills to do this.

New Zealand law is to protect the health and safety of the public by ensuring that all health practitioners are competent to practise in their specific scope of practice ("Health Practitioner Competency Assurance Act", 2003). Nurses are expected to base their practice on reliable and valid research findings (Rolfe, 1999; Thompson, Cullum, McCaughan, Sheldon, & Raynor, 2004) and some health groups in the US “are insisting that their healthcare providers offer care based on evidence” (Tanner, Pierce, & Pravikoff, 2004a, p. 300). Carlile and Sefton (1998) concluded that electronic medical records would facilitate the assessment of treatment outcomes but stressed that health professionals also need the skills to access and assess this information for evidence-based practice. How do nurses develop these skills?

**Nursing Education**

“In 1984 Zeimer predicted that in 10 years students entering undergraduate nursing programs would be prepared to use computers and that the teaching of computing skills would not be needed” (Graveley, Lust, & Fullerton, 1999, p. 167). Similarly, Hales (1988) claimed “ten years from now, ... young men and women entering nursing will be as comfortable with computers as their predecessors are with stethoscopes and blood pressure cuffs” (p. 344). He suggested that graduating nurses will need no introduction to computers (Hales, 1988). This author has found that this
is not the case. There are still students who, on entry to the Bachelor of Nursing programme, lack basic computing skills.

The nurse of the future will need information technology and health technology skills and must be able to evaluate their effectiveness in providing nursing care. They have a responsibility also to empower their patients to use these technologies (KPMG Consulting, 2000). Therefore, nursing education needs to prepare nurses for the changing healthcare environment and nurses’ changing roles. Nurses need to be able to access and evaluate reliable sources of information to inform their practice, to ensure their practice is evidence-based. They need to be able to use the technologies in their workplace and accurately record patient outcomes to ensure patient safety. In a world where often there is an “information overload”, nurses need to be effective and efficient information brokers for their patients, to ensure they have access to reliable health information, in either electronic or paper-based form.

*Context and Aims of this Study*

What skills or competencies will the nurse of the future require to practise effectively and safely? How do they learn the skills to be effective and reliable information brokers? This study aims to identify whether the graduates from one polytechnic have the necessary competencies to meet the needs of the changing healthcare environment. The directors of nursing from one district health board are employers of graduates from the local polytechnic. They will be asked for their perspective on this. Similarly, some graduates from the local polytechnic will be asked for their views related to their own experiences.

In New Zealand in 1989, the Ministry of Education produced guidelines on how to include nursing informatics in nursing education programmes (Hausman,
The guidelines identified expected competencies for registered nurses, nurse administrators, nurse educators and nurse researchers. Nursing informatics was included as a curriculum thread when one New Zealand polytechnic’s Bachelor of Nursing programme was developed and implemented in 1995. Changes have been made to the content taught although the learning outcomes, based on the guidelines, have remained essentially the same. However, the effectiveness of these courses in preparing new graduates for the workplace has not been assessed since external moderation in 1998. Currently, the polytechnic is undertaking a review of the Bachelor of Nursing curriculum to ensure it meets the updated Nursing Council standards for nursing education. This study provides information that will assist in the review process.

Curran (2003) claimed, “… without informatics competencies, an individual cannot master the information and knowledge needed to succeed in today’s healthcare environment or to have as evidence-based practice” (p. 321). Therefore, for this to occur nurses need to be competent information technology (IT) users and, their undergraduate education must prepare them for the changing healthcare environment where electronic health records and evidence-based practice are the norm. It is important that graduating nurses “feel confident that the education and training they have received fully supports their professional needs – both initially and throughout their careers” (Ministerial Taskforce on Nursing, 1998, p. 49).

Nurses need to be computer and information literate and have the knowledge, skills and attitudes for nursing informatics competence. However, are the learning outcomes taught at the polytechnic still relevant and will they prepare nurses for nursing practice in the future?
Summary

This chapter has introduced the background for the presence of nursing informatics in a Bachelor of Nursing programme and described its current status at one polytechnic. The rationale for an informatics competent nursing workforce has been presented identifying its relevance for evidence-based nursing practice and for patient safety. Nursing informatics is defined, and the context for this study has been described providing the rationale for seeking this information.

In the next chapter, the literature will be used to identify specific nursing informatics competencies that nurses will require as beginning practitioners and consequently, what needs to be taught in their undergraduate education. It concludes by outlining the research questions. Chapter Three describes the participants, the methods used for data collection and analysis, and the ethical considerations. Chapter Four presents the results of the study and finally, Chapter Five discusses the findings, the limitations of the study, the implications for nursing education and nursing practice, and suggestions for further research.
CHAPTER 2 LITERATURE REVIEW

In this chapter, the literature will be used to define nursing informatics and to identify suggested nursing informatics competencies that nurses will require as beginning practitioners and consequently, what needs to be taught in their undergraduate education. It starts by defining nursing informatics and how nursing informatics competencies have evolved, from the definitive document by Hannah in 1986. This is explored from an international perspective and compared with where New Zealand stands at present. Reports on the effectiveness of nursing informatics education are reviewed as well as suggested methods of delivering this information. Finally, the research questions are proposed.

Definitions

Competence

Professional competence is defined as “the habitual and judicial use of communication, knowledge, technical skills, clinical reasoning, emotions, values, and reflection in daily practice for the benefit of the individuals and community being served” (Hudert, Hafferty, & Christakis, 1996, as cited in Greiner & Knebel, 2003, p. 24).

Nursing Informatics

Nursing informatics was first described by Scholes and Barber in 1980, as “the application of computer technology to all fields of nursing” (American Nurses Association, 2001, p. 12), with a focus on nurses being computer literate as well as being computer programmers. More latterly nursing informatics has been described as “the professional use of computers” that includes computer literacy, information
literacy, communication and management of clinical information (Shorten, Wallace, & Crookes, 2001).

Nursing informatics definitions have been reworded and re-focussed many times to reflect the changes in the use of communication and information technologies in nursing practice. The following definition for Nursing Informatics was adopted at a meeting held by the International Medical Informatics Association-Nursing Group (IMIA-NG, 1998): "Nursing informatics is the integration of nursing, its information, and information management with information processing and communication technology, to support the health of people world wide!" (p. 1). The focus changed to include communication technology and information literacy to support nurses’ decision-making. Computer programming was no longer seen as an essential skill. Nursing informatics thus included the concepts of computer literacy, information literacy, and informatics knowledge and skills.

However, as the nursing informatics environment changes and matures so must definitions of nursing informatics to reflect the changes. This can create problems in the idea of identifying a common definition. In New Zealand, there is no common definition of nursing informatics, so for this study the IMIA-NG definition will be used for its simplicity yet comprehensiveness.

Since the 1980’s, various international authors have identified nursing informatics competencies for nursing education (American Nurses Association, 2001; Bryson, 1991; Hales, 1988; Hausman, 1989a; Hebert, 2000; Jiang, Chen, & Chen, 2004; Magnus, Co, & Derkach, 1994; Marini, 2000; McNeil et al., 2003; Ronald & Skiba, 1988; Saranto & Leino-Kilpi, 1997; Staggers, Gassert, & Skiba, 2000; Vanderbeek et al., 1994; Watson, 2003; Yee, 2002). Most of these authors identified specific knowledge and skills relating to the degree of computer literacy
nurses require for practice. However, since 1998 information literacy has regularly appeared in the competencies. The place and definition of computer literacy as a component of nursing informatics education is now described, followed by information literacy and their place in nursing informatics competencies.

Computer Literacy

Although the Nursing Council of New Zealand does not use the term “computer literacy” in the competencies for the registered nurse scope of practice, one indicator of competence is “computer skills necessary to record, enter, store, retrieve and organise data” (Nursing Council of New Zealand, 2005a, p. 5), a basic level of computer literacy. Several authors have identified computer literacy as an essential skill for graduating nurses (Axford & McGuiness, 1994; Graveley, Lust, & Fullerton, 1999; Hales, 1988), whereas the Western Illinois University expects all their graduates to be computer literate (Leland et al., 2000, October 31).

Ringle (1981) proposed that to be literate meant, “to be educated regarding the fundamental or basic beliefs and methods of communication in society” (p. 12). The term computer literacy, he suggested, implies it is of equal importance as reading and writing.

The literature describing computer literacy is extensive. Initially, the key components were computing skills and programming but more recently programming has been replaced by information literacy and communication. Some authors include issues such as the impact of computers on society (Ringle, 1981), a positive attitude (Hess, 1994; Jiang, Chen, & Chen, 2004), and ethical issues (Leland et al., 2000, October 31). Hess suggested that “the ability to develop and maintain a positive, anxiety-free attitude or value structure toward computers” (Hess, 1994, p. 211) was necessary to become computer literate. Both Magnus et al. (1994) and
Jiang, Chen and Chen (2004) support this with Jiang et al.’s research rating attitude as the most important nursing informatics competence for graduating nurses.

When Axford and McGuiness (1994) reviewed the nursing informatics models used in education, they noted the focus on computer literacy but found no evidence of either nursing context or content. The National Health Service (NHS) in England, however, has modified the European Computer Driver’s Licence (ECDL), to provide a health context, to facilitate their employees’ learning (Cole & Kelsey, 2004). Coverdell and Utley (2005) suggested using the term “IT fluency”, as it implies an understanding of computer concepts and being able to apply them in any situation. Latterly, some authors have also included information literacy and communication in their descriptions of computer literacy (Childers, 2003; Cole & Kelsey, 2004; Leland et al., 2000, October 31).

Thus, according to the literature, definitions of computer literacy have evolved to include basic computing skills, information literacy and a positive attitude towards computers. Information literacy also needs to be clearly defined when reviewing the skills graduating nurses require.

Information Literacy

A widely accepted definition of information literacy is that proposed by the American Library Association, which is “an understanding and set of abilities enabling individuals to recognize when information is needed and have the capacity to locate, evaluate and use effectively the needed information” (Association of College and Research Libraries, 2000, p. 2). Several authors suggested that information literacy is a foundation skill required by all health professionals (Batchelor, 2003; NHS Information Authority, 2001, February; Saranto & Hovenga, 2004; E. Simpson & Courtney, 2002). Furthermore, the NHS described information
literacy as knowledge management, and expected nurses to have an advanced level of competence in information searches, database and library services, and in accessing patient and public information (NHS Information Authority, 2001, February), essential skills for evidence-based practice.

The American Library Association (ALA) developed standards of information literacy that included being able to use information ethically and legally, to critically evaluate information, and to incorporate selected information into one’s knowledge base and values (Association of College and Research Libraries, 2000). Moreover, it has been proposed that information literacy should be one aspect of the graduate profile along with computer literacy, academic literacy, statistical literacy and professional practices (Meldrum & Tootell, 2004).

