CHAPTER FOUR

THE EXPERIENCE OF TECHNOLOGY

> *I think we do an enormous amount of different things in the one day, I have fun trying to juggle all the things I have to do in my work all the time.*
>
> (8,7)

This chapter is a presentation and description of conceptions of technology within the domain of contemporary surgical nursing. Eight (8) **categories of description** are presented as is the outcome space for the qualitatively different ways of experiencing and understanding technology. Each category of description is a conception of the phenomenon and the outcome space is a presentation of the referential and structural relations between conceptions and is entitled **description of the outcome space: understanding technology in contemporary surgical nursing**.

Conceptions of technology originate from the context of each nurses' experience but are not attributable to any single person. They are holistic, describe common experience and are a collective understanding of the qualitatively different ways surgical nurses experience technology. The results of research present the richness of experience and qualitative differences reflect more or less the context of each person's understanding, ability and willingness to reflect upon and explain his or her experience of technology in contemporary surgical nursing. Analysis of research findings is included with explanation of each conception. The relationship between conceptions and nursing literature is outlined in the final chapter, along with further interpretation, critique and recommendations.

Phenomenographic analysis of transcripts and pictures led to the identification of eight (8) categories of description. Many nurses expressed more than one (1) conception, however not all nurses shared the same experience and understanding of the phenomenon. Each conception preserves the experience and discourse of participants. Quotations and pictures included in the body of the thesis have the quality of representing particular conceptions and are both unique yet typical of understanding. The quotations and pictures of interviewees have not been edited so as to preserve meaning and the intent of each individual. Therefore, quotations included are not necessarily grammatically correct or succinct. Quotations and pictures are the language of participants and express experience and understanding as described by contemporary surgical nurses.

Questions posed by the *interviewer* have been included in the body of the thesis when they flow logically with discourse and all quotations from interviewees are labelled *nurse* in order to maintain anonymity and confidentiality. Individual transcripts are identified by a bracketed code at the conclusion of text. The bracketed code refers to interview number (numerical) and page number (numerical) (e.g. (20,5)).

The eight (8) conceptions of technology in contemporary surgical nursing identified by the research are entitled:

1. **Technology in contemporary surgical nursing as *machinery and equipment***

2. **Technology in contemporary surgical nursing as *changes in 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 understand technology in relation to the patient***

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

CATEGORY OF DESCRIPTION ONE (1)

Technology in contemporary surgical nursing

as machinery and equipment

There were few variations in the way nurses described this category. Technology is understood to be machinery and equipment (objective means) which are used in order to obtain certain ends. Technology is not conceived in terms of a system or as inter-related machinery and equipment. Objective means is experienced as single unique pieces of technology, which bear minimal significance to each other in terms of the total clinical environment. The way in which the phenomenon is understood and experienced is analogous to the commonplace societal view that technological means are indiscriminate machinery and equipment that are devoid of holistic interpretation. Machinery identified by nurses often were Pulse Oximeters, IVAC machines, Electrocardiographs, computers and telephones. Equipment tended to be objects such as drugs, catheters, intravenous infusions and dressings. As the following nurse says:

> *Nurse: ... telemetry, devices that monitor the heart rate, things like the IVACs, regular drip monitoring, syringe pumps, Heparin, Insulin, glucometers, the blood sugar level machines, the pulse oximeters, the Dynamaps for blood pressures. I guess even some of the new, maybe new temperature probe, for the ear, would you call that technology, it works quickly. The optoscope or something. I'm just thinking now of the general ward situation and what I deal with first of all. Like the computer system, actually just entering in patient data. That's the more hands on technology. Things like getting blood gas results or results from patients has been part of technology in a way, because it is technology that gets that information to you.*
>
> (20,5)

Nurses focus often on technology (objective means) which is new (modern) and describe the impact of technology on contemporary surgical nursing in terms of the upgrading of

machinery and equipment. They experience technology from the perspective of improvement with objective means and identify technology to be, that which is most new and exciting. The experience of technology as new or modern is a characteristic of the conception, as the following statements from these nurses show:

Interviewer: *How would you define technology?*

Nurse: *Technology would be equipment, it's a hard one isn't it? The equipment that is used and the ongoing, the upgrading of the equipment that is used.*

(10,3)

Nurse: *Technology seems to permeate, it's, I suppose it's anything new. It doesn't have to be a piece of machinery, it might be a dressing, but something, it's being with the use of technology. ....Technology is the coming together of science and machinery, like the thinking of science and the substance of machinery, the actual physical pieces, be they made of metal or fabric or whatever.*

(13,3)

Nurse: *...a new improved way of doing something.*

(17,5)

Machinery and equipment are understood to be technology when they possess a quality of newness as well as the label of being scientific, an advanced development or modern. Technology is understood to be dependent upon the discoveries of science, which manifest as physical objects in the form of new and improved machinery and equipment. The conception emphasises any objective means that is judged to be impressive and/or novel. Although nurses do designate *older* technology (e.g. manual sphygmomanometer) to be technology, the quality of newness and science makes certain machinery and equipment more technological.

Nurses also understand modern technology to be machinery powered by external sources. Although nurses do recognise technology can be powered by a human source (e.g. manual sphygmomanometer), this type of technology is viewed generally as inferior or less

technological than an electronic version of the same instrument. When discussing *what technology is*, distinctions are drawn between *old* and *new* technology on the basis of microelectronics, diagnostic accuracy, and electricity. Manual technology is experienced as less significant technology compared to new, sophisticated objective means that are powered by an external source. Nurses in the following statements explain the experience of technology:

Nurse: *Equipment used to monitor patients or control apparatus, things that are attached to patients. Equipment that usually requires some degree of knowledge to work them. Things attached. Things that require motors or electricity or something to keep going.*

(8,3)

Nurse: *Surgically, we use a lot of technology with pumps and infusions, anything that measures or guides something I suppose. I was going to say, electronic, to be electrical, to be technology, but not really. Any sort of system.*

Interviewer: *Can you give me an example?*

Nurse: *Like the pumps, the IV drips, that's all a system, catheters, irrigations, central lines are technology. There are a million things. It might be thermometers, the new thermometers.*

Interviewer: *Why do you say new thermometers?*

Nurse: *Oh, and the old thermometers, but I'm thinking of modern, in today's terms now.*

Interviewer: *So the old one is as much technology?*

Nurse: *Yes, that's just the development of technology. The more modern version of technology would be the electrical ones.*

(10,3)

Nurses' experience and understand technology within an historical framework of innovation and progress. *New* or *modern* technology is a demonstration of the progress of nursing and health care. The objective means of the modern surgical ward is impressive, quicker and innovative. Machinery and equipment that are new are most technological. *Pre-modern* or *old*

technology is machinery and equipment that operates manually or is mechanically less sophisticated, even though they perform often many of the same functions. Thus, the evolution of technology particularly in terms of electronic and diagnostic sophistication directly influences understanding and awareness of the phenomenon. In the following statement the nurse directly relates the experience of technology to its evolution over time:

