CHAPTER FIVE

UNDERSTANDING TECHNOLOGY IN CONTEMPORARY SURGICAL NURSING: IMPLICATIONS, RECOMMENDATIONS AND CONCLUSIONS

This thesis has identified and described eight (8) qualitatively different ways by which technology is experienced and understood by contemporary surgical nurses and is a major advance in nursing knowledge. Technology has been revealed to be a complex phenomenon in need of further examination and debate. The findings of the research are distinctive, needed and timely, and the thesis makes a significant examination and critique of the way technology is experienced and understood by contemporary nurses.

This final chapter begins with a **summary of the research. The implications of the research for contemporary surgical nursing** are discussed subsequently and organised under the following subheadings: **The research findings and current literature**; **Technology, theory and contemporary surgical nursing**; **Technology, practice and contemporary surgical nursing**; **Technology, education and contemporary surgical nursing**. The following discussion examines the experience of contemporary surgical nurses in relation to both current literature and arguments presented in this thesis. The chapter makes obvious the value of the research to contemporary nursing and closes with a series of **recommendations** and a final **conclusion**.

SUMMARY OF THE RESEARCH

The research background and literature review

Technology is a significant phenomenon to influence the history, contemporary practice and future of nursing. Nurses' care for people in an increasingly machinery and equipment orientated health care sector where the inclusion of technology has become a necessary and valued component of nursing practice. However, despite its significance nurse practitioners, scholars and researchers have neglected the experience and understanding of technology in nursing. Recorded history has omitted technology as a major factor in the development of nursing practice and the relationship between both technology and the evolution of the modern hospital and nurses' roles and responsibilities are examined inadequately. There has been limited research related to the experience of technology in nursing, and no research examining the qualitatively different ways technology is understood.

Critique of assumptions and beliefs which influence the way that nurses interpret technology in contemporary practice have been omitted also from research and scholarship. The need to consider ideas that inform understanding has been neglected. When the issue of technology has been the focus of nursing literature, the discussion has tended to be sanguine and dominated by grandiose statements, unsubstantiated evidence and dramatic pronouncements. Nursing literature continues to be dominated particularly by utopian and dystopian beliefs concerning the potential outcomes of continued technological change and inadequate commonplace assumptions associated with the phenomenon. Nurses express a faith in the dynamism of technological progress and believe technology to be often little more than a random collection of neutral objects (the neutral argument).

Faith in technological progress dampens critique and imagines technology to be a juggernaut type of advance in which scientific and technological discovery manifest themselves as control and dominance. Technological advance is described as linear and capable of progressing until it eliminates most challenges which confront humanity (advancement is understood in terms of whether an advance is technically possible). Technology is envisaged to be autonomous and development is believed to be inevitable, unavoidable and irreversible. It has been argued that belief in the inevitability of progress has encouraged firstly, a technological imperative and *the lure of always pushing toward the greatest feat of technical performance or complexity which is currently available* (Pacey, 1983:79). Secondly, it has encouraged acceptance of the suggested potential of technology for nursing and health care, and an uncritical integration of an increasing amount of machinery and equipment into the practice of nursing.

The neutral argument has been identified by this research as a feature of nursing discourse and is manifest as acceptance uncritical of the commonplace assumption that technology has no influence on decision making, practice, beliefs, values, goals, organisation, politics and behaviour of nurses. Machinery and equipment are assumed to be physically and philosophically independent of human action and choice. The neutral argument is the basis for assertions made typically in nursing literature which are expressed commonly as statements such as *good workers never blame their tools.* It is believed that technology is subject always to the preferences and decisions of nurses.

The argument has been demonstrated to be fallacious and serves to dampen critical discussion and debate. It negates the need to reflect upon technology from the perspective of its effect

upon nursing and society and is associated commonly with technological determinism or a technological imperative. It fosters a faith in technological progress. Through acceptance of the neutral argument the responsibility of nurses to examine adequately the importance of technology to nursing and understand better the practice of nursing is bypassed. It has been argued that when the complexity of technology in health care and society and the influence of changing societal values, cultural nuances, and the political agenda of health care authorities and private enterprise are comprehended and understood, the argument is acknowledged to be both spurious and inadequate.

This thesis has revealed that nursing discourse is limited and informed poorly. The literature does not communicate adequately the qualitatively different ways in which technology is understood and experienced by surgical nurses. For example, inadequacies are demonstrated particularly by the way that nurses define technology in nursing literature. Discourse assumes a pre-conditional relationship between science and technology even though there are deficiencies in this approach to interpreting the phenomenon. There is a general lack of definition available in the literature and a tendency to define technology in relation to the development of new and impressive machinery and equipment associated with other health care disciplines. Overall, the discourse lacks philosophical argument, theoretical foundation and practical relevance.

The research results and the use of phenomenography

In response to the inadequacies of nursing knowledge this research has sought to describe the experience and understanding of technology in the domain of surgical nursing. The research has sought to answer the following question: *Are there qualitatively different conceptions of*

technology within surgical nursing? To answer this question the qualitative research approach of phenomenography was utilised. Phenomenographic research is interested in the content of thinking, rather than the process of perception or conceptualisation (Marton, 1986:32). Phenomenography is a distinctive research approach that has application to the field of nursing and is centred on the process of describing various specific phenomena as they appear and create meaning. Rather than seeking overarching laws of thought and perception, thinking is described in terms of what is both experienced and understood.

Through the use of a phenomenographic approach it has been demonstrated that there are qualitatively different conceptions of technology in contemporary surgical nursing. Phenomenographic analysis of research data from interviews with twenty (20) surgical nurses revealed eight (8) qualitatively different conceptions (categories of description) of the phenomenon. The conceptions revealed are entitled:

1. technology in contemporary surgical nursing as machinery and equipment
2. technology in contemporary surgical nursing as changes to skills
3. technology in contemporary surgical nursing as increasing knowledge
4. technology in contemporary surgical nursing as respect and autonomy
5. technology in contemporary surgical nursing as gaining control of clinical practice
6. technology in contemporary surgical nursing as clinical resources of the practice environment must meet the needs of technology
7. technology in contemporary surgical nursing as the need to include the patients' experience and clinical presentation
8. technology in contemporary surgical nursing as alteration to the free will of nurses.

The logical relations between conceptions have been presented as an outcome space (figure eleven (11)). The referential aspect of the outcome space is based on levels of insight into technology as a consequence of, and associated with, the various ways that nurses' experience and understand the use of machinery, equipment, and objective means in nursing practice. The structural aspect of the outcome space is noted to be hierarchical and consists of four (4) levels of awareness or insight into the experience and understanding of technology.

The results of the research confirm the appropriateness of phenomenography as a research approach that is capable of furthering the discipline of nursing. Not only are the results unique in terms of what they tell us about the relationship between technology and the future of nursing practice, theory and education (see below), but the approach provides knowledge that has not been identified through other approaches to research. Phenomenographic studies describe and illuminate the essential meaning of phenomena and present the way in which nurses respond to their world. The research approach is unique and has the potential to obtain research outcomes that add to the body of knowledge of *what* and *how* we experience and understand within the framework of nursing theory and practice. As an approach to qualitative research, phenomenography does describe phenomena as they appear and create meaning, and has application when seeking to qualitatively research understanding of experience.

As in other phenomenographic studies (e.g. Bruce, 1997; Dahlgren & Fallsberg, 1991; Marton, Carlsson & Halasz, 1992; Renstrom *et al.*, 1990; Sandberg, 1994; Svensson, 1989) this research has found understanding of the phenomenon to be limited in number and able to

be related logically in the form of an outcome space. In addition, the research confirms the argument of Bruce (1997:181) who suggests that when research seeks to identify conceptions of an abstract rather then a concrete phenomenon (i.e. technology), it is possible to identify a clear object relation (i.e. machinery, equipment and objective means). The experience of technology in contemporary surgical nursing is understood as a limited number of ways of experiencing machinery, equipment and objective means. Surgical nurses' conceptions of technology are about the varying ways machinery, equipment and objective means mediate with the subject, their volition and their daily practice. Technology is experienced as eight (8) ways of understanding the experience of using objective means in the world of nurses.

THE IMPLICATIONS OF THE RESEARCH FOR CONTEMPORARY SURGICAL NURSING

THE RESEARCH FINDINGS AND CURRENT LITERATURE

Prior to this research the qualitatively different ways of understanding and experiencing technology in surgical nursing were unknown. Although there have been limited attempts to explain the relationship between nursing and technology (e.g. Harding, 1980; Henderson, 1985; and Walker, 1970), the literature is not research based and is reliant on opinion and assumptions which do not express fully the experience and understanding of surgical nurses. This research has described eight (8) conceptions of the phenomenon, which derive directly from the experience and understanding of practicing surgical nurses. Characteristics of four (4) of the eight (8) conceptions are described in nursing literature, and the remaining four (4) conceptions have not been identified previously. Notwithstanding, it is the first time each experience and understanding of technology in surgical nursing has been identified as a conception of technology.