Various authors have suggested how information literacy should be included in nurses’ education. In 1991, Bryson proposed nurses should “be able to use a library information retrieval system to search for documents” (Table 2, p. 102) and suggested this be taught in a nursing research course. Similarly, Hausman (1989) identified nurse researchers as the people who needed this skill. It appears that information literacy was not yet considered an outcome of nursing education for all nurses. However, in 1994, Axford and McGuiness suggested that information literacy should be included in nursing informatics education.

Batchelor (2003) claimed situating information literacy in nursing has developed in response to the increase in information technology and an increase in nursing literature. This is referred to in the Canadian Nurses’ Association competencies where nurses are required to “combine information to contribute to knowledge development in nursing” (Hebert, 2000, p. 12).
Information literacy has also been linked to the increased need for evidence-based practice and the ability to find the evidence to support or change nursing practice through the process of critical thinking (E. Simpson & Courtney, 2002). Shorten, et al. (2001) also support the idea that information literacy is necessary for nurses for evidence-based practice and lifelong learning and prescribed an integrated approach in teaching information literacy. However, Shaw-Kokot, McGraw and Moore (2002) suggested only the cognitive skills of information literacy need to be taught, as these are transferable to different tasks, an important consideration given the plethora of bibliographic databases available. Meldrum and Tootell (2004) agreed with this but included “use information in an ethical and socially responsible manner” (¶ 5), referring to nurses’ professional responsibility. They supported Verhey (1999), Shorten, et al. (2001) and Barnard, Nash and O’Brien (2005) with an integrated approach to teaching information literacy and suggested it required collaboration between library and academic staff.

The Health Practitioner Competency Assurance (HPCA) Act 2003 and the Nursing Council of New Zealand (NCNZ) require nurses keep themselves and their practice up to date. One indicator of competence listed by the NCNZ (2001) is “applies relevant research to underpin nursing assessment” (p. 5), an essential component of evidence-based practice. Therefore, graduating nurses need to be information literate to practise in the current milieu of evidence-based practice, where they must use their critical thinking skills to determine the appropriate care for their patients. This supports the place of information literacy as a component of nursing informatics education.
Nursing Informatics Competencies

Ronald and Skiba (1987) first identified informatics competencies specifically for nurses. These included the history of computing, computer concepts, system analysis and design, applications of computers to nursing, the role of the nurse in computerisation and, professional issues such as privacy, confidentiality and security of health information, and the impact of computers on society (Ronald & Skiba, 1988). However, Hales (1988) suggested that the beginning nurse should have competence with application software, telecommunications, and networking, thus identifying computer literacy and communication skills only. The same year, the IMIA-NI-WG8 recommended similar nursing informatics competencies for practising nurses, as well as for administrators, researchers and teachers in nursing (Peterson & Gerdin-Jelger, 1988). Although the concept of accessing data was included, this was related to patient information systems rather than information literacy (Vanderbeek et al., 1994). The NLN also used these competencies but included more computing skills (National League for Nursing, 1988).

Following on from these, Bryson (1991) interviewed nurse educators who were teaching in undergraduate nursing programmes in the US. They recommended computer literacy competencies as well as knowledge about the personal and social aspects of computer use for graduating nurses. More recently, Jiang, Chen and Chen (2004) used Bryson’s domains to group the 42 competencies they recommended for undergraduate nursing education. Additionally, the American Nurses Association included computer literacy and informatics competencies, as well as implementing “public and institutional policies on privacy, confidentiality and security of information” (American Nurses Association, 1994, p. 12), for graduating nurses.
Carter and Axford (1993) used the Delphi method to determine competencies for nurses practising in Australia. Several of the 17 domains identified related to computer literacy. However, they also included security, ergonomics, troubleshooting and the nurse’s role in information technology (Carter & Axford, 1993). They are one of the few to mention ergonomics as a competency. Watson (2003) also found that ergonomics was not seen as part of nursing informatics although, this is one of the learning outcomes of the introductory nursing informatics course at Christchurch Polytechnic Institute of Technology (Murray, 1994).

In their strategic plan for nursing informatics education, the National Advisory Committee on Nurse Education and Practice (NACNEP) proposed that nurses needed core informatics competencies, which included basic computing skills, as well as the ability to “analyse and interpret information needed to provide care, and implement policies related to privacy, confidentiality, and security of information” (Gassert, 1998, p. 265). Alongside this, they included understanding standard nursing taxonomies/nomenclatures as an essential competence. This was the first explicit reference to nursing datasets.

Saranto and Leino-Kilpi (1997) concluded that the important competencies for nurses were basic computer skills; knowledge about system security; data transfer, that included email and using bibliographic databases; and skills in computerised patient monitoring. Thus including other technologies nurses used in practice. Whereas, the nursing informatics course introduced in the American University of Beirut in 1996-1997 included basic computer skills; information literacy; communication; and knowing how to manage nursing and health care data and information (Marini, 2000). This last outcome included ethical and legal issues related to information systems.
Similarly, in 2000, IMIA-WG1 recommended essential competencies for all health professionals for their practice that included computer literacy and information literacy, as well as appropriate documentation, appropriate decision making, and efficient and responsible use of information processing tools (IMIA-WG1, 2004; IMIA-Working Group 1, 2000). These competencies also emphasise the ethical and professional issues for nurses using information systems. However, Staggers, Gassert and Curran (2001) claim that these competencies were never validated and were only recommendations.

Staggers et al. (2001), however, identified 304 comprehensive and explicit nursing informatics competencies that were validated in 2002. They suggested that their competencies were a useful resource for curriculum development in nursing programmes (Staggers, Gassert, & Curran, 2001, 2002). The competencies described by American Nurses Association in 2001, were based on those of Staggers et al. and expected the beginning nurse practitioner “to have basic computer literacy, information literacy and basic patient management skills” (Saba, Skiba, & Bickford, 2004, p. 79). Similarly, Repique (2004) identified 10 essential competencies for mental health nurses, from those collated by Staggers, et al. (2001), and classed them as computer literacy or information literacy competencies. He claimed this was a beginning level for mental health nurses and acknowledged that this list would need to be added to and changed along with advances in information technology (Repique, 2004), one of the few authors to do so.

Remarkably, Yee's (2002) research showed that beginning practitioners required basic IT skills related to using the hospital information system, scheduling systems, retrieving work-related procedures; and management and financial
statements. Yee did not identify information literacy as a necessary competence for nurses.

The “Health Professions Education” report identified five core competencies for health professionals (Greiner & Knebel, 2003). These were: to provide patient-centred care; work in a multidisciplinary team; employ evidence-based practice; apply quality improvement; and utilize informatics. They claimed that to be competent in employing evidence-based practice, health professionals needed to “know where and how to find the best possible sources of evidence” (Greiner & Knebel, 2003, p. 57) whereas, to “utilize informatics” entailed using electronic communication, managing knowledge, supporting decision-making and reducing error. They also included generic competencies such as computer skills, and understanding of security, ethical and legal issues when using information technology in practice.

In England, the National Health Service (NHS) Information Authority (2001) identified health informatics competency profiles for employees of the NHS. The domains where nurses require an advanced level of competence are data quality, information management, clinical informatics, security and confidentiality, and knowledge management. Knowledge management included information literacy as well as managing patient information to support their practice (NHS Information Authority, 2001, February). These comprehensive competencies reflect how informatics has evolved in response to the changing healthcare environment.

New Zealand

The Ministry of Education Continuing Education Division funded an education officer to develop a nursing informatics curriculum for New Zealand Schools of Nursing because, in practice, nurses were using information systems to
identify patient dependency levels in relation to staffing needs, for rostering and, in some places, nurses were using a patient information system (Hausman, 1989b). The guidelines identified specific knowledge, skills and attitudes, for computer literacy and computer applications, that all nurses required (Hausman, 1989a). They also included philosophical considerations, as well as additional specific competencies for nurse educators, nurse researchers and nurse managers/administrators (Hausman, 1989a). (It is again interesting to note that the use of bibliographic databases was identified as a competency for nurse researchers only.) This was a starting point for consensual integration of nursing informatics into basic and post basic nursing education programmes, however the method and degree of integration was left up to the individual institution (Appleton, Carr, & Hausman, 2000).

Klynveld Peat Marwick Group (KPMG) (2001), in their review of undergraduate nursing education in New Zealand, suggested that in ten years all nurses “will need to have generic computing skills to use information technologies” (p. 47) for a range of clinical and learning situations, and information literacy skills would be essential for practice. They proposed that the nurse of the future would communicate electronically with progressively informed consumers of health services, and become brokers or “interpreters of health information due to their expertise to distinguish poor information from rigorous evidence” (KPMG Consulting, 2001a, p. 13). One submission to their report identified the nurse of the future as having “information technology skills/computer literate/internet literate” (KPMG Consulting, 2001c, p. 68).

More recently, Watson (2003) surveyed 38 nurse educators and 28 clinical nurses in New Zealand and Australia. From this she identified 53 nursing informatics competencies, for beginning nurses. These she grouped into six themes or domains
related to basic computing skills, communication, information retrieval, security, and
knowledge of health care monitoring systems.

One of the competencies in the NCNZ, registered nurse scope of practice
“Ensures documentation is accurate and maintains confidentiality of information” is
assessed by the nurse being able to: “Demonstrate literacy and computer skills
necessary to record, enter, store, retrieve and organise data essential for care
delivery” (Nursing Council of New Zealand, 2005a, p. 5). This competency relates to
nursing informatics competencies required for patient safety and evidence-based
practice.

Evaluation of Nursing Informatics Education

Although nursing informatics has been included in schools of nursing
curricula for over 25 years the content taught and the effectiveness of the courses has
varied. In the 1980’s, courses in nursing informatics were introduced in some US
nursing schools and an undergraduate course was established at Georgetown
University School of Nursing in 1985 (Saba, 2001). When the goals of informatics
education were identified at the American Medical Informatics Association Spring
Congress, it was proposed that because health professionals work collaboratively,
they should learn collaboratively, particularly in informatics (Staggers, Gassert, &
Skiba, 2000).