Nurse: *I would probably define it as something that you can do manually but has a machine or a component with electricity supplied to it. So that's like the manual blood pressure cuff and the dynamap and so you're relying on something other than what you are. So you are relying on electricity to come into the machine for it to work and you can't manually override that, you can't just say I will do it manually, I would consider that technology in my frame of reference. But I guess if you didn't have a sphygmomanometer, and you got a sphygmomanometer then you'd probably call that technology. So I wonder if it's not time related.*

Interviewer: *What do you mean by time related?*

Nurse: *OK. If you are a graduate today, you're probably very familiar with thermometers that are membrane thermometers gauging the temperature. To me that would be technology but because it's their beginning point, they may not see it as technology. They may see what comes after that as being technology, which may be a further development of technology. Does that make sense? So in the case of the sphygmomanometer, the sphygmomanometer that I know that I have to pump up and all the rest and is a free standing thing, to me isn't technology, but the complexity of the machine with electricity and everything else is technology.*

(19,6)

The quality of newness and sophistication constitutes a reason to categorise any form of machinery and equipment as technology. In the above example, the nurses' experience is so discrete that *older* objective means is no longer defined as technology. Nurses particularly experience this understanding in relation to their level of familiarity with certain machinery and equipment. Restrictions on the use of technology due to a nurse's level of education and experience, or the availability of particular means, creates the conception that particular

machinery and equipment (that which is not accessible) are more technological. When technology is less available for use or is restricted to specialist wards an aura of sophistication and importance is engendered in addition to defining characteristics such as newness and power source. Frequency of use and availability are additional reasons for machinery and equipment to be defined as technology. Such familiarity has the potential to cause certain objective means to be devalued and not understood to be technology. In the following quotation the nurse is at the external horizon of her experience and begins to recognise that familiarity of use has influenced understanding of the phenomenon. The nurse explains that she has become so used to particular technology in her clinical environment that it has become less significant and looses its quintessence:

> *Nurse:* *I used to think technology was machines and things like that, but now I do think drips, IVACs, intravenous therapy and catheters and things like that are probably technology too, because you don't see them anywhere else other than in a hospital. .... I've never had to talk about it and I've become very used to dealing with them so I probably don't consider them technology, whereas we don't always have IVACs, or have syringe pump drivers and things like that, so you consider them as more technological than a drip or a catheter which you see every day.*
>
> (15,7)

For some surgical nurses their experience of technology can be characterised as a hierarchy of awareness and value. Some forms of machinery and equipment are understood to be more technological than others. Power supply, newness and science are important in the development of a hierarchy as are function and design which are always relational to age and accessibility. Modern, sophisticated, electronic machinery and equipment are more technological than older manually operated and readily accessible objective means.

The simple and ordinary were identified rarely to be technology and the conception is

described as having the characteristic of failing to understand the relationship between technology and daily activities, practices, actions and roles. For example, even though drugs and intravenous infusions are nominated frequently to be technology, some nurses do not experience the practice of administering drugs to be associated with technology. There is limited conceptual relationship described between technology and the nurses' actions, and there is a lack of awareness of the relationship between the phenomenon and clinical practice. As the following discussion with a nurse illustrates:

Interviewer: *In what way did the other patients need more time? If it wasn't technology, what was it?*

Nurse: *Technology. Well, I suppose, well it wasn't, well it was a lot of helping them swallow the tablets, a lady who's potassium levels are low, she needed to have, she's got potassium in her drip as well, which is only running 24th hourly because she gets overloaded very quickly, so she's got to have chlorvescent as well, which has to be dissolved in water and takes quite a long time to drink and swallow tablets, and a lot of time is just spent when you've got nearly 20 tablets, when you're taking one at a time with a lot of water in between, it certainly takes, well nearly 20 minutes.*

(18,11)

According to the example above, assisting a person to swallow tablets (drugs) has no relationship to the experience of technology. The tablets as technology and the act of administering the tablets were unrelated. The nurse clearly experiences technology to be unrelated to the time spent with the patient. There was a clear disassociation between the clinical practice of the nurse and the technology. The nurse dispensed pharmaceuticals, adjusted intravenous equipment and assessed potassium levels, but a practice link between the nurses' actions and the technology was absent

Summary

Nurses understand technology to be objective means most commonly manifest as machinery

and equipment. Their experience is related to the physical nature of technology and their understanding reflects an emphasis on the new and exciting. The experience leads some nurses to undervalue technology common to clinical environments. Nurses speak of older machinery and pieces of equipment as technology, but rate them less technological. For example, a common piece of technology such as a mercury thermometer, although a simple and important piece of equipment used by nurses, is less technological than a microelectronic thermometer even though both perform the same function. Objective means that are new, accurate and powered by an external source are experienced as more technological than older and familiar machinery and equipment.

An important characteristic identified in this conception is the way technology is defined. The conception not only confirms that nurses define technology as machinery and equipment, but that availability and newness are factors influencing their description of the phenomenon. The emphasis on sophisticated machinery and equipment as a defining characteristic is linked not only to a fixation on the impressive, but a bias towards the inaccessible. The conception confirms the earlier review of literature. Surgical nurses lack knowledge of what is specifically nursing technology and are impressed by the machinery and equipment of other professions (which may or may not be related directly to nursing) not only because of their mystique or prestige, but because of their lack of accessibility. The characteristics noted above have not been identified in the literature previously and have implications significant to understanding the way nurses define and value their own discipline.

CATEGORY OF DESCRIPTION TWO (2)

Technology in contemporary surgical nursing

as changes in skills

This conception originates from experiences of the relationship between machinery and equipment and alteration to nursing skills. Technology is understood to influence directly the skills of each surgical nurse. Technology stimulates the need to examine accepted skills and acquire new skills necessary for contemporary nursing practice. Nurses experience technology as: alteration and de-emphasis of certain skills, the need to engage in critical appraisal of skills required to achieve certain ends, and as a principle catalyst in the development of clinical practice and education. In fact, some nurses experience technology as a phenomenon which determines directly their education and behaviour. For example, the following nurse remarked that:

> *Nurse:* *I guess, technology in our ward, it makes sure that we're always reading up on things and educating ourselves. A lot of the girls subscribe to the nursing journals and they're always bringing in things and reading about new procedures that they're going to be doing or things like that. It ensures that you're constantly educating yourself.*
> (17,5)

Nurses understand technology to be responsible directly for changes in the type of, and demand for, nursing skills used in the daily care of patients. The following statement explains a nurse's experience of skill change:

> *Nurse:* *The patients who I once used to nurse in ICU are now in the wards, so you've got a much sicker patient in a general ward than you used to have. Patients stay in hospitals not anywhere near as long as they used to, it's very rare that you sponge a patient in bed because it seems that no matter how sick they are, no matter how big the problem is of getting them from the bed to the bathroom, you can overcome it, with*

the help of devices.