The following discussion examines each conception relative to nursing discourse. It should be noted that since there is no literature that addresses specifically the relationship between technology and surgical nursing, the examination is based on a comparison between the research findings and nursing literature which seeks to discuss technology as a phenomenon important to nursing as a discipline.

Characteristics of the experience and understanding of technology identified in nursing literature

There is a body of nursing literature that discusses characteristics of four (4) conceptions described by this research. Characteristics discussed relate to the following conceptions: ***1. Technology in contemporary surgical nursing as machinery and equipment; 2. Technology in contemporary surgical nursing as changes to skills; 3. Technology in contemporary surgical nursing as increasing knowledge; 4. Technology in contemporary surgical nursing as the need to include the patients' experience and clinical presentation.***

1. Technology in contemporary surgical nursing as machinery and equipment

Nursing literature is dominated by explanation of technology relative to the use of objective means. Technology is defined and described as the use of machinery and equipment in clinical practice (e.g. Ashworth, 1987; Farmer, 1978; Given & Given, 1969; Henderson, 1985; and Orem, 1991). The definition and description is an accurate reflection of one (1) of the qualitatively different ways the phenomenon is understood and experienced by surgical nurses. Technology is experienced and understood to be the application of machinery and equipment to the process of attaining certain ends in surgical nursing practice and health care.

The experience and understanding is common to society and nursing, and is a basic or rudimentary conception of the phenomenon. It is a beginning point in the establishment of an understanding of technology and describes what is most obvious about the phenomenon (Barnard, 1996a; Ellul, 1964; Harding, 1980; Pacey, 1983; and Winner, 1977).

2. Technology in contemporary surgical nursing as changes to skills; and 3. technology in contemporary surgical nursing as increasing knowledge

Further experiences of contemporary surgical nurses that are identified in the literature relate to both the conceptions that technology is *changes to skills and technology is increasing knowledge*. Even though surgical nurses experience and understand skills change and increasing knowledge to be two discrete conceptions of technology, both experiences are united in descriptions of technology found in nursing literature. Skills and knowledge are described as a collective experience manifest commonly as the development of nursing practice skills and the need to raise educational standards through knowledge development (e.g. Carnevali, 1985; Pillar & Jacox, 1991; and Wichowski & Kubsch, 1995). Notwithstanding, nursing literature parallels the understanding of surgical nurses in that both skills and knowledge are noted to be needed for adequate technology use in contemporary nursing and for the development of professional practice. Skills and knowledge are described as central to the ability of nurses to use machinery and equipment and to engage in the daily practice of nursing (e.g. nurses need to develop skills necessary to solve challenges associated with the application of machinery and equipment; nurses need to develop knowledge of policies and procedures in order that they can use machinery and equipment). The relationship between machinery, equipment and the development of skills and knowledge is established in so far as skills and knowledge foster an instrumental practice. Skills and

knowledge are applied to technology. They are an adjunct to technology as machinery and equipment. The experience and understanding of surgical nurses does however reflect the findings of recent research by Wichowski & Kubsch (1995) who found that technology (machines and equipment) are an increasingly important part of every clinical environment. Nurses rely on continuing education, personal reading and the utilisation of peer mentors to maintain knowledge and skills. Their research highlighted that nurses do need to keep up with rapid changes in nursing technology and they feel inadequate and unprofessional when they are unfamiliar with machinery and equipment.

Notwithstanding, it should be noted that skills and knowledge are not experienced or understood in an holistic sense as two factors within a number of factors of technology (e.g. people, organisations, skills, culture, knowledge, values, etc.) which come together to be the phenomenon, despite the fact that both the outcome space for the qualitatively different ways technology is experienced and understood by contemporary surgical nurses and the arguments of numerous authors from outside the discipline of nursing (e.g. Borgmann, 1984; Ellul, 1964; Marx, 1975; Pacey, 1983; Postman, 1992; Winner, 1977; and Winner, 1986) suggest the explanation of technology presented by this thesis is plausible and reasonable.

This research has demonstrated that there are inconsistencies between nursing literature, the experience and understanding of surgical nurses, and the opinions of authors outside the domain of nursing in relation to the way that skills and knowledge should be understood in relation to machinery and equipment. Evidence regarding the experience and understanding of technology has been needed in order to describe accurately the relationship between technology and the skills and knowledge of nurses.

4. Technology in contemporary surgical nursing as the need to include the patients' experience and clinical presentation

Nursing literature and contemporary surgical nurses agree that technology fosters an excessive reliance on the objective elements of perception in nursing assessment, diagnostics and treatment. Objective elements manifest as quantitative evidence obtained from machinery and equipment and are valued as both real and worthwhile indicators of the experience and physical presentation of the patient. Excessive reliance manifests as the tendency to accept quantitative evidence obtained from machinery and equipment in preference to, and in spite of, the thoughts, experiences and feelings of the patient. Technology is experienced and understood as a phenomenon that has the potential to objectify the patient in technologically orientated health care systems where disease and cure are the primary focus.

An influential factor in the development of this experience has been the understanding that technology should be interpreted only as an instrumental phenomenon (Braun, 1984; Briggs, 1991; Castledine, 1995; Clifford, 1978; Curtin, 1978; Harding 1980; and Sandelowski, 1988). Technology is understood to be objective means used in the care of patients and the emphasis leads to a tendency to become system orientated, governed by efficiency and effectiveness measures, and problem focussed (Allan & Hall, 1988; Barnard, 1997; Battistello, 1976; Braun *et al.*, 1984; Cooper, 1977; Cooper, 1993; Farlee, 1978; Henderson, 1980; Reiser, 1978; Sinclair, 1988; Strauss, 1968; Wilson, 1991; and Yates, 1983). Nursing care becomes subject to automation, rationalisation and control as patients are treated as signs and symptoms of disease. Experiences become objectified, the human condition becomes subject to measurement, and the patient becomes secondary to the machine and its objective evidence

in both the daily routine of nurses and the assessment and diagnosis of people.

The experiences of surgical nurses and arguments presented in the literature demonstrate clearly that technology is a phenomenon which influences increasingly nursing practice and patient care, particularly in environments governed by a medical model and characterised as busy and stressful (Allen & Hall, 1988; Calne, 1994). For example, a further conception identified by this research describes technology as the experience of gaining control of nursing practice where control had been difficult to obtain. Technology improves the effectiveness and efficiency of nursing practice through rational explanation and the establishment of predictable behaviour. It assists greatly in the ability to understand the physical condition of the patient and saves nurses time by making the measurement of signs and symptoms increasingly accurate and potentially reliable.

Although dehumanisation has been noted by numerous authors to be an experience of technology in nursing (Braun *et al.*, 1984; Calne, 1994; Cooper, 1993; Donley, 1991; Henderson, 1980; Sandelowski, 1988; and Wilson, 1991), this research has not identified dehumanisation as a conception of technology in surgical nursing. Notwithstanding, the experience and understanding of surgical nurses includes description of objectification of the patient (it is noted that objectification of the person is an experience associated often with the concept of dehumanisation and is characterised by inappropriate treatment and a failure to consider the desires, needs and care of the person). Their experience and understanding of technology highlights the potential to discount the experience of the patient when clinical evidence is available from machinery and equipment. The demands of maintaining technology, the need to rely on evidence from machinery and equipment as a result of

inadequate nursing or medical experience, and the gathering of clinical information within pre-set time frames weigh heavily on the other roles and responsibilities of nurses. The many demands of nurses make it tempting for them to accept the assessment of machinery and equipment in preference to the experience of the patient.

The effect of machinery and equipment on surgical nursing practice is described as the refocusing of nurses away from humanity in order to foster unreasonably a scientific or objective perspective. Surgical nurses experience difficulty engaging in meaningful relationships with patients. They understand the need to integrate technology into their nursing practice and are aware of pressure to focus on its use. They describe their experiences as inadequate and disapprove of current nursing practice because it focuses excessively on machinery and equipment use and gives lip service to the importance of the patient. The experiences of surgical nurses are consistent with explanations presented previously by Winner (1977:212), who argued against the concept of dehumanisation as it does not explain the notion of what is *truly human* or reflect clearly the experience of technology. He suggests that a better approach to expressing the experience is that:

> *More highly developed, rational-artificial structures tend to overwhelm and replace less well developed forms of life.*

It should be noted that although some nurses may practice individually in ways which dehumanise the care of the patient, most are aware of the effect of technology on the nurse - patient relationship and do not condone their experience nor its effect on the quality of nursing. They understand fully the needs of the patient and endeavour to care for each person from an individualised perspective, recognising the potential for technology to distract them away from the person's experience. However, they do highlight that in accordance with

nursing literature the technological environment of care can be characterised as leading potentially to the objectification of care and a tendency to rely on both the efficiency and rationality of machinery and equipment.