Surveys of schools of nursing in the US, Europe and Australia have reported,
at different times, on the content of nursing informatics courses and the perceived
competence of graduates from these. In the US, some nursing curricula included
computer literacy and some computer-aided learning systems (Hannah, 1988). Ten
years later NACNEP (1997), Carty and Rosenfeld (1998), and Gravely, et al. (1999)
found that almost 50% of the schools of nursing surveyed offered no informatics
education, and of those who did, many focused solely on computer literacy. Several, however, integrated computer competencies into their nursing curricula (R. L. Simpson, 1998) but only graduates from 11 of the schools surveyed met the prescribed level of “technological excellence” (Carty & Rosenfeld, 1998). Furthermore, Gravely et al. (1999) found that nearly 50% of 156 undergraduate nursing students did not perceive themselves as computer literate.

Verhey (1999) evaluated the information literacy strand in the undergraduate curriculum in the San Francisco State University’s School of Nursing. From the students who completed the surveys, she found that 88% of the 1992 cohort and 62% of the 1996 cohort, on graduation, did not know how to use the bibliographic databases. However, nurses need to be able to access the relevant information from these databases, for evidence-based practice (Verhey, 1999). Furthermore, Carty and Rosenfeld (1998) found that only 57% of the 190 US schools of nursing they surveyed had Internet access, 55% had access to CINAHL and 46% had access to Medline. These latter two are the bibliographic databases most frequently used by nurses.

In her survey of Finnish undergraduate nursing students, Saranto (1998) found that 70% of students had completed a foundation-computing course and therefore had basic computing skills and a positive attitude towards computers. Furthermore, Cheek and Doskatsch (1998) established that nursing students were increasingly computer literate but had difficulties with information literacy. Similarly, Cole’s (2004) survey of 342 undergraduate nursing students found deficits in their information literacy. He reported that 48% were unable to use an electronic library catalogue, 46% did not know what a bibliographic database was, and 56% claimed they did not having the ability to access these databases. He considered these
as “serious skill deficits” (Cole, 2004). More recently, Desjardins, Cook, Jenkins, and Bakken (2005) found that students, on entry to Columbia University’s undergraduate and masters programmes in science, had basic computing skills but lacked information literacy skills. It appears that little has changed since 1998.

Furthermore, McNeil, et al. (2003) in their survey of 266 nursing programs in the US and Puerto Rico found that “computer literacy skills, rather than information literacy” (p. 347) was being taught at undergraduate level. However, 80% of the schools expected their graduates to demonstrate computer literacy skills and information literacy skills (McNeil et al., 2003). Remarkably, only 50% of the schools taught their students how to access electronic databases. This raises the question as to how information literacy was learned by the graduates in the other 30% of the schools of nursing.

The Nightingale European project was introduced in 1998 to promote consistency in the education of nurses in nursing informatics. It contained specific curriculum content and courseware for nursing schools (Paidi & Mantas, 2002). However, Schrader and Burkle (2000) identified inconsistencies in the amount and presence of nursing informatics in undergraduate nursing programmes in Germany, similar to the New Zealand situation described by Honey and Baker (2004).

An earlier survey of 38 Australian schools of nursing found that 13 schools had no informatics content and eight had no intention of including it. The undergraduate programmes focused on computer literacy and only minimally mentioned health information systems and nursing information systems (Chu & Thom, 1993). However, Pelletier (2001) found that 10% of Australian nursing students in their first year of postgraduate education indicated they had no computer skills and 35% of students did not meet the recommended level of computer literacy.
Both Verhey (1999) and Shorten et al. (2001) evaluated information literacy programmes in undergraduate nursing education showing varying levels of success. Verhey's programme in San Francisco University showed little change in information literacy whereas students from the other programme demonstrated a marked increase in confidence in searching for relevant information using bibliographic databases (Shorten, Wallace, & Crookes, 2001).

As recently as 2004, Cole identified some significant deficits in the computer and information literacy of undergraduate and postgraduate nursing students. Similarly, Macintosh-Murray and Choo (2005) found that healthcare providers were not "as competent in critical thinking and information skills as might be assumed" (p. 1343). Furthermore, if "Informatics competence is a prerequisite for healthcare professionals to optimally use information technology to promote patient safety and to enable evidence-based practice." (Desjardins, Cook, Jenkins, & Bakken, 2005, p. 906) then, nurses need to be computer and information literate and have the knowledge, skills and attitudes for nursing informatics competence. How competent are beginning nurse practitioners in New Zealand?

Delivery of Nursing Informatics

A range of teaching methods for nursing informatics has been implemented throughout the world. The recurring methods have been separate courses, either compulsory (McGonigle & Eggers, 1991; Perry & Mornhinweg, 1992) or elective (McKenna & Ribbons, 2000; Vanderbeek et al., 1994), taught using a nursing context to assist student learning but, more frequently nursing informatics has been integrated into clinical courses (Bryson, 1991; Carty & Rosenfeld, 1998; Honey & Baker, 2004; Saranto & Leino-Kilpi, 1997; Staggers, Gassert, & Skiba, 2000; Travis & Brennan, 1998; Vanderbeek et al., 1994). Information literacy has often been
taught in collaboration with library staff (Barnard, Nash, & O'Brien, 2005; Cheek & Doskatsch, 1998; Shorten, Wallace, & Crookes, 2001; Verhey, 1999). Furthermore, because nurses will practice within a multidisciplinary team on graduation, some authors recommend that a multidisciplinary approach should be used to teach informatics competencies (M. Sinclair & Gardner, 1999; Staggers, Gassert, & Skiba, 2000).

Glasgow Caledonian University used problem based scenarios and interactive learning tools to teach informatics (Hoy, Docherty, Topp, & Trinder, 2000), whereas other nursing programmes have introduced specific information technologies to teach nursing informatics competencies. Hardware, such as the Nightingale tracker (Sutherland, Wofford, Hamilton, & Schmidt, 2003) and personal digital assistants (PDAs) (Bakken et al., 2004; George & Davidson, 2005; Wilson & Dignam, 2000) have been introduced for students to learn appropriate documentation using simulated patient records. Other simulated health information systems, have been developed and integrated into nursing curricula to teach competence in these technologies (Cole, 2004; Connors, Weaver, Warren, & Miller, 2002).

Although some students identified a disparity between the nursing informatics they had learned and what was in practice, the employing agencies identified cost savings in their orientation of nursing graduates from Case Western Reserve University (Travis & Brennan, 1998).

New Zealand

Nursing informatics has been taught in different ways throughout NZ schools of nursing (Appleton, Carr, & Hausman, 2000). However, Murray (1994) used the learning outcomes suggested by Hausman (1989a) as the framework for teaching nursing informatics at Christchurch Polytechnic Institute of Technology. Initially,
three courses were developed with an informatics component integrated into one of the research papers. In 1997, this course was separated out to produce a fourth paper, although the intent of the course did not change. Initially, the introductory course was taught at the beginning of the second year of the programme but in 2000, this was moved to the first semester of the programme as more students were entering the programme with some degree of computer literacy, and students required the skills knowledge learned in this course earlier in their education.

Unitec New Zealand’s school of nursing has integrated the use of Personal Digital Assistants (PDAs) in clinical courses to introduce students to the technologies of practice and documentation of patient care (Wilson & Dignam, 2000). More recently, Honey and Baker (2004) used the competencies prescribed by Hausman (1989) in developing their integrated informatics curriculum. They proposed that the guidelines produced by Hausman in 1989 were still relevant yet they suggested it would be useful to identify standardised guidelines for New Zealand nursing education (Honey & Baker, 2004).

The new “Education Programme Standards for the Registered Nurse Scope of Practice” include information technology, research, and evidence-based practice in the curriculum content required for schools of nursing undergraduate programmes (Nursing Council of New Zealand, 2005b), this is a change from their 2002 competencies for comprehensive registration. However the number of hours and methods of teaching are still at the discretion of the individual schools of nursing.

Summary

From this review of the literature the place of nursing informatics in nursing and more particularly in nursing education is recognised universally to ensure patient safety and to support evidence-based practice. However, for nursing education in
informatics to be effective then nursing graduates need to be able to transfer the
skills and knowledge to practice (V. Sinclair, 1989).

What is required in practice? Do we produce graduates with the knowledge
skills and attitudes needed for practice? Are the learning outcomes taught at the
polytechnic still relevant and appropriate for the nurse of the future? This study
proposes to answer these questions.

Few sources were found that report the expectations of the workplace and
whether nursing informatics education meets these expectations (Staggers, Gassert,
& Skiba, 2000; Yee, 2002). However, no recent literature was found that assesses the
expectations of Directors of Nursing and compares this with those of their employees
who are graduates from one polytechnic. This study aims to fill that gap. It has been
designed to answer the following questions:

1. What nursing informatics competencies do Directors of Nursing
   expect their new graduates to have on entering the workplace?
2. To what extent do nursing graduates from the polytechnic have these
   competencies?
3. How well do the graduates themselves think they were prepared
   through their informatics education?
4. What nursing informatics competencies do the Directors of Nursing,
   and the graduates, think would be useful for the nurse of the future?

The following chapter describes the location of the study, the participants, and the
methods used for data collection and analysis. It discusses also the ethical
considerations, and the consent processes.
CHAPTER 3 METHOD

This chapter describes the methods used to answer the research questions, the location of this study, and the ethical considerations. The recruitment processes and profiles of the participants are outlined. This is followed by the procedures used for data collection and analysis.

The Location of this Study

The study has been limited to one district health board, which is in the same geographical area of New Zealand as the polytechnic. This was for convenience and because it is known that this district health board currently employs graduates from the polytechnic. Similarly the polytechnic was selected, as this has been the only Bachelor of Nursing programme in a New Zealand polytechnic with specific nursing informatics courses.

Participants

Recruitment Methods

The Chief Nursing Director of the district health board gave permission for the researcher to access the Directors of Nursing (DONs) for each of their major hospitals. This gave a representative sample of five Directors of Nursing from health facilities that provide a range of inpatient care. The DONs from these facilities were contacted via email and individual interviews arranged. Prior to their interview an information sheet (Appendix A) and consent form (Appendix B) were emailed to the DONs. On receipt of the signed consent forms, the time and place for the interviews were confirmed.

Graduates from the polytechnic were recruited for focus group interviews. The DONs identified suitable members of their staff who would be able to distribute
the flyers to nurses who had graduated from the local polytechnic between 2001 and 2004 and had worked for the district health board for at least one year. The employing institutions therefore identified the potential participants. Only two responses were received from this process so the flyers were followed up by invitations distributed the same staff members who had handed out the flyers. From this, a further three graduate nurses volunteered to participate. Interview times were suggested and a neutral place for the interview was selected. The participants self-selected the focus group interview they would participate in. This eventually produced two participants for each focus group interview. However, because one participant did not arrive for the second focus group the remaining participant was interviewed on her own. In order to obtain a more representative sample of graduates from the different practice areas, a further three graduates were approached by the researcher and agreed to individual interviews. This gave a total of six graduates.