(13,7)

A characteristic of this conception is that although technology changes nursing skills, it does not change practice principles. Technology is characterised as less of a change mechanism to nursing principles then a change mechanism responsible for the introduction of new options in care. Technology increases the number of practice options available for nurses. Nurses experience technology as altering less the fundamentals of clinical practice than the choices available to achieve certain ends. Technology is experienced as the alteration and addition of nursing skills available to maintain principles of practice as the following statements from two (2) nurses describe:

Nurse: *...it's changed the day to day what you are doing, or how you do it, but not necessarily how you nurse, looking after your patients, it has just given a new option, another option that is not there otherwise.*

(16,7)

Nurse: *...we may have more aids to help us with taking blood pressures and this sort of thing, but actually looking after the basic needs of the patient is not going to change.*

(2,6)

In addition to experiencing new options of care the phenomenon is understood to alter particular nursing skills in order to make them simpler, easier and in some cases more accurate. For example, the electronic thermometer and the dynamap machine for blood pressure monitoring have made the process of observing a patient's vital signs more accurate and less time consuming. The following two (2) nurses describe their experiences stating that:

Nurse: *It's easier. Press a button. Didn't want to say that. It makes it easier.*

(1,6)

Nurse: *... things have all changed from years ago. They have these quick in and out procedures and it doesn't matter if they sneeze, they won't pop their lenses out, that's all changed, enemas and things, you get all this pre-packed stuff that you just sort of mix it up and it's there. We had the old metal containers with rubber tubes that you had to stick*

through the sterilisers and the big drama of enemas, it's all changed.
(8,5)

Objective means does however make certain skills less important in clinical practice. Technology is experienced as altering daily routine and is understood to be a major catalyst in changing nursing practice. The following nurse describes the experience:

Nurse: *Well, it doesn't change my role as an RN really. I mean I'm still there to do the obs and look after their A.D.Ls and all that sort of thing, but I guess I don't have to so much. As I was saying before, we don't have to turn people, and we don't have to do dressings as much, I mean we still do dressings, we have to with necroscopy tubes, but on the T.U.R.P patients, we don't have to do those things.*
(17,6)

Whilst certain skills become less important, other skills become fundamental to the care of the surgical patient. The development of health care technology has meant new skills are acquired in order to practice adequately. Although the principles of nursing are not experienced to be altered, the skills required to achieve many of the usual goals of nursing are at times different to previous years. For example, the process of taking a person's blood pressure is a basic activity associated with measuring a person's vital signs but the skills required to successfully complete the process have changed. As the following nurse says:

Nurse: *I think complex technology such as some kind of monitor, something with a lot of cables, probably a LED light display, something that you need to know more than just the old blood pressure. So if you're taking a blood pressure with an old sphygmomanometer with the ball and the pump, as compared to a dynamap, that's high technology, in comparison to what we can do manually.*

Interviewer: *Doesn't it measure the same thing?*

Nurse: *It measures the same thing but you need different skills.*
(19,6)

The experience of nurses affirms the need for awareness of alteration to health care technology (machinery and equipment) and the need for nurses to respond in ways which

makes them skilful practitioners who are both aware of the needs of modern nursing and able to respond to the requirements of clinical practice.

Technology requires the modern surgical nurse to assimilate to objective means in ways that do not hinder the usefulness of technology to patient care or the health care system. Central to their experience is not only the assimilation of changing skills in clinical practice, but the need to develop skills necessary to manipulate machinery and equipment and problem solve their operation. Problem solving is a prerequisite skill and is referred to commonly as *troubleshooting*. Troubleshooting refers to the ability of nurses to solve problems associated with the use and application of technology, as stated by the following three (3) nurses:

Nurse: *We apply it to a person. So, we're in charge of operating that technology and we're in charge of the accuracy of it too. You know, if it works properly, and if it's not, we should be responsible for fixing it.*
(10,8)

Nurse: *...when someone is alarming for some reason, you try and work out why, what's going on and why they're alarming, what we can do to fix the problem.*
(5,3)

Nurse: *...you end up being the trouble-shooter, Miss Fix it type person, and of course with a lot of younger staff who perhaps aren't very au fait with this type of machinery, plus you need a competency to, you're supposed to have a competency to look after, say, somebody with an epidural or to change the PCA syringe or something like that. And because sometimes you might be, say, one of the only people on the ward who knows how the, who is allowed to do it or who does really know how to work the machinery, you spend quite a lot of time with it.*
(1,5)

Troubleshooting is experienced as being able to organise and manipulate objective means in order to ensure it works. It is the fostering of skills necessary for the maintenance of objective means in clinical practice. As the following nurse says:

Nurse: *... we have to troubleshoot, so if a laser is not working, you have a set*

procedure, you turn it off, check everything, and then go through the starting procedure again. If you can't get it to go, then you get the engineers up to fix it. But that sort of work is what the nurses do.

Interviewer: *What do engineers do?*

Nurse: *They actually open the machines up and pull the innards out and go through all the connections and that sort of thing.*

(6,4)

Troubleshooting is experienced as an instrumental skill related to ensuring the normal function of machinery and equipment used in ward management, health care practices, and patient care. Instrumental means *acting to serve as a means; useful; helpful* (Barnhart & Barnhart, 1994:1094), and is indicative of an instrumentalist philosophy. **Instrumentalism** (in.stru.men.tal.ism) is a philosophy by which *thoughts and ideas are valuable according to their function as instruments in the control and adjustment of the environment* (Barnhart & Barnhart, 1994:1094).

Although modification and minor repair to machinery and equipment may occur, the repair and design of technology is generally not an experience or skill associated with troubleshooting. When technology is found to be faulty, nurses are required to know how to obtain a similar piece of equipment and who to contact in order to have faulty equipment assessed. Their experience is associated with the skill of keeping machinery and equipment working in an appropriate and normal manner.

An interesting characteristic of the conception is the way changes to nursing skills stimulate opinion concerning the future development of nursing. When changes to skills are the subject of reflection, beliefs and fears about technology and the future of nursing are made clear. The experience of changing skills includes formulation of beliefs related to their value to nursing

practice. The beliefs involve invariably opinion concerning technology as either saviour or demon.

Some nurses' spoke of the need to be orientated toward the future application of objective means and the need for nurses to be responsive to health care technology. They experience uncritical acceptance of technological progress and are motivated particularly by an imperative to *keep up with* technological advances, even if they have negative effects. In the following statement a nurse explains his ideas about technology and skills change:

> *Nurse:* *The nurse is going uphill. I think we're half way there, but there is a long way to go to meet the ideal of what the nurse should be. We're climbing the ladder to meet it. With the technology, we're just a few steps behind it at the time being. That's why I've put her half way up.* (7,10)

In figure two (2), the picture created by a nurse describes how technology causes linear increases in nursing skills and knowledge. Nursing skills and knowledge are depicted as advancing steadily towards an undefined but technologically orientated future. Despite the fact that nurses are characterised as having no time and support in their clinical practice and to experience pressure to attain certain clinical skills at a predetermined level of efficiency and effectiveness, they must continue to progress forward into the future. The description is deterministic, understands technology from an instrumental perspective, and portrays the future of nursing to be linked directly to the progress of technology in the form of machinery and equipment. Skills and knowledge are not defined as components of technology (as in figure one (1)). Skills, knowledge and the future of nursing are inextricably linked to the integration of objective means into the daily practice of nurses. The development of nursing occurs as a result of association with technology rather than being a part of the phenomenon. For example, the nurse notes in figure two (2) that there is *pressure to achieve skills to meet*

technology.