Experience and understanding of technology not identified previously in nursing literature

There is no body of literature which describes characteristics of four (4) conceptions of technology described by this research. Conceptions not described are: ***5. Technology in contemporary surgical nursing as respect and autonomy; 6. Technology in contemporary surgical nursing as control of clinical practice; 7. Technology in contemporary surgical nursing as the practice environment must meet the needs of technology; 8. technology in contemporary surgical nursing as alteration to the free will of nurses.***

5. Technology in contemporary surgical nursing as respect and autonomy

The nursing literature has not identified previously respect and autonomy as an experience of technology although some authors recognise the importance of technology to the development of nursing as a professional group (e.g. Barnard, 1996a; Cooper, 1993; Gordon, 1991; Harding, 1980; Henderson, 1985; McConnell, 1991; and Walters, 1995). According to numerous nurses, the use of machinery and equipment has led to professional advantages for nurses which were not possible prior to their involvement with *modern* technology (e.g. Abel-Smith, 1960; Bongartz, 1988; Cooper, 1993; Edelstein, 1966; Gordon, 1992; Maggs, 1983; McConnell, 1990; Roberts, 1954; and Simpson, 1990). Surgical nurses agree with this assessment but emphasise that technology is associated also with the development of personal respect and autonomy manifest as colleagueship, consultancy and companionship. Surgical nurses experience and understand that the use of machinery and equipment leads to personal

respect as a valuable member of the health care team. They are respected for their knowledge and skills and their ability to use technology in an autonomous manner. For example, they are often the only health care workers who possess the knowledge necessary and skills required to operate particular machinery and equipment in clinical environments and experience autonomy and independence in their practice.

Although the legal and political responsibility for technology remains ultimately in the hands of medicine, despite their growing knowledge, skills, and the introduction of new roles and responsibilities to nursing (Barnard, 1997; Briggs, 1991; Brown, 1992; Castledine, 1995; Harding, 1980; Katz *et al.*, 1976; Reiser, 1978; and Walters, 1995), the process of machinery and equipment use cultivates for many surgical nurses an experience of importance and uniqueness which is an extension to experiences described previously in the literature. Instrumental use of machinery and equipment is manifest not only as professional advancement but the development of personal recognition. Experience and understanding acknowledges the fact that technology is not only of value to nursing as a discipline, but has a quality of value which transfers to those individuals capable of being involved in its use. The conception demonstrates for the first time within the context of surgical nursing, that when groups and individuals possess technical skills and knowledge that are of value to the health care sector and society, their experience of technology can be described often in terms of increasing personal respect and autonomy.

6. Technology in contemporary surgical nursing as gaining control and predictability in clinical practice

The experience of seeking to control the daily practice of health care through the use of

technology has not been identified in nursing literature. Notwithstanding, technology has been extolled as a phenomenon capable of assisting nurses to save time and fulfil their roles and responsibilities in clinical practice (e.g. Harding-Price, 1990; Jenkins, 1988; and Stevens, 1985) and increase the efficiency and effectiveness of nursing practice and patient care (e.g Adams, 1986; Bailey, 1988; Goshen, 1972; and Simpson, 1989). However, the experience of seeking to control the clinical environment by integrating machinery and equipment into the practice of nursing is a conception not identified previously. Surgical nurses seek to use technology in order to manage the clinical environment of care. Machinery and equipment are used to coordinate various elements of patient care and clinical practice and they are understood to be important to making safe and predictable the many roles and responsibilities surgical nurses must amalgamate continually into their practice.

Their understanding and experience is particular to an instrumental understanding of technology and demonstrates clearly the functional orientation of nurses. Surgical nurses rely on technology to obtain a sense of balance (composure) in busy and stressful clinical environments where nursing practice alters regularly, policies and procedures are governed by external authorities, patients are often very sick, and the business of health care can be detrimental to a calm and unhurried experience. Their understanding is fostered by their belief in technological progress. Their beliefs are encouraged by the usefulness of a lot of machinery and equipment to nursing care. Their reservations are appeased by the assumption of neutrality, and their eagerness is motivated by the fact that surgical nursing is hard work.

Surgical wards are more often busy than they are quiet. The demands on surgical nurses are unlimited and their roles and responsibilities are expanding. They look to technology to solve

many of the challenges they face (e.g. lack of time; caring for large numbers of patients). Nursing literature is eager to support the view that technology will solve their problems (e.g. Folta, 1973; Reed-ash, 1983; Simpson, 1990; and Stevens, 1985), and their instrumental understanding focuses their attention or the way technology assists to perform many of the functional processes of daily care. Their experience and understanding emphasises the need to maximise the efficient and effective use of technology in clinical practice in order to do their best for patients and control the process of care delivery. According to the conception, appropriate use of machinery and equipment will control busy, stressful and complex surgical environments and turn them into predictable and manageable experiences for both the nurse and the patient.

7. Technology in contemporary surgical nursing as clinical resources of the practice environment must meet the needs of technology

This research has described for the first time the experience and understanding that technology needs to be resourced appropriately in clinical practice in order that machinery and equipment can function in an efficient and effective manner (e.g. ergonomic management; power supply; and appropriate ward design). When resources do not foster adequately the use of machinery and equipment and when machinery and equipment are defective or deficient, the practice of nursing becomes difficult and stressful. Technology under these circumstances becomes a burden to the clinical practice of nurses. The conception describes that technology is subject to impediment and nurses seek to maximise its use through avenues such as ward design and the supply of associated resources and the use of equipment. Technology is experienced and understood by surgical nurses as the inter-relationship between numerous elements that assist to make possible the use of machinery

and equipment (technology). Resources and the environment of care come together collectively so as machinery and equipment can function at an optional level of efficiency and effectiveness.

The experience and understanding of surgical nurses demonstrate the validity of arguments presented by this thesis which emphasise that technology can be understood not only as machinery and equipment, but as numerous factors which come together in the environment of care (Barnard, 1996a; Ellul, 1964; Marx, 1975; and Winner, 1977). For example, it can be argued that an intravenous giving set supplied for use with an IVAC machine is more than a resource necessary for the function of the machine (as experienced by surgical nurses). The intravenous giving set is a piece of plastic tubing designed specifically for the machine and as such is not only important to the pump, but is as much technology as the machinery and equipment with which it is used. Resources supplied or policies developed (for example) are integral to the function of machinery and equipment and as such are inter-connected to the phenomenon. They are technology as much as the machinery and equipment are technology. This explanation is relevant to any resource or related factor that forms part of the use of technology (e.g. knowledge, power supply or organisational arrangements). Each is reliant on the other and each is as much technology as the other. They are inter-relate collectively in order to make as effective as possible the use of machinery and equipment.

Notwithstanding, surgical nurses and the nursing literature do not explain technology in such an encompassing manner. Rather than understanding technology as numerous inter-related factors that combine to constitute the phenomenon, there is a tendency to *reify* or *thingify* technology as an abstraction and a material thing. The **reification of technology** involves

treating it as if it were a single entity with an undifferentiated character rather than a phenomenon understood in a more holistic sense as a collective of tools, instruments, people, machines, organisations, media, values, techniques and systems. For example, although surgical nurses experience resources such as electricity to be fundamental to the use of machinery and equipment (as noted in category of description one (1) when technology was defined as new and modern machinery and equipment powered by an external power source), they do not define electricity as technology or understand electricity to be part of the phenomenon. According to surgical nurses, electricity is a resource that assists them to use technology. The reification of technology demonstrated by this conception highlights the deeper challenge that nurses face in coming to terms with the fact that a wide range of technology is inter-connected by many factors which symbolically are representative of the phenomenon. Despite the fact that surgical nurses and nursing literature fail to understand and describe technology in an holistic sense, it is clear from this conception that numerous factors (seemingly outside the realm of technology according to surgical nurses) are experienced as part of the phenomenon. The experiences of surgical nurses are complex and their descriptions are incomplete.

8. Technology in contemporary surgical nursing as alteration to the free will of nurses

Although the experience of alteration to free will has not been described previously in nursing literature, it is noted that nursing discourse includes discussion of technology in terms of its increasing demand on the time and energy of nurses (Allan & Hall, 1988; Barnard, 1996a; Barnard, 1997; Calne, 1994; Cooper, 1993; Reiser, 1978; Reverby, 1987; and Sandelowski, 1988). The conception reflects opinions noted in the literature but describes the phenomenon as far more pervasive then has been identified previously. Surgical nurses experience and

understand that their practice is altered by technology. They note that they are compelled often to meet the needs of machinery and equipment at the cost of other roles and responsibilities. They are disappointed with some of the effects of machinery and equipment on their practice, but are unable seemingly to do anything to reverse their experience.