The rationale for the time frame of 2001 to 2004 since graduation was because Benner’s (1984) “advanced beginner” or new graduate nurse initially focuses on the tasks and rules of the workplace and it is not until the end of their first year they have “settled in” in their roles as registered nurses (Benner, 1984; Tiffany, 1990). After the first year they are more able to reflect on the skills and knowledge they required on graduation. Similarly, because of the recency of their graduation, they may not have forgotten too much of their educational experiences, and changes in technology/informatics in practice would have been reasonably limited.

Profiles of the Participants

Directors of Nursing

The five DONs interviewed were registered nurses and women who held management positions in each of the major hospitals in the district health board. Two
of the hospitals provide secondary medical and surgical services, one is an acute tertiary hospital, one provides mental health services only and the fifth provides secondary medical, rehabilitation and mental health services in a smaller metropolitan area covered by the district health board (see Table 1). One DON has been in her position for seven years whereas four of the DONs have been employed in their positions for between two and three years. All five of the DONs have responsibility for the professional practice of the nurses they employ. However, four of them also have organisational and budgetary responsibility. The number of nurses they employ range from 130 to 980 fulltime equivalent (FTE) registered nurses as well as varying numbers of enrolled nurses.

The DONs employ between 2 and 30 graduates each year on their new graduate programmes. One DON offered permanent employment to her new graduates on completion of their one-year new graduate nurse programme whereas the others could not guarantee employment at the end of their programmes.

Four of the five DONs stated they had mostly taught themselves how to use the computer applications available to them, and two had completed informatics papers. They also commented that the district health board offered training in new applications, however for some programmes, for example Excel™ and PowerPoint™, the district health board paid an external agency to provide the training for the district health board staff. Only one DON said she had completed Excel through this process. Another DON had attended a community education course in computing.

*Graduate nurses*

Each one of the graduates had received some education in using computers or had used computers in their work prior to their commencing the Bachelor of Nursing
programme. The graduates were all registered nurses who had graduated from the polytechnic in the years 2001 and 2002 (see Table 1). They have worked in mental health nursing, medical and surgical nursing, older person’s health, and practice nursing. The nurse who worked in older persons’ health and the practice nurse had also worked for the district health board in mental health nursing. All have worked for the district health board for at least one year since graduation.

Table 1: Participants' profiles

<table>
<thead>
<tr>
<th>Category</th>
<th>Institution</th>
<th>Number</th>
<th>Year of graduation</th>
</tr>
</thead>
<tbody>
<tr>
<td>DON</td>
<td>Tertiary hospital</td>
<td>1</td>
<td>N/A</td>
</tr>
<tr>
<td>DON</td>
<td>Secondary hospital</td>
<td>3</td>
<td>N/A</td>
</tr>
<tr>
<td>DON</td>
<td>Secondary hospital with rural hospitals</td>
<td>1</td>
<td>N/A</td>
</tr>
<tr>
<td>Graduate</td>
<td>Mental health</td>
<td>2</td>
<td>2001</td>
</tr>
<tr>
<td>Graduate</td>
<td>Medical/Surgical</td>
<td>2</td>
<td>2001, 2002</td>
</tr>
<tr>
<td>Graduate</td>
<td>Older person’s health</td>
<td>1</td>
<td>2001</td>
</tr>
<tr>
<td>Graduate</td>
<td>General practice</td>
<td>1</td>
<td>2001</td>
</tr>
</tbody>
</table>

Data Collection

The original research plan was to use two methods of data collection to ensure internal validity. These were individual semi-structured audio taped interviews and focus group interviews to collect the data from the participants. However, because of the difficulties in recruiting participants for the focus groups, only one focus group was used.

Semi-structured Interview

Drever (1995) suggests the semi-structured interview is “especially suitable for investigating professional concerns and issues in educational policy and practice” (Drever, 1995)p. 17). Furthermore Cohen and Manion (1989) propose that the semi-structured interview method should be used when the interviewees have a “common ground” or experience. During the semi-structured interview, the interviewer is able
to constantly evaluate the data obtained and to prompt to elicit further relevant information (Cohen & Manion, 1989; Gay & Airasian, 2000).

Two groups of interviewees were identified as representative of populations from whom answers to the research questions could best be obtained. The first group included the Directors of Nursing (DONs) of the major health facilities. The second group were graduates from the Bachelor of Nursing programme at the local polytechnic.

The five DONs, who employ graduates from the polytechnic each year, have similar responsibilities in their positions within the district health board and therefore have a “common ground”. The semi-structured interview process provided the opportunity for the DONs to identify their experience, understanding and knowledge relating to nursing informatics, health information systems, and the competencies expected of the new graduates they employ.

*Focus group interview*

Initially, focus group interviews were planned for the registered nurses who had graduated from the local polytechnic graduates, as more participants were expected from this group. However, because of recruitment difficulties, only one focus group was used and the remainder of the graduates were individually interviewed using semi-structured interviews. This enabled the researcher to gain in-depth information about the graduates’ perceptions on the usefulness of the learning outcomes to their nursing practice.

A focus group interview “focuses on a respondent’s subjective responses to a known situation in which he has been involved” (Cohen & Manion, 1989)p. 310) and is used to elicit the perceptions and attitudes of interviewees, the language they use and their understanding on a particular topic (Kidder, 1981; Seaman, 1987). The
preferred number of participants for effective discussion in a focus group can range from four to eight but may involve as few as two (Wilkinson, 2003). The interviewer facilitated one focus group that was used to elicit the knowledge, attitudes and perceptions of two of the graduate nurses to the value of the learning outcomes of the nursing informatics courses taught at the polytechnic.

Instruments

DONs interviews

The proposed interview questions and the learning outcomes of all the nursing informatics courses were emailed to the DONs prior to the interviews. Interview guides were used to ensure all key points were covered in the interviews. The approximately one hour semi-structured interviews with the DONs were audio taped at the institutions where they are employed. The researcher transcribed the tapes and the transcripts were emailed to the DONs for verification of content.

Further questions for the DONs related to their experience with information systems and informatics education to elicit whether this related to their understanding of nursing informatics as a concept and an outcome of nursing education. They were also asked their understanding of the IMIA-WG1 definition of nursing informatics (chap. 2, p. 9) and whether they thought it was relevant to nursing today.

Interview guide questions for DONs

- What is your knowledge and experience with information systems?
- How have you learned this?
- Have you completed any nursing/health informatics courses?
- From your perception are the graduates competent in the learning outcomes for the nursing informatics courses at the polytechnic?
- Are there other nursing informatics competencies you would expect new graduate nurses to have for nursing practice in the future?
These questions were used to ascertain their understanding of nursing informatics as a concept, and to compare their use of health information systems with those used by the graduate nurses. These would also be used to compare their perceptions of the needs of new graduates with those of the graduates.

**Nursing Informatics learning outcomes**

- Explain the reasons for, and appropriate measures to protect data and people.
- Demonstrate personal ergonomic safety when using a computer.
- Use appropriate software for electronic communication.
- Select and analyse relevant on-line sources for nursing practice.
- Accurately input and save data, retrieve and print information.
- Use appropriate technology for presentation of information.
- Analyse human factor components of user interfaces.
- Describe emerging trends in health care informatics and their impact on the health care professions.
- Use appropriate applications for analysis and management of data for nursing research.
- Analyse how information systems can be used in health related areas.
- Create an example of an information system for analysis and decision making in nursing.
- Use and apply appropriate information technology in nursing practice.

**Graduate interviews**

The graduate nurses (GNs) were given the information sheet and consent form to read and sign prior to their interviews. Before the interview commenced, the graduates were asked to reflect on their practice and complete five-point Likert scales (see Table 2), as 1 High to 5 Low, for the eleven learning outcomes. This was to rate their usefulness and their frequency of use in their practice. This was anonymous and, was used as stimulus material (Barbour & Kitzinger, 1999) and
focus for the interviews. The participants in the focus group were encouraged to
discuss the learning outcomes with each other. Additionally, all interviewees were
given the opportunity to ask for clarification of the learning outcomes from the
interviewer, if required.

Table 2: Learning Outcomes Rating Scale

<table>
<thead>
<tr>
<th></th>
<th>Usefulness of learning outcome</th>
<th>Frequency of application of learning outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explain the reason for, and appropriate measures to protect data</td>
<td>High 1</td>
<td>High 1</td>
</tr>
<tr>
<td>and people.</td>
<td>Low 2</td>
<td>Low 2</td>
</tr>
<tr>
<td>Demonstrate personal ergonomic safety when using a computer.</td>
<td>Low 3</td>
<td>Low 3</td>
</tr>
<tr>
<td>Use appropriate software for electronic communication.</td>
<td>Low 4</td>
<td>Low 4</td>
</tr>
<tr>
<td>Select and analyse relevant on-line sources for nursing practice.</td>
<td>Low 5</td>
<td>Low 5</td>
</tr>
<tr>
<td>Accurately input and save data; retrieve and print information.</td>
<td>High 1</td>
<td>High 1</td>
</tr>
<tr>
<td>Analyse human factor components of user interfaces.</td>
<td>High 2</td>
<td>High 2</td>
</tr>
<tr>
<td>Describe emerging trends in health care informatics and their impact on the health care professions.</td>
<td>High 3</td>
<td>High 3</td>
</tr>
<tr>
<td>Use appropriate applications for analysis and management of data for nursing research</td>
<td>High 4</td>
<td>High 4</td>
</tr>
<tr>
<td>Analyse how information systems can be used in health related areas.</td>
<td>High 5</td>
<td>High 5</td>
</tr>
<tr>
<td>Create an example of an information system for analysis and decision making in nursing.</td>
<td>High 1</td>
<td>High 1</td>
</tr>
<tr>
<td>Use and apply appropriate information technology in nursing practice.</td>
<td>High 2</td>
<td>High 2</td>
</tr>
</tbody>
</table>

Information was also sought on the graduates’ perceptions of the usefulness
of these learning outcomes to future graduates and whether there were other nursing
informatics skills or knowledge they thought would be useful for these students. The
interviews were audio taped and transcribed by the researcher. Copies of the
transcripts were emailed to five of the participants for verification. The interviewee who did not use email was mailed her transcript for verification.

*Interview guide questions for graduates*

- In what way have the nursing informatics courses at polytechnic prepared you for the workplace?
- What was the most useful component?
- What applications do you regularly use in your practice?
- If we were to rewrite the current nursing informatics courses what do you think should be included?
- What other nursing informatics competencies would be useful for future practice?