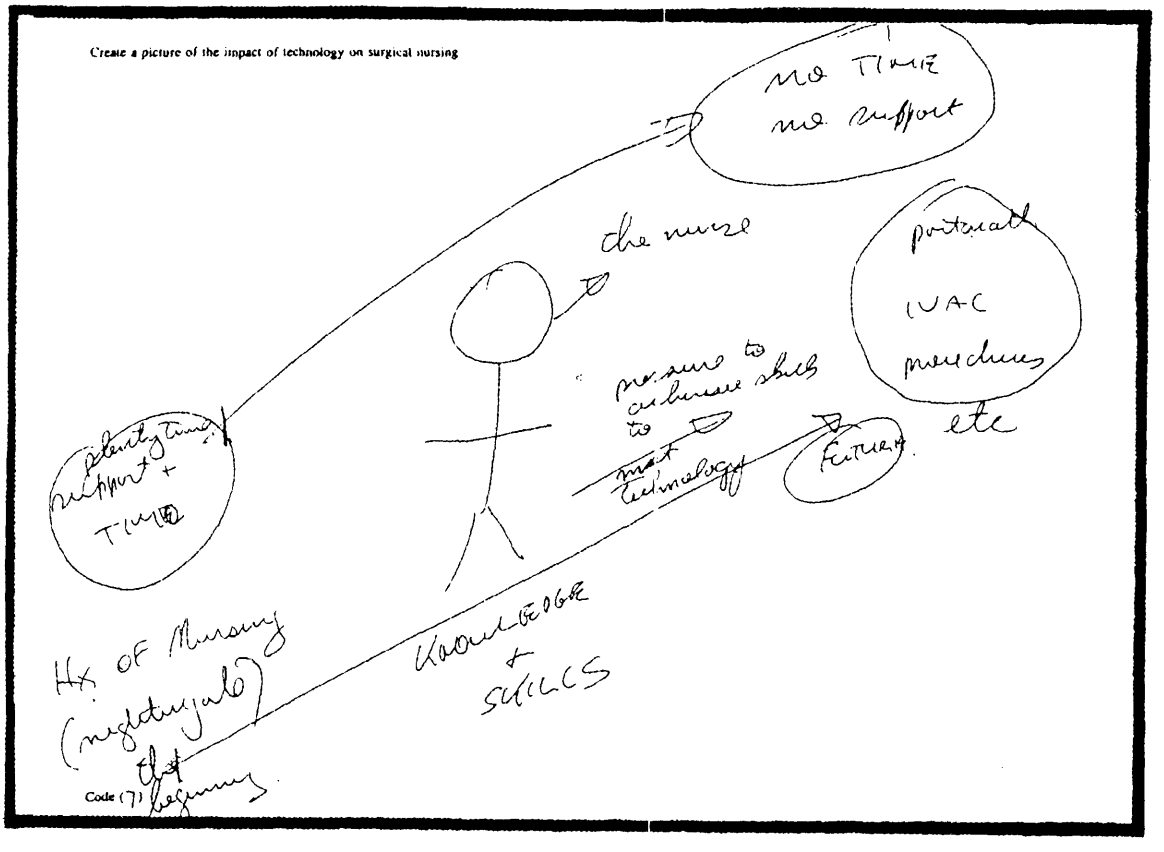

Figure 2: **Technology and skills**

Machinery and equipment (e.g. portacath, IVAC) are described as exerting pressure on nurses to achieve skills necessary for the future. The following discussion also explains the experience:

> *Interviewer:* *If we're climbing towards the future, and the future has a lot of technology within it, yet there's no time and support* [pointing to figure (2)], *I get the feeling as though you see this as a negative development.*
>
> *Nurse:* *No, because I think the way the role of nursing is, we've got to follow the technology, there seems to be no point in going off at a tangent because the public expect the technology to be used on them for their benefit, so we've to channel that technology.*
>
> (7,10)

The need to *keep up* with the development of technology and not *fall behind* in the

advancement of skills and knowledge is a common and consistent characteristic of the conception. In the following interview the nurse stated that:

Nurse: *You need to advance, you have to go with what's happening, you have to keep up.*

Interviewer: *And if you don't keep up?*

Nurse: *You get left behind. It's become a much more computer, electronic oriented society, isn't it, and if we don't know how to operate that equipment or use it or that sort of thing, we'll probably find that we lose touch maybe with the advancements that are going on, the technological advancements.*

(5,8)

Some nurses experience and understand technology as an exciting phenomenon and are encouraged by the potential of its continued development. Nurses spoke of being enthusiastic about the future. They experienced a sense of awe in relation to technological advance and are inspired by the various objective means available to nursing and society. They are impressed by innovation and the newness of objective means as demonstrated by the following comment from a nurse:

Nurse: *... new things amaze me when they come out. I think, oh, whoever thought of that. They must have been clever to think of that.*

(18,11)

However, some nurses were less inspired by technology and changes to skills, and spoke of experiencing uneasiness regarding the future of nursing. They understand the future of nursing to be associated with continued demands to modify nursing so as to engage in practices that are perceived as undesirable for nursing and patient care. In the following statement a nurse describes her experience and expresses her fears (technology as a demonic force) about being displaced by technology. The nurse understands that just as it can be argued that failure to embrace technology use can lead to an exclusion from health care practices, an embracement of technology can have also the same effect (although she does not

forego her acceptance and interest in the progress of technological development). The nurse states that:

> *Nurse:* *... in the future, we'll have a lot of, what is the word, it's not skill erosion, it's role erosion or something like that, maybe in the future. I think they find with the appearance of physios and OT's and dietitians and all that sort of thing, over the years nurses used to do all that sort of thing and there's been a bit of role erosion. I'm not sure exactly how technology would do it, but I think there is the potential for it. ... maybe we'll have robot nurses, I don't know. I see it as generally positive though. You need to advance, you have to go with what's happening, you have to keep up.*
>
> (5,8)

In particular, the nurse experiences and understands technology to cause nurses to spend less rather than extra time with patients. Technology increases the automation of nursing care and demands from nurses' time in exchange. The experience of technology is associated often with increasing numbers of objective means in surgical areas. In the following graphic (figure three (3)) the nurse experiences technology as a dialectical dilemma. The nurse is unsure whether the future of nursing should be understood as a positive experience for both the patient and nurse (the positive experience is characterised as increasing time spent together and is portrayed on the right side of the picture), or understood as a negative experience where the primary function of the nurse will be to monitor patients electronically in an impersonalised surgical environment (left side of graphic). The positive experience expresses technology as the utopian ideal. Technology advances in ways that benefit the patient and the profession. The negative experience (portrayed on the left side of the picture) is typical of dystopian views and portrays the nurse and patients are dis-embodied objects. Each person is reduced to an impersonalised dot on a page rather than a portrayal of a human being. The single dot at the bottom of the left side of the graphic is the nurse, whilst the six (6) dots which are joined to the nurse by a series of straight lines are the patients. Patients are

monitored by an impersonalised electronic system. The picture portrays clearly an understanding of technology as both *good* and *evil*, and is typical of the way the phenomenon is described both in nursing literature and by society. Each experience is typically utopian and dystopian and portrays the confusion generated by an inability to reconcile differences between what is stated about technology and what is experienced.