The conception is a level four (4) understanding of technology (as described by the outcome space (figure eleven (11)) and although underpinned by an understanding of technology in terms of the use of machinery and equipment, it describes the experience of technology with insight greater than the understanding described at levels two (2) and three (3). In this conception, technology is experienced and described by surgical nurses from the perspective of personal and daily practice. The conception describes the experience and understanding of technology from the perspective of how it affects each nurse, not in terms of what is required of them to practice effectively and efficiently (e.g. knowledge, skills), but in terms of how they go about their day and relate together as people.

Technology is described as linked inextricably to the behaviour, goals and practices of nursing and opposes literature which believes technology to be neutral to the daily practice of nurses (e.g. Adams, 1986; Birckhead, 1975; Drought & Liaschenko, 1995; Fitter, 1987b; Folta, 1973; Handy, 1989; Kristensen, 1989; McConnell, 1991; Stevens, 1985; and Tunstill, 1972). Technology is characterised as a phenomenon which interferes with the practice of nursing and the conception highlights the fact that a lot of nursing discourse does not reflect the experience and understanding of contemporary surgical nurses. The conception illustrates those authors such as Johnson (1974), who more than two decades ago described technology as a neutral phenomenon and whose beliefs are common and persist in nursing discourse, are

incorrect. This conception demonstrates that arguments in support of technology as a neutral phenomenon are fallacious and do not assist adequately to explain the experience of nurses. They foster poorly conceived ideas that do little to enhance understanding or a realistic appreciation of the complexity of nursing practice. For example, Johnson (1974:66) claimed that:

> *The nurse has it in her* [sic] *power to give considered encouragement to relatives and to maintain high standards of basic personalised care to her* [sic] *patients no matter how involved she* [sic] *may also become in the technological aspects of that care.*

The experience and understanding of surgical nurses demonstrates clearly that nurses cannot use technology without also, to some extent, being influenced or used by it. The inclusion of machinery and equipment in clinical practice engages automatically the nurse in a reciprocal relationship with the phenomenon in which various demands are placed on both the nurse and technology. The experience of surgical nurses demonstrates that the use and effects of technology in clinical practice can not be explained adequately as the performance of nursing duties in accordance with the intended desire of each nurse. Despite the best efforts of surgical nurses, the demands placed on nurses from technology can orientate their attention and practice away from preferred goals and the patient.

Notwithstanding, surgical nurses experience disquiet about their experience. Their ability to display many of the caring behaviours associated commonly with nursing (i.e. a commitment to placing the person as the central focus of care) are described as challenged, not by a lack of compassion or desire to be involved more with patients, but by the rapidly expanding influence of technology on their roles and responsibilities. Nurses have to forego many important roles and responsibilities during each day in order to attend to the needs of

technology. The conception describes the experience of technology in surgical nursing as the desire to engage in patient focussed nursing practice founded on professional and personal responsibility, in technological environments which modify the ability of nurses to fulfil their desire. The finding is significant and is of major concern to the discipline of nursing and the provision of health care services.

Conclusion

The experience and understanding of technology in surgical nursing is manifest as eight (8) conceptions. Conceptions are noted to be portrayed inadequately in nursing literature that alludes only partially to characteristics typical of the experience of surgical nurses. It has been argued that technology is described best in surgical nursing as a multifarious phenomenon which influences the health care system, the profession of nursing, and the roles and responsibilities of nurses. In addition, the explanation and understanding of technology in nursing is noted to be incomplete. The experiences and understanding of surgical nurses are complex and hence the need for significant research, scholarship and debate.

TECHNOLOGY, THEORY AND CONTEMPORARY SURGICAL NURSING

This research has demonstrated the dominance of instrumental understanding in nursing and has argued that in accordance with the views of numerous authors, current understanding of technology is inadequate for appropriate theoretical interpretation (Barnard, 1996a; Barnard, 1997; Borgmann, 1984; Ellul, 1964; Harding, 1980; Pacey, 1983; Postman, 1992; Purcell, 1994; Sandelowski, 1988; and Winner, 1977). It is argued that appropriate theoretical interpretation will not evolve until technology is understood to be fundamental to the development, organisation, practice, values, ethics, behaviour and politics of nursing. Before

the meaning and implications of technology to nursing practice and patient care can be addressed adequately, attempts must be made to explain better the relationship between nursing and technology which transcend the superficiality of instrumentalism. Explanation of technology needs to include firstly, perspectives which originate from research and scholarship in nursing, and secondly, perspectives from theoretical interpretation originating from domains of knowledge outside the discipline. Domains of knowledge include disciplines such as theology, history, sociology, politics and philosophy (Barnard, 1996a; Harding, 1980; and Walters, 1994).

Surgical nurses do not understand technology from the perspective of sophisticated theoretical explanation. Their lack of a theoretical perspective is demonstrated most poignantly by the inadequate way they define technology. Machinery and equipment are highlighted as the only defining characteristic of the phenomenon (technology as machinery and technology is a conception described by the outcome space (figure eleven (11)). Definitions of technology mimic those found in nursing literature and rarely rise above a basic or rudimentary level of understanding.

However, despite the lack of suitable theoretical explanations in nursing it is noted that conceptions of technology include four (4) experiences which are defining characteristics associated commonly with philosophical thought (i.e. religion and theology (Will or volition), ethics and politics (skills), epistemology (knowledge), and metaphysics and aesthetics (machinery and equipment) (Mitcham, 1990). The four (4) defining characteristics are related logically in the outcome space as experiences of technology and are significant to the future development of a theory/ philosophy of technology in nursing. For example, not only can the

experience of technology in nursing be explained by drawing on the work of Ellul (1964) (as outlined in chapter one (1)), but the experience and understanding of surgical nurses can be explained relative to the theoretical work of Mitcham (1990) who described three (3) ways of being with technology in contemporary society. The three (3) ways of being with technology are: Ancient scepticism (suspicion of technology), Enlightenment optimism (promotion of technology), and Romantic uneasiness (ambiguous about technology). Beliefs characteristic of enlightenment optimism have been identified in both the nursing literature and the experience and understanding of contemporary surgical nurses. An enlightenment optimism way of being with technology is described in terms of the four (4) defining characteristics of philosophical thought identified above. These are inter-related as beliefs and assumptions that form the particular way that nurses experience and understand the phenomenon. According to Mitcham (1990:45), enlightenment optimism is manifest as:

> *(1) the will to technology is ordained for humanity by God or by nature; (2) technological activity is morally beneficial because, while stimulating human action, it ministers to physical needs and increases sociability; (3) knowledge acquired by a technical closure with the world is truer than abstract theory; and (4) nature is no more real than-indeed it operates by the same principles as-artifice.*

The foundations of enlightenment optimism originate from the writings of Francis Bacon (1561-1626) who is noted as the founding father of the enlightenment period of the Renaissance, and whose ideas have been influential to nursing literature (as noted in chapter two (2)). Francis Bacon fostered an optimistic appreciation of the value of science and technology to the extent that both have evolved to become the dominant indicators by which modern society judges development and advancement. Their importance has increased so much that many aspects of science and technology have evolved to become independent increasingly of political and moral control. Nature and artifice are interpreted as ontologically analogous, whilst people and the natural world are interpreted as machines to be understood

and conquered in order to attain domination and governorship. The end result of these processes has been that the distinction between nature and artifice has disappeared. Humans have become *l'homme machine*.

The outcome for nurses has been increased faith in technological progress, a decreasing distinction between the natural and the artificial, and an emphasis on the use of machinery, equipment and scientific explanation within a medical model which conceives of disease as something to be controlled and cured. In a reverse of the traditional theology of Jewish and Christian teaching, scriptural interpretation of Genesis has become a call to technical activity. Technical activity as a way to enlightenment has replaced the moral and ethical. Science and technology are joined together as a practical and intellectual endeavour called modern science, which has evolved to be a virtuous undertaking which leads to the acquisition of knowledge and the status of humans as co-creators with God (the process even negates the necessity for God). Knowledge acquired through experimentation has become of value based on its ability to engender works. Through the potential of scientific knowledge there has evolved the belief that humanity has the power to control the world and master the natural (Ellul, 1964; Mitcham, 1989; Mitcham, 1990; Neville-Sington & Sington, 1993; Postman, 1992; Purcell, 1994; and Winner, 1986).