Additional information was sought on the health information systems the graduates regularly used. This was to identify any similarities or differences with those the DONs used and, whether it related to their experience as graduates today and their view of those nurses would need in the future.

*Ethical Considerations*

The polytechnic gave ethical approval for this study prior to recruitment of participants. Neither University of Canterbury nor the district health board, where the participants were employed, required additional ethical approval processes.

The names of the interviewees are not used in the report. To maintain anonymity the DONs and graduates (GN) were identified by the abbreviation for their status and a number. For security purposes, the audiotapes and the typed transcripts of all interviews were copied, and the copies kept in a locked filing cabinet at the polytechnic. Only the researcher has access to these.
Consent

The DONs were emailed the information sheet (Appendix A) and consent form prior to their interviews so they were able to make an informed decision whether to participate. Similarly, the graduates read their information sheets (Appendix C) prior to their interviews. Thus all participants were aware that they could withdraw, including their information, from the study at any time. Signed consent forms (Appendix B) were obtained from each participant prior to commencing audio taping of the interviews.

Conflict of Interest

The researcher was also the educator in the nursing informatics courses at the polytechnic and was aware of potential influence in the focus groups and graduate nurse interviews. As, from the researcher’s experience, students generally focus on the course content rather than the learning outcomes, it was useful for the researcher to be the interviewer to clarify any uncertainties as to the content covered in the learning outcomes.

Analysis Methods

Analysis of interview data identifies the interviewees’ understanding of a specific topic. It may identify new perspectives or new knowledge on a topic (Kvale, 1996)p. 153). Content analysis, and descriptive statistics were used to analyse the data collected. Wilkinson (2003) says content analysis is useful for the analysis of interview and focus group data because it is based on the understanding that participants have beliefs and understandings that can be reliably drawn from what they say. The process used is where the researcher has determined the specific categories for coding from the literature reviewed (Wilkinson, 2003) and in this instance refers to the nursing informatics competencies and learning outcomes of the
nursing informatics courses. Descriptive statistics were used to describe the graduates' rating of the learning outcomes.

The data were analysed by listening to the interview tapes and reading through the transcripts many times to identify specific concepts for coding. A number of concepts related to nursing informatics competencies were identified, as well as several other concepts that influence graduate nurses, and other nurses, applying these skills and knowledge in practice. These were also coded.

Summary

This chapter has described the recruitment process and the profiles of the participants, followed by a description of the methods used for data collection and analysis. The following chapter presents the findings from the interviews and relates these to the research questions. The other factors that arose from the data are also described.
CHAPTER 4 RESULTS

This chapter presents the findings related to the research questions identified from the review of relevant literature. The views of the DONs and the graduates are considered in light of the current learning outcomes in the nursing informatics courses at the polytechnic. The differences or consensus between the two groups of participants are identified and their suggestions for the competencies expected for the nurse of the future are collated and compared. However, during the analysis other factors that affect nurses using information systems in practice were identified. These are presented later in this chapter.

Health Information Systems

Health information systems are described as electronic systems to record patient information from a range of sources. These may include patient demographic data as in patient management systems to more complex patient monitoring systems including wireless input to the patient’s file (Thede, 2003). When the DONs were asked for their understanding about information systems and in particular health information systems, they all described health information systems as management tools that would provide them with information for strategic planning. One DON described her understanding of health information systems as:

*bosically computerised digital systems that retain information, are able to produce information from a databank, able to, given the right instructions, analyse information, produce reports and in doing so provide support for health information, support for the health service.* (DON5).

She referred to the different contexts for using information systems as in direct patient care, accessing laboratory results, or as management tools for strategic
planning. However, one DON described three management systems she had been instrumental in developing. Two were for monitoring the use of specific categories of staff, whereas the third was for charge nurses to obtain projected data for managing their staffing and their unit’s budget. This DON made no reference to patient information as a component of health information systems.

Only two of the DONs referred to health information systems related to patient care and nursing practice. One suggested that health information systems are support systems for the “patient’s journey”. She was also the only DON to include monitoring devices, used in clinical practice, as information systems.

Definition of Nursing Informatics

The DONs were asked also to consider the following definition of nursing informatics and comment on its relevance and appropriateness to nursing in New Zealand:

Nursing informatics is the integration of nursing, its information and information management with information processing and communication technology to support world health. (From IMIA-WG8 Nursing Informatics, Stockholm, 1998)

The definition was seen to be broad and vague. However, they all acknowledged that it was one aspect of nursing and the technology used by nurses today. Furthermore, one DON said:

*It’s an acknowledgement that from a nursing point of view, technology is part of our world. It doesn’t matter whether it’s to do with documentation. You can’t nurse nowadays in a world … our world is full of technology. … from the pumps through to the patient information* (DON3).

This comment related also to her concept of health information systems.
Two of the DONs questioned the use of the phrase "integration of nursing", suggesting that nursing informatics is integrated into nursing rather than the other way around. One DON also queried its relevance to the local context of nursing as the definition referred to "world health". Although some aspects of the definition were queried, their views indicate acceptance of this definition for nursing informatics in New Zealand.

Applications Used

All interviewees were asked to describe the applications they frequently used. Both the DONs and the graduates used email, the district health board's Intranet, the Internet and word processing. The DONs used Excel™ occasionally and one graduate used it to develop graphs for incident reporting. Similarly, the DONs used PowerPoint™ only occasionally whereas the graduates who had undertaken further study were the ones who used it.

Three DONs said they regularly use bibliographic databases, such as CINAHL, and the Otago Medical School library. One also commented that the district health board has a subscription to the Joanna Briggs Institute but did not state whether she used it, although she expected her nurses to use it. The graduates involved in further study had accessed similar resources through the district health board and the libraries available where they had enrolled for their study.

None of the DONs currently uses a patient management system. However, the graduates' descriptions about the health information systems they regularly used were quite specific and related to patient information systems. One graduate in mental health described how she used the patient information system:

*The system that we use is primarily for like writing notes, care plans, accessing documents from years ago, accessing other peoples' notes and that*
sort of thing. ... in some wards they write progressive notes so then they just print off one sheet at the end of the shift, end of the 24 hours. (GN1)

These were then pasted into the patient’s case notes. Whereas the graduates who work in the tertiary hospital, used information systems differently. They referred to the patient management system that has basic admission, discharge and transfer functions, and the Éclair laboratory results system as the main information systems they used. These are all patient information systems.

Furthermore, the four DONs who have organisational and budgetary responsibility use data management systems such as Stargarden™, a rostering system; a workforce management system; the staff competency database; and WASP™, a staff-patient ratio system. Other management information systems identified were Chairman™, GAP™, tracking systems, Assessment and Rehabilitation operational reports, mental health databases, and a midwifery database that records midwife visits.

The graduates did not claim to use any of the management tools described by the DONs. However, the graduate who developed an information system described its use both as a management tool and as a support for patient care in the rest home. It included patient care plans because: “…it’s easier for the care staff to access the information on the computer than go through everybody’s files manually” (GN4). Other online documents on this system included accident and incident forms and reports.

The practice nurse described her use of their information system for referrals, assessments and recalls. However, she also used the information system for communicating with other health professionals within the practice. For example, she
would send an online message to the doctor when her patient needed to be seen by the doctor.

*Competencies Expected of New Graduates*

The interviewees were asked to identify what they perceived as the expected competencies of graduate nurses on entering the workplace. They identified competencies related to computer literacy, information literacy and informatics concepts but they also made reference to attitudes and understanding that affected nurses using these skills and knowledge. All the DONs used the learning outcomes as prompts to identify their expectations of new graduates.

*Computer literacy*

Four of the DONs required their new employees to be computer literate but two recommended that all graduates should have keyboarding skills as a minimum requirement. However, they all agreed that graduates should have basic computing skills. They related this to the need for accuracy of data entry to ensure that the information retrieved is therefore reliable. As one DON stated: "*The main thing at graduate level is to be competent to be able to enter data; understand why they are doing it. Enter it accurately. Feel competent with doing it. . . .*" (DON5).

Accuracy and understanding of data entry was also linked to using management systems that provide information for nurses in management positions to use.

All of the DONs reiterated the importance for all nurses to be competent with email. All, except one graduate, use email extensively in his/her work and personal lives. One of these graduates explained the importance of email in mental health nursing: "...we wouldn't have family meetings or we would never be able to organise a core team meeting, case team meeting . . . If we didn't have email it would just be impossible." (GN2).
Two of the DONs required their nurses to be competent with presentations and using PowerPoint™ for communicating information. One DON linked this to education of colleagues and patients, indicating that nurses enrolled in their new graduate programme are required to do a case presentation. Her expectation is that this would be “… a reasonably smart presentation” (DON1). One DON said it would be useful for graduates to be able to graph the data they collected. She linked this to incident reporting and her perception that nurses preferred visual representations of data.

The graduate nurses reinforced the DONs’ requirement for graduates to be computer literate because, as one graduate stated:

*everything is computerised now even xrays so being familiar with computers and your way round systems and basic computer literacy really, like opening files, closing files, saving, storing, use of keypad, mouse, they are all very relevant and important to your practice.* (GN6)

Information literacy

The DONs all stressed the importance of new graduates having information literacy skills to help them make links between theory and practice and to use the resources available. They expect that all nurses use evidence to support their practice, and access relevant sites for health information for their patients. Furthermore, the DONs suggested that the new graduates’ information literacy skills would help them access a wide range of information already available within the hospital information systems. Resources such as the diagnostic applications, and pharmacology information on the Intranet, are available to help them make decisions about the care they provide. Three of the graduates stated they had used the district health board Intranet for information on medications and guidelines for practice, and
the Internet for information for patients, particularly sites such as http://www.mindnz.co.nz (an information and resource site about mental illness).

**Informatics concepts**

Two of the DONs stressed the importance of confidentiality and ethics when using information systems and email, and particularly keeping patient information private. All the graduate nurses mentioned confidentiality as important for new graduates, one saying: “... that is something that is really important also in my workplace and it needs to be drummed into people really how important that information is and how confidential it is” (GN3); and another linked it to the professional responsibility of nurses. One DON raised the security issue of passwords. She noted that a number of nurses did not have access to the information systems, as they did not have a current password. She said she thought that was because they did not see the need for them to do this.

Only one DON expanded on the learning outcome relating to ergonomic safety and referred to some advice she received from a new employee about her own workstation setup. Whereas, one graduate commented that, from her experience, ergonomics in the workplace needed some attention.

In addition, the nursing informatics skills and knowledge that the DONs expected new graduates to have included understanding what systems are in the workplace; the terminologies used for data collection, and understanding why data is collected.