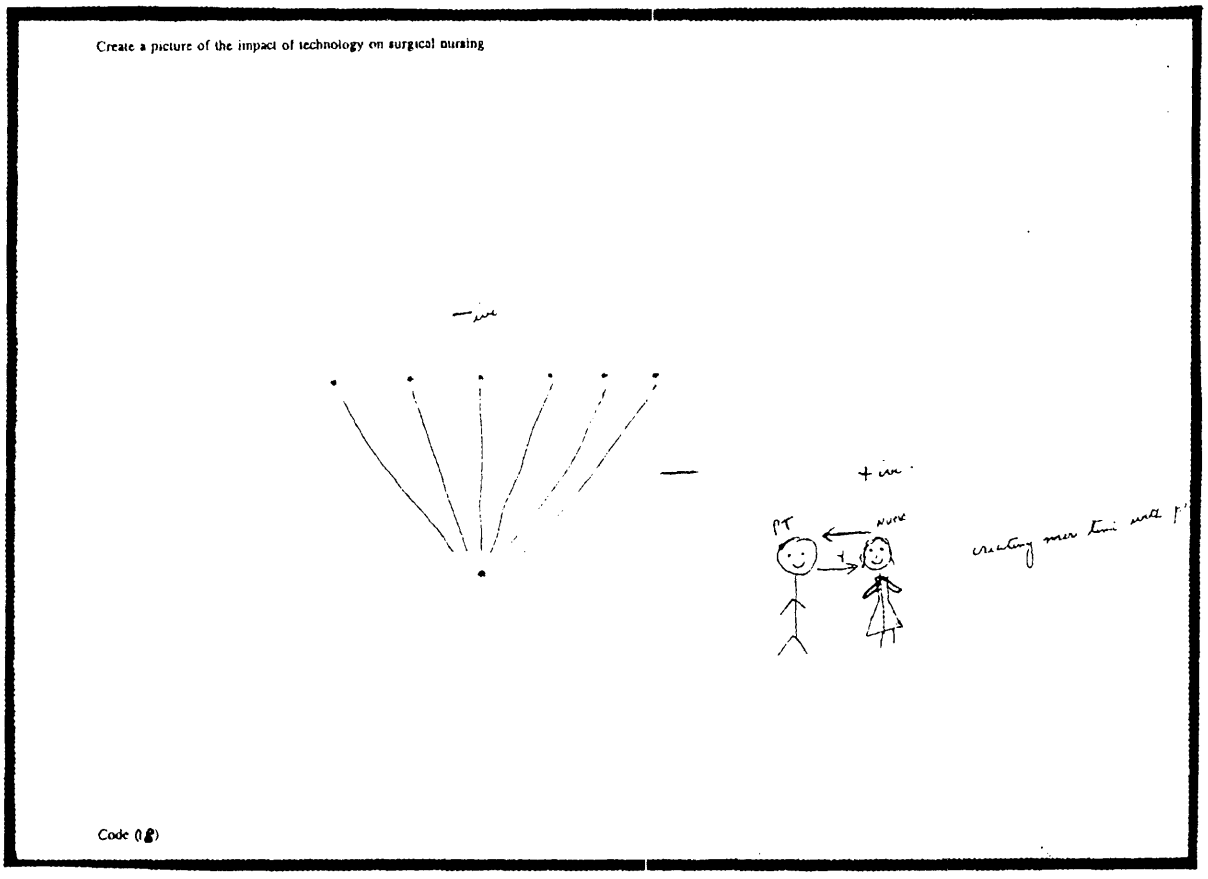

Figure 3: Technology can be both positive and negative

During the interview the nurse expressed her ambivalence about the potential benefits of technology for patients and nursing practice and described her experience of the phenomenon in terms of machinery and equipment noting that:

Nurse: *...you hear all these things in the factories and they're doing away with all the workers because robots can do all sorts of things. Maybe the impact of technology may. I mean I'm looking at the future, I don't know whether you want to talk about the future? But like I said, that came to me very clearly when I was down in CCU* [Coronary Care Unit] *and I thought, this freaks me out, you know, there all sort of lying there in hospital, and your just sort of monitored, you don't see anyone or don't talk to anyone or something like that.*

Interviewer: *OK, and you've got another version?*

Nurse: *My positive version.*

Interviewer: *And what have you got there?*

Nurse: *We're both happy with the outcome and hopefully the technology will create more time to be with the patient.*

(18,12)

Nurses' spoke of challenges experienced when caring for people on a human level. They spoke of human interaction being experienced as restricted or unnatural in highly technological environments. The need to focus on machinery and equipment and practice in a way which assimilates to the manner in which technology functions in the world (requiring rationality and efficiency), turns *normal* nursing behaviours into conscious and rational skills. Seemingly *normal* activities of caring in a human relationship become contrived experiences. Practices that for many years have needed little identification (e.g. touch, communication) have become controlled, planned and systematic As explained by the following nurse who stated that technology:

Nurse: *... may decrease the amount of time you spend actually touching the patient. I think it's a conscious effort to make sure you talk to the patient, to hold her hand, her blood pressure goes up if you hold her hand you can drop it back to a normal level as opposed to giving her medication. So, yes, I think it's affected practice in that area.*

Interviewer: *What do you mean by conscious effort?*

Nurse: *That colleagues may remind you that it's documented in the text that it's important to talk to the client, touch the client and all the rest of it,*

so it's been identified by external people, other than yourself as well. So it is a bit of a conscious effort I think. I think it probably does occur at a subconscious level as well, but that's an individual thing and I think it is a recognised aspect.

Interviewer: *So you feel it is unusual to have to identify it as conscious?*

Nurse: *Yes I do actually. I think you can be. I don't think it's normal.*

(19,7)

Despite the fears expressed by many nurses, they continue to praise the potential of health care technology at the expense of other important attitudes towards the phenomenon. For example, the need for nurses to be pro-active and more critical of changes to skills was experienced rarely. Technology is understood to meld nursing skills in order to comply with the demands of the health care sector and compliance has the quality of changing and improving nursing and health care. Technology and skills change is characterised generally as a positive experience even though some of the negative effects of technology which are understood to be associated with the introduction of machinery and equipment (e.g. less staff; depersonalisation) are not desired, as the following statements from two (2) nurses illustrate:

Nurse: *it reduces a bit of workload, but then again, because of having the access to that facility, it may have actually reduced numbers in the ward. I don't know. Or, because there was a need for more staff in the area, the technology may have been developed to keep the balance of numbers but make your workload less. See what I mean? I don't know. But that's a guess on my part. I think it has changed practice in a variety of ways.*

(19,6)

Nurse: *the other thing I thought of was that maybe with lots and lots more machinery and equipment and stuff, you might need less nurses. All these things, like monitoring. ... I was just thinking, I was just drawing my picture here and just imagining this person in a basic hospital bed with like monitors to just monitor their vital signs for you and record them for you, then you would have more time to do other things, so maybe you could actually look after more patients, so maybe you would need less nurses, maybe. I don't know.*

Interviewer: *Is this something you've experienced?*

Nurse: *No, not really, I don't think. Not yet. There's not enough equipment around at the moment*

(5,9)

Summary

Skills are changing rapidly in nursing. Many of the skills that were required previously are no longer necessary or relevant to contemporary surgical nursing practice. New skills associated with the application of technology have become important elements in the practice and continued development of surgical nurses. Nurses experience technology as changing skills in a changing health care sector. It provides new options in clinical practice and acts to extend the skills of surgical nurses.