Mitcham (1990:45) notes that many elements of enlightenment optimism are a part of intellectual discourse in ideologies such as Marxism and pragmatism, and are found in popular beliefs and discourse associated with technological progress, education, technology assessment, public policy and medicine. In fact, Reiser (1978) earlier highlighted the relationship between the promotion of technology and medicine. It was argued that

medicine's contemporary faith in science is manifest as the idea that progress as a scientific spirit enters clinical practice through technology. A similar relationship in nursing has been described in this thesis with particular reference to the continued promotion of technological progress and the failure to differentiate between technology and science. Reiser (1978:162) noted that:

> *The doctor* [nurse] *who depended chiefly on technology in diagnosing and following the course of illness could think of himself* [sic] *as using the same rigorous methods as did the scientist who pursued truth in his* [sic] *laboratory.*

Technology has evolved to be significant to nursing and influences the way that nurses understand and explain their practice. This research has demonstrated that nurses need to explain better that they're understanding and experience of technology is based on maturity of insight, practical expression and theoretical explanation. Nurses need to not only be excited about the potential of technology and science, but to examine each phenomenon and be open to explaining the relationship between themselves and technology from various practical and theoretical perspectives.

For example, the outcome space (figure eleven (11)) described by this research is similar to the definition of technology proposed at the beginning of the thesis. Conceptions of technology at levels one (1) and two (2) of the outcome space correspond to figure one (1) which proposes objective means, knowledge and skills to be two concentric circles representing factors important to defining technology. They are central also to the experience and definition of technology in surgical nursing. Technology at its most basic forms the central circle and knowledge and skills form the next concentric circle from the centre. The definition of technology proposed in this thesis differs however when the way technology is described at levels two (2), three (3) and four (4) of the outcome space are contrasted. Many

of the factors of technology defined previously as technique in figure one (1) are observable in the experiences portrayed by the outcome space, but surgical nurses do not describe their experiences in a similar way. At levels two (2), three (3) and four (4) of the outcome space the experience of technology continues to be understood in terms of the use of machinery and equipment rather than a more complex inter-relationship of many factors of technology (e.g. knowledge, tools, economics, organisational behaviour, values). Surgical nurses do not interpret technology in terms of numerous interrelated factors of the phenomenon. Even though surgical nurses may in fact experience technology in ways similar to that which is described by the definition proposed in chapter one (1), their understanding and theoretical interpretation does not extend to describing technology in a like manner.

The results of this research indicate that explanation and understanding of technology is precluding theoretical development in nursing and is impeding the ability of nurses to explain technology in health care from a nursing perspective. It has been illustrated that there is potential for theoretical development in nursing and there is a need for increased urgency in attending to the matter.

Conclusion

Theory is an avenue to develop and demonstrate maturity of insight and a mechanism to explore the importance of technology as it relates to the history, contemporary practice and future of nursing. Theory can assist nurses to explain technology in relation to their experience and understanding and can provide a framework in which the significance of technology to nursing can be interpreted. The lack of available theoretical interpretation adds to challenges nurses and health care institutions face maintaining quality nursing care in

technologically complex environments, and impedes nurses in their attempts to explain and critique technology in relation to the scope of their practice.

TECHNOLOGY, PRACTICE AND CONTEMPORARY SURGICAL NURSING

Surgical nursing practice is significant for its inter-relationship with technology, its growing commitment to the phenomenon, and continued changes to roles and responsibilities. Even though nursing literature varies in its appreciation of the relationship between technology and nursing it is clear that the experiences of surgical nurses are indicative of the immense importance of technology to contemporary clinical practice. However, a large amount of nursing literature presents an idealised view of the phenomenon and is inaccurate. For example, technology is not the answer to most nursing problems even though many believe it is (e.g. Folta, 1973; Kristensen, 1989; Pillar & Jacox, 1991; Simpson, 1990; and Stevens, 1985). Despite its many advantages, conceptions of technology demonstrate that it does not always save time and does not facilitate always an ability to be with patients in both a physical and psychological sense.

The varied experiences of surgical nurses demonstrate clearly that the validity of nursing discourse which argues technology to be clearly utopian (e.g. Edelstein, 1961; Gordon, 1992; Huether, 1978; Johnson, 1974; and Miller, 1969) or dystopian (e.g. Allan & Hall, 1988; Birckhead, 1978; Brunt, 1985; Cooper, 1993; Donley, 1991; and Sandelowski, 1988) are unrealistic commonplace views, as are assertions regarding a symbiotic relationship between technology and contemporary nursing practice (e.g. Laing, 1982; Lenihan & Abbey, 1978; Mayberry, 1985; and Ray, 1987). Arguments in favour of any one particular view are both deterministic and insufficient and do not reflect adequately the qualitatively different ways in

which technology is experienced and understood. This research has demonstrated that surgical nurses experience and understand technology in relation to both positive and negative outcomes and less often adopt a particular stance or explanation regarding the effects of technology.

In fact, it is common for surgical nurses to describe technology as leading to outcomes which vary constantly from bad to good (as evidenced by pictures created by surgical nurses for this research that portray the impact of technology as both positive and negative (e.g. figure three (3)). Experience of technology in surgical nursing cannot be summarised as clearly utopian or dystopian. Although nursing literature is dominated by commonplace views/ assumptions encouraging portrayal of a particular impact of technology, the experience of contemporary surgical nurses is far more diverse. Nurses experience technology as discrete experiences that are complex and significant for their range of description. Technology leads to outcomes both positive and negative for nursing and patient care. The phenomenon is clearly not a collection of neutral objects which lead always to outcomes acceptable for patient care when used correctly, even though the majority of nursing literature would have nurses belief it ought be interpreted is that way (e.g Ashworth, 1987; Carnevali, 1985; Stevens, 1985; and Wichowski & Kubsch, 1995), nor is it a demonic force leading to uncaring nurses in sterile wards (e.g. Calne, 1994; Cooper, 1993; Henderson, 1980; and Wilson, 1991). It has been demonstrated that conceptions of technology in surgical nursing practice encompass numerous experiences that generate moral, ethical, behavioural, inter-personal and financial challenges that in various ways influence patients, nursing practice and the health care sector.

Winner (1986) notes that what is fascinating about changes which occur as a result of

technology, is that societies and groups within it (i.e. nurses) alter patterns of their life without often appearing to do so. That is, the life of each person and group is altered by the processes and context in which they live and work, goals of nursing practice alter, the ends to which nurses find themselves working change, and the contexts of clinical practice continue to broaden without often due understanding and explanation of the ongoing changes and their relationship to technology. An influence significant to nursing has been also the lack of evidence to demonstrate definitively the extent of changes to have occurred in nursing as a result of poor records, no research and limited scholarship. Changes that have occurred have not been recognised, understood or described. Consequently, there has been a lack of understanding and explanation of technology in the literature and a failure to debate issues related to technological change. Notwithstanding, it is clear that despite the failure of nursing literature to record changes, surgical nurses are aware of the significance of technology to their practice. Surgical nursing practice has altered as much, and as quickly, as the machinery and equipment that they use. Knowledge associated with the use of technology continues to grow, skills necessary for machinery and equipment use are increasing, and nurses seek to use *modern* technology to control aspects of care delivery in clinical environments which place numerous demands on the daily practice of nurses. Their experiences indicate that nursing practice is significant for its increasing involvement with technology. Conceptions of technology in contemporary surgical nursing demonstrate that nurses practice within technological environments where an inter-relationship has been established between the efficiency of machinery and equipment, the knowledge and skills of nurses, the surgical ward, the institution, volition, patients, values and the organisation of practice.

In accordance with arguments presented in this thesis, surgical nurses illustrate that it is not

appropriate to assume technology to be neutral pieces of machinery and equipment used in the practice of nursing. Nursing practice is changing as a result of technology and changes have implications numerous for surgical nursing practice. It is necessary therefore to consider the experience of technology from the perspective of each of the qualitatively different ways that surgical nurses experience and understand the phenomenon, the way they each constitute an experience of technology, and the way they collectively describe technology to be complex.

In addition, examination of the relationship between change, technology and clinical practice is required from perspectives which do not conceive of the experience of technology as secondary to the use of machinery and equipment and are open to the various experiences that arise from the technological environment in which nurses' practice. Technology influences the practice of nursing both from the perspective of what nurses' do, and how they understand themselves as practitioners. Ellul (1964), Ellul (1968) and Winner (1986) note that there is nothing secondary about the experience of technology. The act of including machinery and equipment in nursing practice introduces patterns of technological activity and operations that by their very nature change nursing by making efficient and rational its numerous inter-related factors. Machinery, equipment, policies, politics, nurses, organisational arrangements, people, patients, values and the total clinical environment of care become inter-related in a relationship based on the rationalisation of actions, the conscious articulation of processes, and the efficient organisation of work and practices (Barnard, 1996a; Ellul, 1963; Ellul, 1964; Ellul, 1980; Sklair, 1971; Winner, 1977; and Winner, 1986).

The logical relations between experiences portrayed by the outcome space (figure eleven

(11)), demonstrate clearly the actuality of this assertion. Although surgical nurses do not define technology as the inter-relationship between factors inherent to technology or in terms of the concept of technique, it has nevertheless been demonstrated that their experiences are significant and complex. Contemporary surgical nurses experience technology in relation to factors such as machinery, equipment, behaviour, organisational arrangements, knowledge, skills, economics, respect and values. The experience of technology is multifarious and broader than instrumental explanation. The phenomenon is significant as a major influence on various aspects of nursing care and the experience of surgical practice.