**Relevance of Current Learning Outcomes**

The DONs were asked to review again the learning outcomes of the courses currently taught at the local polytechnic and whether they thought the graduates had these competencies. The DONs acknowledged they had difficulty in ascertaining
whether new graduates from the local polytechnic had these competencies and it appeared that they had not sought this information from their staff.

The Likert scales showed the learning outcomes were seen as useful or more useful with 77% of responses on the learning outcomes usefulness rating scale, where they had circled 1, 2 or 3 (see Table 3). Only 5% of responses indicated they were not useful to learn (circled 4 or 5). Conversely, the learning outcomes were only slightly more likely to be used in practice, at 52%, with the least likely at 42%. These responses were either high or low in their frequency of use with only four responses at the midpoint of the scale.

Although five graduates identified all the current learning outcomes as useful, only six of the eleven learning outcomes were regularly used in their practice (see Table 3). These six outcomes related to computer literacy, information literacy and protection of data. They all indicated that they used data security measures in their practice and accurately entered, saved and retrieved data.

Only one graduate indicated that it was not useful to learn how to use different ways for communicating electronically. Similarly, one graduate rarely used this outcome in her practice. Four of the graduates indicated that the learning outcomes, related to creation and analysis of information systems were not applicable to their practice. All the graduates identified the learning outcome for information literacy as important to learn. However, one graduate rarely used this in her practice. Although all the graduates recorded that ergonomics knowledge was useful to learn, their use of this knowledge was evenly distributed around the midpoint of the scale.

One graduate summed up her learning from the courses and computer literacy:
I think it's almost like a subliminal thing; it just comes. You don't actually know that you know but you've had some knowledge so therefore ... It's easier to use the computers on a daily basis because somewhere back in the recesses you've got that underlying knowledge (GN6)

Table 3: Frequency of Graduate Nurses’ responses

<table>
<thead>
<tr>
<th></th>
<th>Usefulness of learning outcome</th>
<th>Frequency of application of learning outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Explain the reason for, and appropriate measures to protect</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>data and people</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Demonstrate personal ergonomic safety when using a computer.</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Use appropriate software for electronic communication.</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Select and analyse relevant online sources for nursing practice.</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>Accurately input and save data; retrieve and print information.</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Analyse human factor components of user interfaces.</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Describe emerging trends in health care informatics and their</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>impact on the health care professions.</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Use appropriate applications for analysis and management of</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>data for nursing research</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Analyse how information systems can be used in health related</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>areas.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Create an example of an information system for analysis and</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>decision making in nursing.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use and apply appropriate information technology in nursing</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>practice.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. Total = 6 responses.
Scale: High = 1, Higher than average = 2, Average = 3, Lower than average = 4, Low = 5.

Competencies for the Nurse of the Future

All five DONs said the current learning outcomes were appropriate.

However, they expanded on the concept of computer literacy and in particular the use of management systems. The graduates were more specific about the
competencies they thought that future graduates would require, making suggestions for the course content.

*Computer literacy*

Although all interviewees acknowledged that, as time progresses, more students on entry to the programmes would be computer literate, one graduate said that the basic skills would still be very important. However, he suggested that there should also be more emphasis on database structure because, he said, patient information systems are databases.

The DONs suggested including learning how to use data entry devices that could be used at the bedside or in the community. Two particularly referred to personal digital assistants (PDAs) as devices that would be used in the future. However, one graduate added: “... we’ve got barcode scanning coming in now and I can just see that one day that’s going to link to a record on a ... you could utilise that at the bedside too with all your vital signs and everything and keep a very good clinical record” (GN6).

Furthermore, two of the DONs mentioned that nursing practice in the future would include medication systems and access to comprehensive pharmacology information. Whereas, one DON identified electronic nursing care plans as tools for future nursing practise and that new graduates would need to know how to use these. One of the graduates had developed these in the rest home and the staff there were currently using them.

Two of the DONs stressed the importance of communication in the future nursing environment. They described the use of email for communicating with colleagues and patients, and also for providing education. Three of the DONs referred to nurses being able to develop quality presentations for health promotion
I think it would be helpful if they could understand how people talk about case mixes and DRGs and the important systems and a bit like what sort of information do we have to report on to Ministry of Health for instance. ... Knowing what information we are required to report on; how that might impact on what they are doing day to day. (DON1)

Another DON, who saw this lack of understanding affecting data entry, supported this. Similarly, the graduates expected future graduates to have some understanding about systems used in the workplace, the terminologies used for data collection and, understanding why data is collected.

One graduate suggested:

education on what each kind of sector uses in regards to computers and how much ... Like in general wards they use computers for this, this and this ... cos then the student's got an idea that if they go into this field that computers are being used and play a big part, and if they go into this field they will be handwriting everything. (GN1)

Whereas, another graduate proposed introducing simulated patient information systems, for students to practice on.

Again from a management perspective one DON commented on the need for a common language that nurses could relate to their practice. She saw this as being necessary for nurses to be able to use the information. She related this to nurses having difficulty understanding the coding systems used and relating them to patients in the ward or department. She also stressed the advantage of having correct information that is relevant, to support what nurses intuitively know.

When the suggestion of nurses using management systems was put to the graduates, one commented:
If I was taught that in the degree course and then I come out now and three years post the degree and doing, working on the ward and seeing myself in that environment for some time to come, by the time I came to use that information I think that I wouldn’t have remembered, cos I wouldn’t have been using it (GN3).

She suggested that she would learn about it when she needed to use it. Another graduate questioned the rationale for this, identifying it as another task for nurses to include in their workload.

Other factors

The additional factors that were identified by both groups of interviewees were access, attitudes, transition to practice and the nursing context of informatics education.

Access

All five DONs commented on the difficulty some of their nurses have in accessing computers for data entry, accessing patient information and for accessing online resources to support their practice. This was described as a resource issue because, as one DON identified, there are not enough computers. Another DON linked this to nurses not having the time or opportunity to use the patient information system. However, some nurses did not have current passwords to access the patient information system and consequently, did not have Internet access. They were therefore unable to access information to support their practice, or to give their patients.

Two of the graduates also described issues of access to computers as affecting the way they practised. One stated: “... in one of our offices we have 2 computers but we have four staff so it’s just not practical for all four staff to type
their notes” (GN1). They concluded that this often validated the continued use of handwritten progress notes for some nurses, as there was not always a computer available to write up their patient notes at the end of the shift. One graduate also commented that some of the day staff chose not to use the computers, as the ward clerks would enter their notes for them.

Another factor was the usability of the system. One DON stated that the information system that is used at present needed some improvement to facilitate documentation and access to patient information. She suggested that it was not “user friendly”. Similarly, one of the graduates said that, although their patient information system was a useful system, she sometimes had some difficulties in accessing patient information. She claimed the information was not presented logically.

Attitudes

Two of the DONs felt that new graduates should be confident in using computers. However, they went on to say that often the culture of the workplace inhibited new graduates using the hospital information systems available to them. One said:

the risk of them being sucked into an existing culture is very high, which means that their comfort level to actually start doing some of this stuff is diminished. It is within that ward setting or department setting they don’t do it ... and the graduate nurse isn’t going to feel like they’ve got that confidence to do it (DON4)

Three of the DONs commented that it was important for nurses to accept that the technology and information systems are there to support their practice. One DON compared it to taking blood pressures, another essential part of a nurse’s role.

Additionally, one DON commented that they may have the competencies but the
motivation to apply them to nursing practice may not always be there. She described her recent interaction with a staff nurse who had not accessed Joanna Briggs Institute for some relevant nursing practice guidelines on an aspect of nursing care she was interested in. Although the nurse knew how to access the site, she had not followed this through.

Other factors the DONs thought should be taken into consideration were the aging nursing workforce and the aging population. They commented that older staff were often resistant to using the information systems and two of the DONs mentioned some were “still in the kardex mode” referring to recording methods of the 1960’s. Another DON also expressed concern about the aging workforce and her perception of their difficulty in adapting to an increase in information technology. One of the graduates explained how some of the nurses she worked with used perceived naivety to manage this difficulty. She claimed that a lot of staff had avoided attending the training for this system.

One graduate attempted to rationalise nurses’ attitudes towards computers and patient information systems in this way: “I think because people don’t associate computers with nursing, people are putting up these walls, perhaps. Whereas they are a part of their daily activity regardless of what we do” (GN4). Another graduate suggested that the introduction of patient information systems had to be carefully managed because individual learning styles needed to be considered. However, one graduate suggested that graduates could be “empowered” by their informatics competence, to question some practices they thought were not correct.

Transition to Practice

The transition from student to registered nurse affects graduates in different ways. One DON described the difficulty some nurses had in their transition to
practice and suggested that the new graduates could advise them what would help them in their transition to registered nurse. One graduate suggested that although the transition may be challenging there are ways the graduate could control the situation to their own advantage:

it's quite hard being a new grad because you've got everything to take in. You're trying to fit in. You've got all these other things going on but at least if you are good at something you can focus on it. If you could be the one that people can talk to you about the computers or if you can show someone something else or pick that up really quickly you sort of ... I always really hang on to the things that I'm good at (GN5).

She went on to say that the Bachelor of Nursing programme gave graduates basic presentation and word processing skills, which also gave them an advantage when undertaking postgraduate study.

Two of the graduates identified difficulties with the time lapse between learning the skills and knowledge and using them in practice. Neither of these graduates have undertaken postgraduate education. One suggested she would gain that information when she needed it. However, another graduate suggested it was easier to refresh that knowledge rather than learn it as new knowledge on top of learning how to apply it to practice.

Context

Four of the graduates stressed the need to continue to link nursing informatics content to practice. This, they said, was to help students see the relevance of nursing informatics to nursing. Four of the DONs commented on the need to keep nursing informatics in context also, from a practice and an educational perspective.
One DON stressed the importance for graduates to understand the principles of information systems as she saw these as transferable to any workplace. However, she also emphasised the need for nurses to see technology as “one tool” and for them to know how to adapt to different situations, as well as keeping patient-focused. Similarly one of the graduates said: “if it makes it easier in the long run and you’ve had the proper implementation of say a new information system or something, people can get past that and see the potential benefits for patient outcome, patient care” (GN6).

Summary

The interviewees have confirmed that the current learning outcomes taught at the polytechnic are appropriate for new graduates. Although the graduates have these competencies, they indicated that they did not all use them in their nursing practice.

Both groups of participants recommended that undergraduate students should be given more information and exposure to the current health information systems. They also suggested that security and confidentiality issues should be emphasised, and particularly, accuracy in entering data. The DONs linked data entry to being able to access reliable data for management purposes.