It is clear however that despite the enthusiasm associated with changing skills, technology provokes uncertainty in practice and a crisis of meaning for many nurses. They understand the future of nursing to be inextricably linked to technology, and even though the outcome of their relationship with machinery and equipment is unknown they are prepared to describe their experiences as beneficial for nursing and patient care. The potential outcome of their relationship to technological progress as well as continued changes to skills creates the impression that technology is exciting and needs to be encouraged in contemporary surgical nursing practice.

CATEGORY OF DESCRIPTION THREE (3)

Technology in contemporary surgical nursing as increasing knowledge

The focus of this conception is the experience of technology as increased knowledge. Technology is understood to lead to changes in the level of knowledge required to practice in contemporary surgical nursing. Technology is associated with the intellectual development of nurses. Nurses need to not only know how to perform certain skills but also to develop their conceptual understanding. According to one (1) nurse, technology has *made it a more knowledge-based profession, you have to have a fairly good brain* (15,4). The experience is shared with other nurses as described in the following quotation:

> *Nurse:* ... *it's* [nursing] *altered from, well it wasn't just a totally caring profession, but for the majority of it was a caring profession to a position where we got a lot more knowledge, there is a lot more skills, you've got to manage your time a lot better.*
>
> (11,6)

Nurses experience knowledge as dynamic and subject to rapid alteration, modification and development. They spoke of an imperative to *keep up* with changing knowledge in nursing, medicine and health care. Even though knowledge development has always been important to nursing practice, rapid changes to technology over recent years has made knowledge even more essential. According to the experience and understanding of the following nurse, knowledge has become increasingly important in professional development:

> *Nurse:* *It means we have to be dynamic to change as new technologies, equipment, procedures come in, you can't stay static, you have to keep your knowledge base. You need to go to seminars, inservice, getting people in to give lectures about things, people from surgical*

companies and things like that. Keep you informed.

(7,7)

Knowledge development in nursing has become an ongoing professional objective. Nurses spoke of health care technology placing continual demands on time and intellectual energy. The need to be able to understand the varied types of technology (machinery and equipment), to participate in health care practices, and make critical decision concerning the use of technology has made knowledge an essential component of contemporary practice. The following two (2) nurses explain:

Nurse: *... you learn something basic that's specific to that particular piece of technology and you get some experience with that and then the next step would be something allied to that, that's a little bit more complex, that is added on to the basic foundation of knowledge concerning that piece of technology. And so you build.*

(13,2)

Nurse: *... the introduction of say computers, may be seen as being negative, because initially it takes a lot more time to be educated to use them and the same with any sort of equipment really.*

(5,10)

Characteristic of the conception is the importance of developing knowledge so as time is not wasted during clinical practice. Saving time is an indicator of the value of technology and the nurses' ability to maximise its use is a measure of their professional practice. In fact, the value of a nurse as a professional colleague is rated often in relation to his or her ability to use machinery and equipment in an efficient and effective manner. Knowledge influences clinical performance and is a fundamental criterion in the assessment of adequate nurses' practice as described by the following nurse who stated that:

Nurse: *The computers, when they came in, it was all, this wonderful idea, but we figure it wouldn't be a time saver, but I guess it is, because we know where charts and X-rays are, where they are supposed to be, it's probably the lack of knowledge, not being able to use the equipment properly, that it's wasting your own time, rather than saving your time*

(9,3)

Knowledge is related directly to the use of increasingly sophisticated diagnostic and assessment technology. Knowledge of technology use and understanding information obtained from machinery and equipment enables nurses to respond better to clinical problems due to increases in accuracy and speed of assessment. Technology assists in the assessment and diagnosis and appropriate knowledge of the meaning of clinical information increases their roles and responsibilities in decision making and clinical treatment. Knowledge as a consequence of increasing technology is a positive experience for both the patient and nurse, and is associated with expert practice. It saves time and professional recognition, as described by the following statements from two (2) nurses:

Nurse: *Crikey. It's good. I mean we are quite capable of doing it and it's very interesting. I mean, if we were going to look after patients holistically, as they always like to tell us, we need to have that with us.*

(9,5)

Nurse: *If you know how to use an IVAC or a PCA or ECG machines and they help your patients' care, which they all do, if they are used correctly, then you've got other time to do other things because you're not watching drips and you're not giving injections of morphine or pethidine, if you know how to do your ECG machine, you pick up someone's, or doctors can pick up someone's ECG which is wrong, or you know why and so you can more holistically care for them. You've got more time to do other things.*

(15,3)

Nurses are required to not only perform skills but to understand the reasons for their actions. They need to know what they are doing and why they are doing it. Even where individual practice is supervised by senior colleagues, there continues to be increasing pressure upon each nurse in relation to his or her level of knowledge.

A characteristic of the experience of increased knowledge is the restriction on the interchange of nurses between clinical specialisations. Clinical environments require staff to have

knowledge particular to specific health care technology. Even though the principles of nursing practice remain the same within and between clinical specialisations, the specifics of objective means and disease processes preclude nursing staff mobility. Knowledge requirements are understood to be so specific that inappropriate exchange of nursing staff is dangerous to patients and professional practice. The following nurse describes the experience:

Nurse: *A few weeks ago, I was told I was to be sent to Intensive Care for the evening shift to look after a ventilated child. And I said, well no, she says, well you have to, and I said, I don't. I said I have not looked after a child on a ventilator since 1990 and I'm not about to walk in there and do it tonight. I said, you will get someone who knows what they're doing. I can do your cardiacs or something if I have to go down there, my ward is busy, I'm sure somebody else can go anyway, but I will not do that. And she said, well you have to. And I said well I don't and I won't. Because I thought that was unsafe because although I used to do it, I haven't done it for a while.*

(3,6)

Understanding technology from merely a skills or instrumental perspective ignores knowledge as an important factor in the experience of objective means and an important determinate on nursing practice. Knowledge is understood to be central to the experience of confidence and competence in clinical practice and the lack of appropriate knowledge precludes the nurse from performing independently at a level of expertise required to make safe and prudent clinical decisions. The following statements from two (2) nurses describe the experience of technology in relation to safety and the complexity of nursing practice:

Nurse: *I think if you don't know what you're doing with that sort of equipment, it can make you feel not very confident, lose your confidence in what you're doing. Can even make errors I suppose, ask silly questions.*

(11,5)

Nurse: *It's just a lot to learn when you first start. But you catch on. I don't think I was shocked, I think surprised probably. I think I thought it was more old fashioned and hands-on and you stand there and squeeze the bag and put the drip in.*

(15,6)