What remains unclear from the research is whether available nursing literature has been responsible for determining the way nurses explain the relationship between technology and clinical practice. The majority of nursing literature is restricted by reliance on rudimentary and popularised arguments regarding the experience and understanding of technology on nurses and patients (**popularised** meaning: *to make popular, especially by writing about (a subject) in a way that is understandable to most people* (Barnhart & Barnhart, 1994:1622)). These restrictions have slowed the development of knowledge and explanation in nursing and are reflected in the way that surgical nurses understand technology. Although discernment of technology as the use of machinery and equipment is valid and reasonable given the overt nature of machinery and equipment in society and health care, the rudimentary understanding which dominates explanation of experience at the cost of additional explanation has influenced negatively the evolution of more sophisticated insight into the relationship between surgical nurses and technology. Since there has been limited research and scholarly debate available in nursing literature, it is reasonable to suggest that current discourse has been detrimental to the establishment of alternative views. It has added to the propensity of

nurses to foster an explanation of technology that emphasises commonplace assumptions and rudimentary explanation.

Notwithstanding, it should be noted that nursing is a practical occupation in which knowledge is expressed most often through explanation of the way that nurses perform their work. As such, practical significance remains influential as an important component of discourse. Nurses focus often on what they do, and explain technology from perspectives that emphasise their daily roles and responsibilities. Their emphasis on functionality and practical usage of machinery and equipment is to be expected, but is emphasised often to an extent which disregards nurses' involvement in political, ethical, economic, managerial and intellectual aspects of technology which are expressed less clearly as practical performance (e.g. Allan & Hall, 1988; Barnard, 1996a; Harding, 1980; Hiraki, 1992; Reverby, 1987; and Sandelowski, 1988). For example, contemporary surgical nurses do not experience technology in clinical practice as politics, despite the significance of technology to the politics of health care (Allan & Hall, 1988; Barnard, 1997; Ellul, 1964; Illich, 1973; Reiser, 1978; Reverby, 1987; Starr, 1982; Walters, 1995; Winner, 1977; and Winner, 1986). Reasons for surgical nurses not experiencing politics as a conception of technology are speculative. Obviously, the lack of a conception can be explained by the fact that politics may not be an experience of technology (an actuality which although experienced by surgical nurses would seem to go against the views of authors both within and outside the discipline of nursing). An alternative explanation is that nurses do not understand politics to be a part of technology, and are unaware to the fact that because of their involvement with machinery and equipment they are inextricably linked to the politics of care. They are oblivious to the reality that decisions regarding the acquisition and use of machinery and equipment are always to some degree

political. Decisions regarding access to the use of machinery and equipment by particular groups, patients and individuals, are as much political as they are pragmatic. The stipulation of policies and procedures and decisions regarding the allocation of particular objective means to selected clinical areas are often a consequence of political arrangements. Nurses are involved in political processes but do not understand them in relation to technology. In a typically reductionist and reifying manoeuvre, surgical nurses identify technology as machinery and equipment and substitute this part for the whole. According to surgical nurses, technology is machinery and equipment and politics is politics. For example, some nurses identify political issues such as favoured wards receiving new machinery and equipment prior to others because they care for acute admissions rather than the elderly or people with chronic disease, but do not associate their experiences with technology. It is as if political issues evolve separately to the mere presence of machinery and equipment. Whilst reification of technology, instrumentalism, technological progress, and belief in the neutrality of technology are dominant assumptions and beliefs influencing the way that nurses understand technology, they will continue to have limited insight into the phenomenon and limited influence within health care arenas (Barnard, 1997; Harding, 1980; and Hiraki, 1992).

Notwithstanding, in accordance with nursing literature the experiences of surgical nurses are often positive. It is clearly the case that machinery and equipment can make many aspects of clinical practice easier and more accurate (e.g. the administration of intravenous medication with the assistance of an IVAC machine). When machinery and equipment function well and nurses possess the knowledge and skills necessary to use technology, it can have many advantages for clinical practice. Advantages noted in the literature which were confirmed by surgical nurses relate generally to the monitoring of patient progress, delivering treatment and

accessing information (e.g. Ashworth, 1987; Carnevali, 1985; and McClure, 1991).

In addition, both the literature (e.g. Simpson, 1990; McConnell, 1991) and surgical nurses are deterministic in their appraisal of the potential of technology and emphasise the need to *look to the future* regarding the benefits of technological change. They experience a desire to *keep up* with technology. They are encouraged by their ability to use machinery and equipment and are impressed by the complexity of their changing roles and responsibilities. In accordance with the literature, the outcome of *keeping up* with the progress of technology has been professional development and an increasingly important role in the delivery of health care services (Cooper, 1993; Fitter, 1987b; Mayberry, 1985; and Walker, 1970).

However, there are nurses who experience ambivalence regarding the need to *keep up* with technology. They experience ambivalence not necessarily because they are less enthusiastic about the potential of technological change or because they *fear* technology, as is claimed in the literature (e.g. Folta, 1973; Pillar & Jacox, 1991; Simpson, 1990), but ambivalence as a result of experiences which demonstrate that technology does not always have a positive outcome for nurses or patients. The use of machinery and equipment is understood to lead to both exciting and discouraging outcomes for nursing and health care. The constant demand on nurses to change skills, increase knowledge and respond to pressure increasing from employers to sustain policies and procedures, etc., is an experience of daily practice which most surgical nurses accept but do not necessarily savour. Procedures, policies, professionalism, institutional demands, ethical considerations, and the need to foster educational momentum in their working lives, are accepted but are, at times, arduous experiences of technology.

Even though optimism regarding the use of machinery and equipment is the dominant view expressed by surgical nurses and the literature (e.g Folta, 1973; Mooney, 1956; and Pillar & Jacox, 1991), there are surgical nurses who experience technology in relation to alterative opinion (e.g. Allan & Hall, 1988; Sandelowski, 1988) and object to its unrestrained use. Although approval of the use of machinery and equipment in contemporary clinical practice is believed to be reasonable and a reality of modern nursing and medicine, nurses disapprove of some of the effects of technology on patient care and nursing practice. For example, technology is experienced as increasing emphasis on cure as a philosophy of practice, as increasing amounts of machinery and equipment in health care, as emphasis increasing on the stipulation of policies and procedures, and a decreasing ability to establish a balanced nurse - patient relationship which emphasises personal experience and individualised care. They describe a sense of being drawn towards the consummation of a technical ideal in which there is a de-emphasis of the needs and ideals of the patient and family. Their experiences of technology are summarised best by Wilkinson (1992), who noted that criticisms of the health care sector are associated increasingly with dissatisfaction with scientific development and the technological quick fix.

Conclusion

Technology is understood in clinical practice as the application of machinery and equipment to specific contexts for the purpose of problem solving clinical challenges and accomplishing certain tasks at a level of effectiveness and efficiency. The overt nature of machinery and equipment in health care and the significance awarded to technology in Australian society reinforces this assessment. The experiences of surgical nurses demonstrate that technology is

a major influence on patient care and nursing practice. Conceptions of technology demonstrate that the phenomenon is complex and needs to be described within a framework of explanation that emphasises not only what nurses do, but also the totality of the technological environment of care. It has been demonstrated that nursing literature that relies on superficial excitement and unsubstantiated assertions regarding the use of technology in clinical practice does not describe the complexity of the experience in surgical nursing. Future understanding needs to be informed by explanation of the multifarious nature of technology in the environment of care that accurately reflects both the practice of nursing and the experience of technology.

TECHNOLOGY, EDUCATION AND CONTEMPORARY SURGICAL NURSING

The literature notes the need for ongoing education in relation to nursing and technology. In particular, there is emphasis on the need for adequate educational programs which develop the ability to use machinery and equipment (e.g. McConnell, 1990; Pillar & Jacox, 1991; and Wichowski & Kubsch, 1995). Nurses are advised to undertake educational experiences that assist them to upgrade skills and knowledge so that they can maximise the efficiency and effectiveness of technology. They are urged to access appropriate education so as to make themselves capable of responding to the demands of nursing practice and the health care sector. Overall, the advice they receive is reasonable and valid given the increasing importance of machinery and equipment in clinical practice. However, it ignores the need for additional educational opportunities in relation to technology and is influenced by an underlying desire to foster a technological imperative.

This research has demonstrated that there is need for educational opportunities that enable

nurses to not only advance their clinical skills and knowledge in an instrumental sense, but educational opportunities which assist them to examine current explanation, opinion and research into the relationship between technology and contemporary practice. Currently, there is no literature advising the development of educational opportunities for nurses to reflect critically on the meaning and experience of technology. Additionally, there is no literature advising the need for education related to the philosophy, politics, management and economics of technology.