Other issues that were identified as impacting on nurses’ use of information systems in practice were access, attitude, and making the transition to practice. Both groups suggested that nursing informatics competencies need to be taught in context, that is, focusing on nursing informatics as one of the many “tools of nursing”.
CHAPTER 5 DISCUSSION

The use of information technology is dependent on nurses’ ability to use the information systems in practice. Therefore, it is essential to determine whether nurses in practice and their employers consider the current learning outcomes taught at the polytechnic relevant and appropriate for nurses today and in the future healthcare environment. The participants in this study agreed that they are relevant and appropriate but also identified factors that affect nurses using information systems. Additionally, they also recommended some content and delivery methods that could be included in the curriculum. Because evidence-based practice and patient safety are key components of nursing practice, their links to the proposed competencies are explored.

As the curriculum at the polytechnic is currently being reviewed, the implications of the findings to curriculum development, and nursing practice, are identified. Finally, the limitations of this research and recommendations for further research are presented.

*Nursing Informatics Competencies for Graduating Nurses*

The literature has shown that nursing informatics competence is essential for patient safety and for evidence-based nursing practice. The competencies were described as computer literacy, information literacy and informatics. Because the DONs said they did not know whether the graduates from the polytechnic had these competencies the information obtained from the graduates becomes more important.

It is interesting to note that, although the DONs said they had limited basic computing skills, they expected the new graduates to be computer literate. This may
reflect their acceptance of the place of information technologies in nursing practice rather than their own use of information systems.

Computer literacy has been linked to accurate data entry and therefore, can affect patient safety and the usefulness of the information obtained from management systems. The literature and the interviewees identified this as an essential skill for nurses. NCNZ have also included computer literacy as a competence for registered nurses (Nursing Council of New Zealand, 2004). Similarly, Watson (2003) proposed “consistency” in data entry as an expected competency. She also suggested using a common nursing language or terminology to reduce the likelihood of errors when entering data. One of the DONs, as well as several authors, mentioned terminology in this context (Bakken et al., 2004; Gassert, 1998; Thede, 2003) and linked it to patient safety.

Many authors have proposed that competence in word processing, spreadsheet and database programs are essential skills for nursing practice (Greiner & Knebel, 2003; Hales, 1988; Hausman, 1989a; IMIA-WG1, 2004; Marini, 2000; Saranto & Leino-Kilpi, 1997; Watson, 2003). However, the DONs and the graduates indicated that they expected new graduates to be competent in word processing and PowerPoint™, as Honey and Baker (2005) have outlined in their curriculum.

At the time of her review, Hausman (1989) found that nurses were using management systems for rostering, dependency level recording systems and patient management. Furthermore, Watson (2003) and Yee (2002) identified that undergraduate education should include hospital information systems and how nurses used them. Yee (2002) also suggested that students should be exposed to these systems during their undergraduate clinical experience. However, the DONs’ and graduates use quite different applications in their work. Here their recommendations
were quite different and reflected their own use of applications and information systems.

The DONs saw graduates’ lack of understanding about the management systems currently used in practice as a deficit in the current nursing informatics courses. However, the graduates implied that if they were introduced to these systems as students they would have forgotten this information by the time they came to use it. They proposed, as does Benner (1984), it was initially more important for them to learn and adapt to their role as beginning practitioners.

Many authors have recognized email as an essential basic computing skill for nursing practice. In 1988, Hales recommended that nurses be competent in communicating electronically. Furthermore, since 1997 it has been identified as an essential competency (KPMG Consulting, 2001c; Marini, 2000; Saranto & Leino-Kilpi, 1997; Watson, 2003). Although all participants used email, not all the graduates used it in their work. Interestingly, the DONs referred to email as an emerging means of communication with patients. However, the graduates working in mental health described email as an essential tool they regularly used to communicate with colleagues, patients, and their supervisors.

Many authors have also identified information literacy as an essential tool for evidence-based practice (Meldrum & Tootell, 2004; NHS Information Authority, 2001, February; Shorten, Wallace, & Crookes, 2001; Watson, 2003). Similarly, most participants linked information literacy to evidence-based practice and considered it an essential competence for all nurses. Some linked it to information to support or improve their practice, and others to evaluating health information for patients.

According to one DON, access to the Internet affected nurses’ ability to retrieve relevant information as not all nurses in practice have this access. This is
partly due to them not having current passwords to access the hospital network, let alone the Internet. It could be argued that this is an ethical responsibility for nurses.

Similarly, not all patients have Internet access so nurses become the links for these patients to the relevant information, the links for the “disconnected” (Coverdell & Utley, 2005). The mental health nurses identified themselves as the “information brokers” described in the KPMG report (KPMG Consulting, 2001b). These competencies can also be linked to patient safety by ensuring that patients are referred to, and have access to, appropriate and reliable health information.

Some authors described the role of information users and nurses’ professional and ethical responsibilities when using patient information systems (American Nurses Association, 2001; Gassert, 1998; Greiner & Knebel, 2003; IMIA-WG1, 2004; Saranto & Leino-Kilpi, 1997). Similarly, the recurring informatics competencies that arose from the interviews were data protection, data security and confidentiality of information. However, only two interviewees mentioned ergonomics, which was also highlighted as a deficit in Watson’s (2003) research. It is interesting that health professionals did not emphasise a concept that affects their own health.

It could be argued that some of the learning outcomes the graduates were not using in practice were due to a lack of opportunity to do so. For example, most of the graduates are not currently involved in research and this may have influenced their rating of the learning outcome “Use appropriate applications for analysis and management of data for nursing research”. Similarly, they are not currently participating in evaluation of health information systems so the leaning outcome relating to user interfaces was not indicated as relevant.
Future Healthcare Environment

Several of the interviewees referred to changes in healthcare, and recommended that students should know about the potential of wireless technologies and the use of PDAs in practice. Some authors have linked this to patient safety (Bakken et al., 2004; Saba, 2001; Wilson & Dignam, 2000) and security issues, whereas Saba (2001) also referred to the possible challenges for nurses to respond to the new technologies. Additionally, one graduate suggested changes needed to be managed effectively so that the new technologies would be accepted and integrated into their practice.

One DON mentioned videoconferencing as a future means of communicating with patients in the wider community. However, Gassert (1998) proposed this some time ago. Perhaps this DON saw videoconferencing as a new concept for nursing practice in New Zealand.

Patient Safety

The IOM (2001) stated in their report that an informatics competent workforce is essential for patient safety. It is therefore the School of Nursing’s responsibility to ensure that graduates have the appropriate informatics competencies to promote patient safety.

One of the issues related to patient safety is the continued concurrent use of electronic and paper-based systems. It is important that the dual systems are both current and accurate (Abrahamsen, 2003). This means that nurses must have, and use, their access to the health provider’s network and the Internet. If nurses are asking other personnel to enter their data, as one graduate stated, then are they relinquishing their responsibility and accountability for the data also? Furthermore, accuracy and timeliness of data entry mean the information is available when
required. This is linked to access, when nurses don’t have access because they haven’t completed the specific training, or don’t have a current password. Without access to the patient management system or the Internet, the care nurses provide may be compromised, as they may not have the relevant information or the latest patient information. These are surely issues of patient safety.

Bakken et al. (2004) described the use of PDAs as a means of ensuring patient safety by entering the data as it is received, directly on to the PDA, rather than taking notes and updating the patient information later. Furthermore, Effen and Carty (2002) suggested that nurses should be involved in evaluating information systems to ensure the flow of information logically followed the way they practised. However, the applications currently used were described by one DON as “not that friendly” and by a graduate as not being logical. This reinforces the need to include the development of databases and information systems, and particularly the human factors component, in nursing informatics education.

The Health Information Privacy Code 1994 sets out health professionals’ responsibilities for security and confidentiality of health information. These are also linked to patient safety. If the information is held securely then it will be available when required. Moreover, patients need to have confidence that their information is secure (Rigby, 2004). However, the district health board currently has more than one patient management system and there is sometimes difficulty in accessing patient’s information. As one graduate said:

*It’s a nightmare trying to get notes on people at midnight; on people that have come in acutely. And it’s even worse if they’ve got mental health issues cos you can just never get hold of that because the systems don’t talk* (GN2).
This is certainly a safety issue as they may be unaware of any allergies, reactions or other relevant information in their patient’s health history.

Evidence-based Practice

Access has been described as a component of patient safety but it is also related to evidence-based practice. For nurses to use evidence to support their practice, they need access to the resources and the information literacy skills to find the relevant information. Many authors have acknowledged that nurses must employ evidence-based practice (Carlile & Sefton, 1998; Curran, 2003; Desjardins, Cook, Jenkins, & Bakken, 2005; Rolfe, 1999; Shorten, Wallace, & Crookes, 2001; E. Simpson & Courtney, 2002; Tanner, Pierce, & Pravikoff, 2004b; Thompson, Cullum, McCaughan, Sheldon, & Raynor, 2004; Verhey, 1999). Similarly, they must be able to evaluate the information they give, or refer their patients to, thus fulfilling their role as “information brokers” (KPMG Consulting, 2001c). It is nurses’ responsibility to ensure that their patients receive the current relevant health information in either paper-based format, or the link to the relevant website.

As patients have increased access to the Internet and online access to health professionals and health information, nurses have a responsibility to be competent in these also. Similarly, they need to be able to communicate electronically with their patients, whether by email or videoconferencing.

Both DONs and graduates identified difficulty in accepting computers in nursing as a barrier to some nurses accessing information related to their practice. They also linked this to the aging workforce and their difficulties in accepting changes. Richards (2003) also supports this. Furthermore, several authors have identified attitude as an important aspect in nursing education (Murray, 1994) and when introducing new nurses to the technologies in the workplace (Hess, 1994;

Transition to practice

Transition from student to a beginning nurse practitioner (Benner, 1984) is never an easy journey. By giving students the basic nursing informatics competencies the polytechnic aims to enhance that transition. One graduate claimed that using her nursing informatics skills and knowledge facilitated her transition. This is supported by Travis and Brennan (1998), who concluded: “... when students [are] exposed to informatics concepts within the context of information technology ... they can become contributing members of the health care team within a relatively short period of time” (Evaluation, ¶10). This may help nurses to assimilate into the workplace, at times in spite of the workplace culture.

Implications

The findings from this study have implications for curriculum development in nursing education, and for nursing practice. The current learning outcomes were described as relevant for future graduates from the polytechnic. However, the content identified for future nurses should also be included in the new curriculum.