Nurses spoke of increasing responsibility associated with the development of knowledge. This responsibility is not only to maintain and use particular machinery and equipment, but individual responsibility to be pro-active in understanding better contemporary nursing practices. Limited knowledge reduces quality of care and affects all aspects of clinical practice since it retards the nurses' ability to integrate and use technology. For example, technological knowledge is experienced not only as responsibility to understand theoretical concepts but also as the need for familiarity with the language of medicine and nursing. Responsibility for machinery and equipment is associated with a culture identifiable for its language, behaviour and values. In the following graphic (figure four (4)) the nurse portrays not only technology as machinery and equipment but includes the language of clinical practice. The nurse highlights the use of abbreviations as an example of highly specific discourse that is both important in terms of specifying ownership of particular knowledge and skills, and typical of experience which causes confusion and disenfranchisement for nurses who are not familiar with the ward. When asked what figure four (4) represented the nurse explained that her experience of technology was associated with not only the effective use of machinery and equipment, but also knowledge of the language of clinical practice

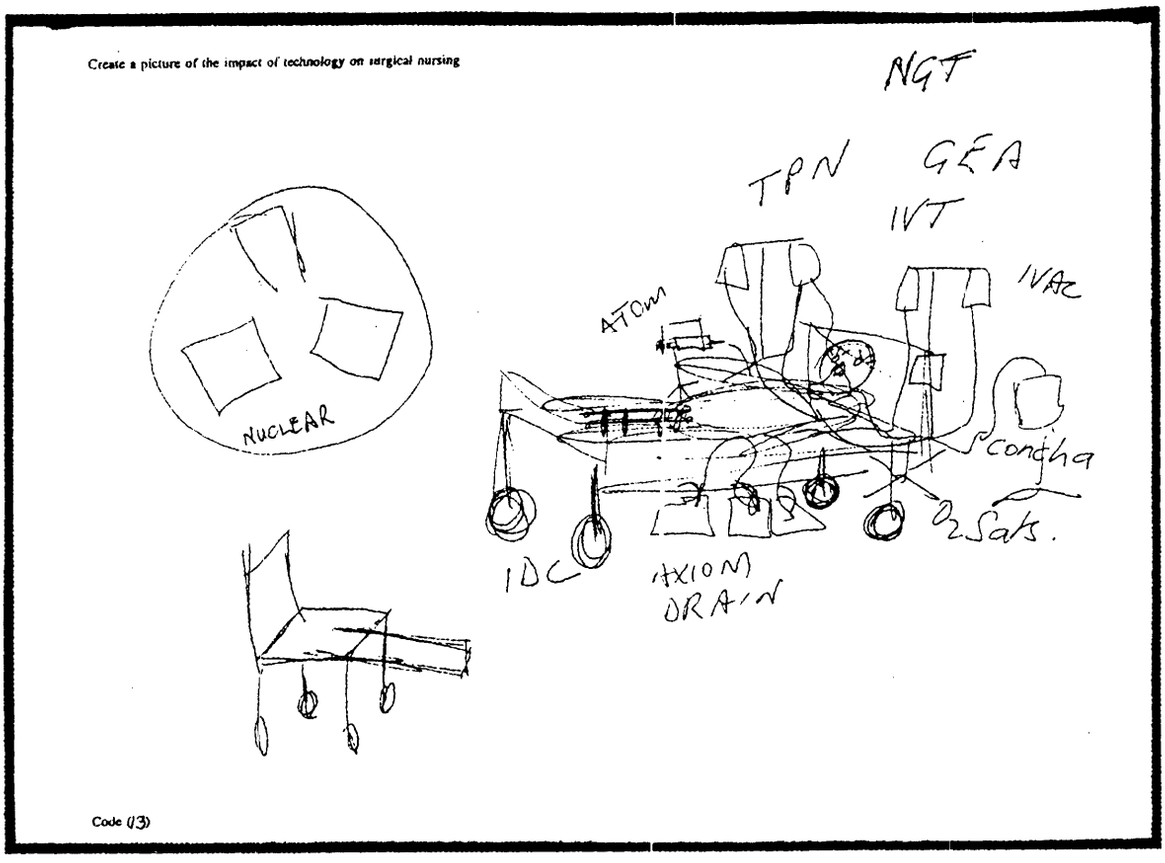

Figure 4: Knowledge and the language of technology

Technology is associated with increasingly specific and sophisticated language and terms that not only describe the parameters of a specialisation but also are fundamental to the culture of the surgical ward. The following discussion describes the experience:

Nurse: *Well, it represents a patient hooked up to things, machines and bits and they've all got, all the things, they are all known by their initials.*

Interviewer: *Such as?*

Nurse: *IVAC. IDC. TPN. GEA. IVT.*

Interviewer: *How do you mean they're all known?*

Nurse: *People refer to things by their Abbreviation.*

Interviewer: *And what significance does that have?*

Nurse: *Well, I find people talk about things when others don't understand what they're talking about. I say, could you please tell me what that means? They tell me, but you feel like an idiot.*

Interviewer: *And what impact does that represent?*

Nurse: *To me? Personally? Well, I used to feel that I should know these things but now I realise I'm not the only one who is at sea with the technological jargon.*

(13,11)

A further characteristic of the conception is the experience that knowledge development in contemporary surgical nursing is understood to be reliant also on mentorship and leadership. Surgical nursing practice is demanding, complex and technical. Meeting the demands of knowledge development requires consistent and serious attention. Nurses experience the need to not only improve personal knowledge through study and attendance at seminars, conferences and trade lectures, but to learn from others and impart knowledge to peers. Technology in contemporary surgical nursing requires the development and availability of peer teachers. Technology demands practicing nurses take responsibility for the knowledge of other nurses. They are required to share their experience and knowledge on a regular and ongoing basis as the following statements from two (2) nurse show:

Nurse: *...technology is a time saver for you, yes, and the other side, it can be more time consuming because it's a new piece of technology, such as a new kind of PCA machine, it might take you an extra half an hour or more to figure out what's going on, or another 20 minutes to teach someone else how it works and another 20 minutes to teach someone else how it works and so on and so on.*

(9,7)

Nurse: *I'd ask to be shown how to do something I hadn't done before, say pull a nasogastric tube out, or something like that and I'd come across staff who'd say "don't you know how to do that?" and I'd say, "no, sorry, no". "Well, I haven't got time to show you". And then you're sort of stuck and think what am I going to do, there's no other senior on the ward, nobody else to ask.*

(11,7)

In addition to these experiences is the understanding that regardless of study, education, peers and time spent using technology, some nurses are less able to assimilate technology into their practice at a level adequate for contemporary surgical nursing. The resultant inability to apply knowledge to practice limits time available for other aspects of clinical care and places excessive demand on colleagues due to their need to focus excessively on the machinery and equipment of other nurses. As the following two (2) nurses explain:

Nurse: *Some people you come across, I don't know if it's they can't comprehend or they have had limited experience with machines or, I'm not 100% sure what it is, but they just can't understand the basics of machines and they have a lot of troubles with them and always ask for help and things like that.*

(15,4)

Nurse: *To me, they're easy when you follow through and read the instructions, usually they come out and they're fine. I just don't know why some people think they can't cope with those things.*

(8,4)

Inadequate knowledge can be related directly to a nurse's inability to focus his or her attention away from objective means in order to concentrate on other aspects of nursing practice. Knowledge development is an experience expressed less in relation to the appropriateness of objective means in clinical practice than the ability of nurses to know how to use machinery and equipment.