Nurses need educational forums that advocate understanding of technology from perspectives, which explain the qualitatively different ways the phenomenon is experienced and understood. In addition, they need introduction to explanations of technology that do not focus excessively on the use and function of machinery and equipment. The instrumental emphasis that dominates currently within both the literature and surgical nursing does not assist intellectual development because broader understanding of the phenomenon is required. Instrumentalism does not explain the significance of technology to nursing or establish appropriate theoretical interpretation because understanding of technology is restricted to the use of machinery and equipment (Allan & Hall, 1988; Barnard, 1996a; Barnard, 1997; Dunphy, 1985; Ellul, 1964; Ellul, 1980; Harding, 1980; Marx, 1975; Mitcham, 1989; Mumford, 1968; Pacey, 1983; Postman, 1992; Purcell, 1994; Reiser, 1978; Wajcman, 1991; Walters, 1994; Winner, 1977; and Winner, 1986).

Nurses require educational opportunities that seek also to impute many of the commonplace assumptions that influence nursing discourse and understanding (e.g. technological progress; technology as a neutral object). Commonplace assumptions need to be debated and

challenged in order for nurses to address the problem of technology with a degree of insight that allows them to advance understanding of their practice and profession. For example, nurses need to consider in educational forums the illogical argument (common to society and nursing literature), that technological progress is both self propelling (progressing at a linear and steady rate) whilst at the same time controlled by human intervention (the neutral argument). It is argued by Winner (1977) that arguments such as this are simplistic and based on assumptions that need to be challenged. Winner (1977:269) notes that:

> *On the one hand we encounter the idea that technological development goes forward virtually of its own inertia, resists any limitations, and has the character of a self-propelling, self-sustaining, ineluctable flow. On the other hand are arguments to the effect that human beings have full control, conscious choice in the matter and that they are responsible for choices made at each step in the sequence of change. The irony is that both points of view are entertained simultaneously with little awareness of the contradiction such beliefs contain. There is even a certain pride taken in embracing both positions within a single ideology of technological change.*

Nursing curricula need to be established which include not only educational objectives related to assisting nurses to develop the skills and knowledge necessary to practice appropriately in contemporary nursing, but educational objectives related to the establishment of courses that assist nurses to examine the historical and contemporary experience of technology. Educational opportunities need to foster intellectual insight and develop postgraduate research programs which seek to investigate and understand technology better as a major phenomenon influencing nursing, the health care system and society.

Conclusion

This research has demonstrated that there is a need to review nursing curricula. Nurses need opportunities to not only develop skills and knowledge necessary for machinery and equipment use, but opportunities to examine the relationship between technology and nursing

practice and theory. Educational programs need to promote understanding of technology. They need to foster research and scholarship that assist nurses to develop their practice, understand technology in a holistic manner, and make an informed contribution to the health care sector.

THE STRENGTHS AND LIMITATIONS OF THE RESEARCH

Strengths of the research

The description of the experience of technology which has emerged from the research has a number of strengths. Firstly, the research describes technology as it is understood by practicing registered nurses. The research reveals the experiences of nurses who work currently in the health care sector and as such does not present a collection of theoretical assumptions or pre-conceived ideas about the phenomenon. The research presents for scrutiny the experience of nurses.

Secondly, the research outcomes conform to the requirements of a quality phenomenographic study. There has been adherence to the basic tenets of the research approach (see chapter 3) and the outcomes of the research program demonstrate the efficacy of the claim.

Thirdly, the categories of description and outcome space describe experiences which belong to a specific context. It is expected that the quality of the research will allow registered nurses in surgical practice to readily identify with the experiences described. The research findings can be used to enhance clinical practice, theoretical explanation, and foster new approaches and content in nurse education.

Fourthly, the research is the first nursing research to investigate the experience of technology within the domain of surgical nursing. The research introduces new ways of thinking about technology within the context of surgical practice and highlights the qualitatively different ways the phenomenon is experienced.

Fifthly, the research presents an alternative view about the phenomenon of technology that is confirmed by the experiences of surgical nurses. Technology has been demonstrated to be a multifarious phenomenon that is not a neutral collection of tools which nurses use within a context. Technology effects many aspects of clinical practice at both the individual and collective level.

Limitations of the research

Limitations of the research are identifiable also within the context of the research. Firstly, although it is appropriate to contextualise the research to a particular experience of technology (i.e. surgical nursing), the results are an incomplete presentation of the possible ways of experiencing technology in both surgical nursing and other domains of practice. Technology research will benefit from further phenomenographic studies to both replicate the research described in this thesis, and to describe ways of experiencing technology in other contexts of nursing practice (e.g. community nursing, intensive care, and medical units).

Secondly, there is a need to develop explanation of phenomenography as a research approach. There are numerous strengths to the qualitative approach, particularly in relation to its emphasis on both individual and collective experience, the retaining of data at the descriptive level, and the unique manner that results are analysed and presented for the reader.

Notwithstanding, there are shortcomings in phenomenography with regards to making explicit methodological, epistemological and ontological principles (Barnard, McCosker & Gerber, 1998; Entwistle, 1997; Hasselgren & Beach, 1997; Marton, 1995; Sandberg, 1997; Uljens, 1993). In addition, the researchers role in phenomenography has not been thematised clearly in the literature. Although the interview is an accepted and dominant approach to phenomenographic method, it has been subject to criticism (common to all qualitative approaches) related particularly to reliability, validity, language and the subjective nature of qualitative research (Marton, 1995; Saljo, 1994; 1997; Sandberg, 1997; and Uljens, 1993). The criticisms are valid in as much as more theoretical work is needed to explain what is accepted currently within the phenomenographic tradition.

Recent attempts to further phenomenography through the identification of methodological underpinnings are exciting for the research approach (e.g. Barnard, McCosker & Gerber, 1998; Hasselgren & Beach, 1997; Marton, 1995; Sandberg, 1995; and Uljens, 1993) but more needs to be achieved for phenomenography to fulfill its potential as an accepted research specialisation

REFLECTION ON THE RESEARCH APPROACH

The research interview as a data collection approach

As an approach to collecting data the interview approach was successful in this research. The research drew upon methodological assumptions common to phenomenology and used interview techniques common to counseling (see chapter 3). The use of a friendly and open approach to interviewing encouraged participants to engage in discourse defined and extended by their own understanding of the phenomena. Discourse evolved from the ideas

expressed by each participant and meaning was clarified when language and intent was unclear. The use of a tape recorder during each interview allowed the researcher to focus on the experience of the nurse rather than taking notes, etc. The technique enhanced the flow of discourse and provided research data for later analysis. In addition, the verbatim transcriptions maintained the context of culture and time as did the criteria of interviewing nurses who had experienced technology within the context of surgical nursing. The research interview focused on the surgical nursing experience. The context was meaningful to the interviewee and interviewer and conceptions were explored together (Marton, 1995; Saljo, 1994).

An indication of the success of the interview process was the number of conceptions identified that do not appear in nursing literature. Although some experiences of technology are identifiable implicitly in the literature (e.g. machinery and equipment, knowledge, skills), it is clearly the case that many of the experiences of nurses are identified for the first time in this research. In addition, many of the conceptions described were a surprise to the researcher. Although this does not prove the researchers impartiality, it does demonstrate the success of the research in terms of unique findings and the use of quality analysis and interview technique. It strengthens the probability that the researcher was successful in bracketing his own prejudices, hopes, conceptions, etc.

The creation of pictures as phenomenographic research method

This research was not unique in its use of pictures as a way of collecting research data (e.g. Kwan & Gerber, 1994; Wenestram, 1984). However, the data collection approach is less common than the use of an interview. Participants were requested to create a picture of their

experience on an A4 size paper (the request to *create a picture* rather than *draw your experience* reduced the level of anxiety associated with having to draw in an artistic sense). The method was successful in terms of providing each person with an additional avenue to express his or her understanding of experience. The researchers examination of each persons' picture reinforced conceptions identified through the analysis of interview transcripts. Pictures portrayed the same limited number of experiences and reinforced the claim that the interviews and analysis were quality processes. For example, numerous pictures are presented in this thesis associated with the conception *technology as control of clinical practice.* All were similar in their design, expression of experience , and intent. Notwithstanding, it is fair to state that even though the method was successful, it suffers from similar criticisms raised by Marton (1995:170) with regards to the need for further explanation of methodological principles.

Researcher bias

It is the nature of both qualitative and quantitative research that there will always be a degree of subjectivity. Selection of data that is relevant to the research question and the intent of the research is always to some degree influenced by the views and ability of the researcher. To minimise the impact of the researcher on the research outcome a rigorous application of a specific approach to research design, data collection, analysis and reporting of results was described and followed during the research process (see chapter 3).