Although Sinclair (1989) suggested teaching nursing informatics in context, in the early 1990’s, Axford and McGuiness (1994) found no evidence of nursing informatics being taught within a practice context. Since then, some Schools of Nursing have integrated nursing informatics into clinical practice courses. Similarly, the NHS has adapted the European Computer Drivers’ Licence (ECDL) to their health environment (NHS Information Authority, 2001, February). The graduates all stressed that nursing informatics should be taught within a nursing practice context and gave suggestions for how this might occur. This was, therefore, seen as a deficit
in their education. Some of the nursing informatics content could be integrated into the clinical practice papers using simulated patient information systems.

The HPCA Act (2005) and Nursing Council of New Zealand require education providers to collaborate with the practice environment to ensure graduates meet the needs of industry. Closer consultation is a necessary outcome of this. Collaboration would help identify issues that affect graduates’ transition into the workplace. One DON suggested that new graduates could inform nurses in practice in ways that would assist their transition to practice. However, the workplace culture, that one DON identified, and the lack of computing resources in the workplace require intervention to aid graduates’ transition. The district health board also has a responsibility to provide more computers to facilitate nurses’ access to patient information and online health information.

Furthermore, nurses should be involved in the development and evaluation of information systems to ensure they meet their needs and the data flows in a logical way, reflecting their practice (Effken & Carty, 2002). This may assist in breaking down the barriers that preclude some nurses using information systems to support their practice. Nurses also need to have a strong voice in the project teams that evaluate information systems for the district health board.

Communication with some groups of patients will be increasingly online. Therefore, employers must ascertain their employees have the skills and the access to do this. Again, this is a resource issue and all nurses must have and use their access to the network and the resources available. They must also have the skills and knowledge to integrate this, and other emerging methods of communicating with their patients. Employers have a responsibility to provide the training and the resources for this to occur.
Recommendations

Curriculum content

The current learning outcomes should be incorporated into the new curriculum because the interviewees believed they are relevant and appropriate for the nurse of the future. The method of delivery and the content could be refined in light of the suggestions from this group of nurses.

Various authors have suggested ways of integrating nursing informatics competencies into undergraduate nursing education, rather than having separate courses. Additionally, information technologies have been introduced in different ways as teaching tools. These suggestions should be considered when developing the School of Nursing’s new curriculum. The graduates proposed that it would be useful for new graduates to have some understanding about patient information systems, what they look like, and how nurses use them. They also suggested ways this might be integrated into the curriculum.

One of the graduates also linked an understanding about databases to effective use of patient information systems. This is essentially the rationale for the current teaching about databases in the curriculum. Clearer links to health information systems would contextualise this learning, thus reinforcing the graduates’ suggestion for more information about current patient management systems in the Bachelor of Nursing curriculum. However, an introduction to two of the patient management systems used by the district health board and the application used by many of the general practices in the city have been introduced into the course content since these nurses graduated.

Many authors have linked nursing informatics competence to patient safety and evidence-based practice. This supports the place of nursing informatics in the
curriculum and its importance for safe and effective healthcare. Furthermore, emphasis on patient safety and evidence-based practice would contextualise student learning.

This group of graduates all had prior experience with computers before they commenced their nursing education. The nursing informatics courses were developed to prepare nurses for the workplace but with more students having some degree of computer literacy it would be useful to identify their skill and knowledge deficits on entry to the programme. Once this is determined the relevant content can be included in the Bachelor of Nursing curriculum. The outcome must still comply with that required by Nursing Council of New Zealand, that is, “Demonstrate literacy and computer skills necessary to record, enter, store, retrieve and organise data essential for care delivery” (Nursing Council of New Zealand, 2005a, p. 5).

_Nursing Informatics Guidelines for NZ Nursing Education_

Honey and Baker (2004) implied that the guidelines from Hausman (1989) were still relevant. However, they also suggested that it would be useful to update these. It would be useful to review these guidelines considering Watson’s findings and those from this study. Furthermore, since Hausman (1989) wrote the guidelines, the students’ skill base has changed, as have the applications that nurses use in practice. Health Informatics New Zealand (HINZ) has sections for nursing informatics and for education. The members of these sections could be delegated this task as they would have the appropriate knowledge and experience.

Although the polytechnic originally used Hausman’s (1989) guidelines for the learning outcomes for the nursing informatics courses, these have been modified to reflect the changing healthcare environment and increasing competence of students. This was also in response to the dynamic nature and increasing
sophistication of information technology. For example, information literacy has become a learning outcome for all students, rather than for nurse researchers only, as originally proposed (Hausman, 1989a).

Hebert (2000) described the development of a Canadian definition of nursing informatics. It may be useful to consider whether a New Zealand definition for nursing informatics is also needed, as Honey and Baker (2005) proposed. This may facilitate nurses’ understanding of nursing informatics and its role as a support for nursing practice. In this way nursing informatics would become more overt in nursing practice and nursing education.

Limitations

This study involved participants from one geographical area of New Zealand. The DONs were all employed in the major hospitals of one district health board. The graduates had all worked for the same district health board for more than one year.

Because the graduates had graduated more than three years previously, their recall of what they had learned in the nursing informatics courses and how they initially integrated it into their practice may be unclear. Similarly, because all had experience with computers prior to their commencing the Bachelor of Nursing programme, they sometimes had difficulty in separating out what was prior knowledge. Finnish nursing students who had basic computing skills prior to their commencing their undergraduate education were reported to have a positive attitude to computers (Saranto, 1998). Prior experience may have also influenced the graduates in this study acceptance of the nursing informatics component of their education. This may have affected their responses.

Therefore, this information cannot be generalised to all new graduates from this polytechnic. Similarly, it cannot be generalised to all new graduates throughout
New Zealand. There may be other issues within other district health boards that affect nurses using information systems in their practice. However, these issues were important to these participants.

The nursing informatics courses' learning outcomes were used as the framework for the interview questions. Because the learning outcomes were quite broad some of the participants had difficulty identifying competencies as these related more to the content of the courses. Furthermore, the content of the courses has been updated since these graduates completed the courses and they were not all aware of these changes. This difference in knowledge about the course content may have skewed their responses.

There were also problems in recruiting graduates, within the timeframe, for the focus groups. More in-depth information may have been obtained if there had been focus groups of between six and eight participants. It is essential to identify more appropriate methods for recruiting participants for future research with this cohort of nurses. The constraints of this number of participants and their availability meant the data collection method was changed to semi-structured interviews.

Further Research

The specific content taught for each of the learning outcomes should be used as the focus in future research. This may clarify what is taught and would therefore facilitate a comparison with employers' expectations of graduates from the polytechnic.

Most new graduates commence their practice in a ward environment so it would be useful to see how the charge nurses view the competence of new graduates and what competencies they expect them to have. Similarly, it would be useful to
ascertain what competencies are expected of nurses in the community nursing services.

Further research could include observation of nurses in practice to identify the frequency of use of informatics concepts in their workplace. This may also clarify whether the issues of access and attitude are actual or perceived.

One of the factors identified as affecting nurses using information systems was access. For safe and effective healthcare it is important to assess the competence of nurses in practice with reference to the issues of avoidance and access. This could be by assessment, or observation of nurses in practice. Work patterns could also be evaluated with respect to nurses’ use of patient management systems and their use of information literacy skills to provide nursing practice based on evidence.
References


Health Information Privacy Code,(1994).


Rigby, M. (2004). Protecting the patient by promoting end-user competence in health informatics systems: Moves towards a generic health computer user "driving


APPENDIX A: INFORMATION SHEET I

Department of Education
University of Canterbury

The effectiveness of Nursing Informatics education as preparation for the workplace.

The aim of the study is to ascertain whether the Nursing Informatics education received in an undergraduate programme has prepared graduate nurses for today's workplace. Elizabeth Hanley is undertaking this study as a requirement for her Masters in Education degree at Canterbury University.

If you choose to participate your involvement in this study will be an audio taped interview lasting approximately one hour. You have the right to refuse to answer any question and to withdraw from the study at any time, including withdrawal of any information provided. The proposed questions have been sent to you for you to consider prior to the interview.

As a follow-up to this interview, you will be asked to review the transcript to ensure you have been accurately recorded.

The results of the study may be published, but you may be assured of the complete confidentiality of data gathered in this investigation: your identity and your organisation will not be made public without your consent. To ensure anonymity and confidentiality, identifying features will be removed or a coding system known only to the researcher and her supervisors will be used. The data will be stored in a secure place and only the researcher and her supervisors will have access to this. The data will be kept for a period of 5 years and will then be destroyed.

This study has been reviewed and approved by the Christchurch Polytechnic Institute of Technology’s Academic Research Committee.

Contact: Elizabeth Hanley 03 9408274 or her primary supervisor Alison Gilmore at 03 3642259. Alison will be pleased to discuss any concerns you may have about participation in this study.
APPENDIX B: CONSENT FORM

Elizabeth Hanley
Phone: 9408274
[Date]

CONSENT FORM

The effectiveness of Nursing Informatics education as preparation for the workplace.

I have read and understood the information sheet for the above-named study. I agree to provide information to the researcher on the understanding that my name nor the name of my workplace will be used without my consent.

On this basis I agree to participate in the study, and I consent to publication of the results of the study with the understanding that anonymity will be preserved.

Also I understand that I may decline to answer any questions and withdraw any information I have provided, at any time, including withdrawal from the study.

NAME (please print): ........................................................................................................

Signature:

Date:
APPENDIX C: INFORMATION SHEET II

Department of Education
University of Canterbury

The effectiveness of Nursing Informatics education as preparation for the workplace.

Elizabeth Hanley is undertaking this study as a requirement for her Masters in Education degree at Canterbury University. The aim of the study is to ascertain whether the Nursing Informatics education received in an undergraduate programme has prepared graduate nurses for today’s workplace.

If you choose to participate your involvement in this study will be an audio taped group interview lasting approximately one hour. You have the right to refuse to answer any question and to withdraw from the study at any time, including withdrawal of any information provided. To ensure that each of the major hospitals are represented applications will be categorised according to hospital and on a first come first serve basis.

The results of the study may be published, but you may be assured of the complete confidentiality of data gathered in this investigation: your identity and your workplace will not be made public without your consent. To ensure anonymity and confidentiality, identifying features will be removed or a coding system known only to the researcher and her supervisors will be used. The data will be stored in a secure place and only the researcher and her supervisors will have access to this. The data will be kept for a period of 5 years and will then be destroyed.

This study has been reviewed and approved by the Christchurch Polytechnic Institute of Technology’s Ethics Committee.

Contact: Elizabeth Hanley 03 9408274 or her primary supervisor Alison Gilmore 03 3642259. Alison will be pleased to discuss any concerns you may have about participation in this study.