The quality of the research has been demonstrated by the identification of conceptions that correspond in order to form clear relationships between each other. Conceptions are different in their portrayal and meaning. Each way of understanding is described in terms of the

nurses' experience rather than the views of the researcher. In addition , the quotations and explanations from participants support findings that are unique. The research results provide an explanation of the qualitatively different ways nurses experience technology and have provided support for criticism and argument raised in this thesis.

If bias has influenced the research outcomes, it is not through want of trying to get around the challenge through the use of accepted avenues. It is unfortunate that the lack of previous research in the area makes comparative analysis impossible, as does the lack of any phenomenographic research in other disciplines investigating peoples understanding of their experience of technology. The test of time will demonstrate whether the research described in this thesis will stand as seminal phenomenographic research into ways of experiencing technology in surgical nursing. Further research will confirm the appropriateness and accuracy of its findings.

Phenomenography as an approach to health care research

The successful completion of this research makes it possible to speculate on the possibilities of phenomenography as a research approach for nursing and health care research. This research demonstrates that researching conceptions has both practical, theoretical and educational value. Health care researchers need to give serious consideration to investigating people's conceptions as an object of study. Phenomenography is a little known qualitative research approach that has potential for health care research, particularly when peoples' understanding of their experience is the goal. Recognition of the qualitatively different ways phenomena are experienced and understood could have an important impact upon health care, health maintenance, clinical practice, theory, and education. Central to improving health care

and developing any discipline is identifying the ways that phenomena are understood and experienced by practitioners, patients, institutions, and society. Although there are few phenomenographic research studies published in the area of health care research, the potential of the research approach indicates the need to become aware of its development. Phenomenographic studies not only describe and illuminate the essential meaning of phenomenon but add also to our understanding by presenting the way in which people respond to their world. The research approach has the potential to achieve research outcomes that add to the body of knowledge of *how* and *what* we experience and understand within the framework of health care, nursing practice, and discipline development.

RECOMMENDATIONS FROM THE RESEARCH

The following recommendations relate to the eight (8) qualitatively different ways technology is experienced and understood by surgical nurses and the review of nursing literature. They are summative, reflect the scope of the research, and are not presented in any order of priority.

The first group of recommendations highlights the importance of understanding the significance of technology to contemporary surgical nursing:

1. This research recommends surgical nurses seek actively to understand better their experiences of technology.

Technology has been demonstrated to be a complex phenomenon that needs to be understood in relation to surgical practice, theory and education. In accordance with the findings of this research it is argued that understanding technology as more than an instrumental phenomenon

will advance knowledge and assist nurses to discern technology as a significant phenomenon to nursing. Understanding technology will assist nurses better to improve the delivery of nursing care, improve the experience of the patient, and foster the development of nursing as a discipline.

2. This research recommends that all health care workers make themselves aware of the qualitatively different ways technology is experienced and understood by contemporary surgical nurses.

Surgical nurses require collegial support in their efforts to nurse within technologically complex health care environments. The complexity of experience and understanding effects significantly the quality of health care provided by all health care workers.

The second group of recommendations relates to the relationship between the research findings and the development of theory:

3. This research recommends further research and scholarship be undertaken to develop theoretical interpretations which explain the relationship between technology and nursing.

Technology has been demonstrated to be a complex phenomenon that is described inadequately by surgical nurses and nursing literature. Appropriate development of theoretical perspectives in nursing which seek to explain the experience of technology will assist to improve clinical practice. Theory will initiate awareness of technology as a

phenomenon significant to nursing and establish an avenue where by its multifarious nature can be debated, researched and understood. The development of theoretical interpretation will provide nurses with frameworks to understand technology better in relation to daily practice, patient care, and the nursing discipline, the health care sector and society.

The third group of recommendations relates to the relationship between the research findings and the practice of contemporary surgical nurses:

4. This research recommends that nurse practitioners, educators, managers, and researchers be informed of the qualitatively different ways technology is understood and experienced by contemporary surgical nurses.

It has been demonstrated that more needs to be achieved in relation to understanding the influence of technology on nursing practice. Insight into conceptions of technology will foster knowledge of the complexity of the phenomenon, and develop awareness of the need for appropriate practice, management, research and education. Understanding the qualitatively different ways nurses experience technology will influence also the future of nursing practice, education, management and research.

The fourth group of recommendations relates to the relationship between the research findings and the education of contemporary surgical nurses:

5. This research recommends the introduction of technology studies to nursing curricula that advance understanding of the experience of technology.

It has been demonstrated that there is need for educational opportunities in nursing which foster an understanding of the experience of technology. It is argued that when nurses advance their awareness of the multifarious nature of technology they will improve their ability to explain the phenomenon in relation to their practice. In addition, they will be able to provide informed leadership to assist in the maintenance of quality health care and advance nursing as a practical discipline. An educated and informed nursing profession will research the relationship between technology, nursing and health care, and foster excellence in scholarship and practice in order to influence positively the future development of nursing as a profession.

The fifth group of recommendations relates to the relationship between the research findings and the need for future research:

6. This research recommends further research and scholarship in relation to each of the qualitatively different ways contemporary surgical nurses understand and experience technology.

It has been demonstrated that each of the limited number of qualitatively different ways of

experiencing and understanding technology in surgical nursing have not been researched previously, and characteristics of experience are identified incompletely in the literature. Each of the conceptions identified by this research have significant implications to understanding nursing and effect directly the quality of patient care and the health care system. Each conception requires explanation that extends further the descriptions outlined by this research. In addition, there is need also for appropriate research within all domains of nursing with emphasis on the way technology influences the practice of nursing. Research and scholarship will develop current knowledge, foster debate and assist to address technology as a phenomenon important to understanding nursing and society.

7. This research recommends the development of research into the historical evolution of technology in nursing.

The historical development of various equipment, tools and machinery, etc., has not been the subject of research and scholarship in nursing. The lack of research and scholarship is a deficit that has effected the ability of nurses to identify technology specific to their discipline. There remains currently a need for research that explores the evolution of technology in nursing during the modern era. In addition there is a need to develop a typology of nursing technology. Historical research which assists the process of understanding better the relationship between nursing and technology, the scope of nursing practice, the relationship between nursing and health care services, and the roles and responsibilities of nurses will assist to explain the significance and development of nursing.

8. This research recommends further phenomenographic research investigating the qualitatively different ways technology is experienced and understood by both contemporary surgical nurses and other domains of nursing practice.

The final recommendation to arise from the research relates to the usefulness of phenomenographic inquiry in identifying conceptions of technology in surgical nursing. The success of phenomenography as an approach to qualitative research in this research indicates the necessity of further studies into the experience and understanding technology and the possibility of a wider application of phenomenography in health care. Phenomenography is a distinctive approach to research and provides new possibilities for nurses and health care researchers.

CONCLUSION

Technology is a complex phenomenon that places before us an abundance of puzzles and questions and on the other hand fools us with simplicity. It is influential in every realm of professional and social life, and it is appropriate that more is done to examine the phenomenon. The purpose of this thesis has been to use a phenomenographic research approach to describe how contemporary surgical nurses experience and understand technology and was guided by the research question: *Are there qualitatively different conceptions of technology within surgical nursing*?

The outcome of the phenomenographic research approach has been the identification of eight (8) qualitatively different conceptions of technology. It was found that current understanding and experience of technology focuses on the way machinery and equipment use manifest as readiness for clinical practice, the outcomes of technology use in clinical practice and

alteration to volition. The experience and understanding described are important to contemporary surgical nursing and are a major achievement of the research. Technology is noted to be a significant phenomenon and the findings of this research are an advance in nursing knowledge. The conceptions and outcome space have not been identified previously and describe understanding and experience important to nursing practice, theory and education. It has been argued that on the basis of conceptions described it can be asserted that technology alters the social, personal and professional lives of each nurse.

Notwithstanding, explanation of current experience and understanding and criticism of nursing discourse has been constructive and at times stated forcibly in order to emphasise the need to consider technology better in relation to nursing. This research has identified limitations to current debate, scholarship, research and the understanding of contemporary surgical nurses. Although their experience and understanding of technology is valid and reasonable, it has been argued that alternative perspectives and explanations are not considered appropriately. For example, nurses do not demonstrate a advanced understanding of technology in terms of definition and explanation, and the relationship of nursing to technology in the form of technique (or soft technologies) is non-existent. It is argued that nurses need to become aware of perspectives that explain that technology is, and is more than, instrumental experience and understanding.

This thesis contributes an important foundation for understanding better the practice of surgical nursing, and is a beginning point in the development of a theory/ philosophy of technology. It has been demonstrated that nurses need to understand better the influence of technology on not only what they do as nurses, but also how and why technology is important

to understanding the way nurses engage in the process of caring for humanity. The research has identified that contemporary surgical nurses must actively seek to explain their experience and understanding with a level of insight that demonstrates the importance of not only technology to the profession of nursing, but the importance of understanding technology as a major factor in society and the experience of health care.