Summary

Knowledge is experienced as a consequence of technology development and is essential for contemporary surgical nursing. However it should be noted that nurses do not define knowledge to be technology. The conception is linked directly with the instrumental use of machinery and equipment. The need for education and mentorship is an important

consequence of the development of technology and knowledge development is essential for the roles and responsibilities of contemporary surgical nurses. Clinical environments change rapidly and threaten nurses when feelings of uncertainty originate from inadequate knowledge.

Even though nurses have always been required to develop a level of knowledge appropriate to the demands of the health care sector, the rapid increase of objective means, policies, protocols and legal requirements have made knowledge development unprecedented. Because of responsibility increasing in relation to assessment, diagnostics and treatment, there has arisen a need for nurses to develop the type of practice necessary to fulfil their expanding job. Knowledge is experienced as fundamental to the use of technology. Failure to establish and develop knowledge is understood to be inadequate for contemporary practice and unhelpful to patient care, colleagues, and the requirements of technology in the health care sector.

CATEGORY OF DESCRIPTION FOUR (4)

Technology in contemporary surgical nursing

as respect and autonomy

This conception is experienced as technology increases professional respect and autonomy. The use of technology (machinery and equipment) creates for many nurses an experience of increased respect from peers, other health care workers and society and objective means are understood to possess attributes needed for the development of nursing as a profession. These attributes include sophistication of knowledge and skills, involvement with scientific progress and an association with power and control. The attributes of technology are awarded to those individuals and groups responsible for its invention and use and as a consequence illuminate the practice of nurses when they demonstrate technological knowledge and skills.

In addition, the general sense of amazement and wonder associated commonly with health care technology (i.e. *It's amazing what they can do now days*) increases individual and group credibility. Technology increases credibility as the use of sophisticated machinery, equipment and materials require specialised knowledge and skills. Surgical nurses experience a reversal of the perception that they are poorly educated and incapable of accepting increased responsibility for patient care and treatment.

They note other health care providers have limited knowledge and skills associated with the use of objective means. Doctors order particular machinery and equipment for the care of their patients and yet are unaware often of the specifics of protocols, procedures and their use.

Technology allows nurses to experience a new sense of recognition in the health care sector. Not only is technology a highly valued feature of health care provision, but a feature increasingly specific to nurses. The experience is explained by the following two (2) nurses who state that:

Nurse: *I have been nursing 9 years. It's a dramatic change over all that time for a lot of people from when they were first trained. The increased technology and everything I think that perhaps we're not given enough recognition for having developed that far along with it to know how to use it and do those things.*

(8,4)

Nurse: *I think having competent, well educated nursing staff, I think that's the main thing that people feel comfortable using things, even if they are relatively new and whenever they bring a new thing in at the hospital, they try to organise for us to go to in-service on it so that we do know how to work it and often we're the ones teaching the doctors how to use it. They say, what's this? I think that lends a lot, in itself, to us as nurses, if you can show that we're not just doing these things because we're told, gives us a little bit more autonomy.*

(17,8)

A further characteristic of the conception is the experience that many nurses have increased autonomy as a result of the development of technological knowledge and skills. Their experience prior to their involvement with sophisticated and new objective means was a lack of recognition and an inability to practice in an individualistic and autonomous manner. Increased involvement with technology has reversed their lack of recognition and introduced a sense of professionalism, sophistication, credibility and ownership. Nurses explain that they:

Nurse: *...rely on technology a bit more. I think mainly it is related a bit to our idea of being a professional, and professionalisation in some ways. That nurses don't want to be seen as just being able to talk to a patient or shower a patient.*

(20,4)

Nurse: *I think that any technology can only be good. That might be a bit too general. But any technologies that are based on a science and research which nursing seems to be heading towards, I think can be very positive. It gives us a lot more credibility if we do move with the times and no-one wants to have all these available and nursing not keeping up and being educated and making use of what's out there.*

(17,8)

The experience of respect and autonomy manifest as collegial relationships with other health care providers, particularly doctors. Nurses understand technology to be a bridge between the nurse as handmaiden to the doctor and professional respect and autonomy that originate from a valued body of knowledge and skills. Mastery of machinery and equipment begets to nurses a label of colleague and technology provides for nurses numerous roles and responsibilities which are valued by others. For example, because of their knowledge and skills nurses are able to make responsible decisions concerning the care, treatment and diagnosis of patients and are consulted regularly regarding the appropriate care of patients by other health care providers as the following statements from two (2) nurses describe:

Nurse: *I knew the director and they do come up to you and say, what's happening, what do you think and they ask you and I think for nurses, well nurses like to be able to be a bit more equal partners or a bit more involved in decisions that are being made. A bit more collaborative about decisions being made. Maybe instead of being told you should do this and that, they like to think and make decisions, based on some sound knowledge.*

(20,4)

Nurse: *...every time she had the Methadone, she'd go into apnoea, on the ventilator, because it just knocked her for six, it was way too much and basically the consultant who reviewed her, he didn't really realise what was going on, because he wasn't there, so I told him and I said, every time she has this, she rah, rah, rah, and he said, do you think it is too much? And he said, do you think? And I said, yes I do and so he cut it down by half, which improved her situation. So that's just a small example I think. He asked, what do you think? Whereas most of the time, most doctors don't ask you directly what you think, they just tell you what to do and you do it.*

(5,4)

The use of machinery and equipment increases some nurses' feelings of self and professional worth. Nurses experience a sense of importance. The use of technology is a role, which is perceived by nurses to be valued highly by others, and the knowledge and skills of technology elevates them to new levels of esteem and importance. The technology of contemporary surgical nursing obliges doctors to be reliant increasingly upon nurses for information and advice. Suffice it to say, reliance on nurses for information has always been a characteristic of the relationship between nurses and doctors. However, increased nursing responsibility for assessment and treatment has enhanced the importance of nurses in the provision of health care. Technology is valued highly at all levels of the health care sector and Australian society and when groups such as nurses are recognised and relied upon for their technological knowledge and skills, they experience a sense of importance and respect. The following nurse describes the experience:

Nurse: *I think the profession looks more professional and more glamorous with the technology because there's a lot more of it now in the wards that nurses use and, but wait a minute maybe I didn't realise there was so much, but people who have contact, who are outside of the nursing profession, have contact with and don't know anything about - they tend to put nurses up a little bit higher because they can work all these machines that buzz and they know exactly what to press and they think they're going to be blown up or something like that, and they panic, and the nurse comes along and she just saves the day and presses the right button, its quite funny actually, and you know, they don't die from having air in their tubes and things like that.*

Interviewer: *So you feel that nursing is more of a profession and more glamorous because of technology?*

Nurse: *Not just because of technology but I think it does have an influence on it. I think the lay public do see technology as something that you have to have a brain to work with and if you have to work with it then, nurses have to work with it every day, then they must have a bit of a brain up there somewhere*

(15,5)

Technology provides more information to the nurse and improves interpretive and diagnostic

ability. The combination of sophisticated clinical practice and a sense of respect from health care providers and society has led many nurses to understand objective means to be of unprecedented benefit to their roles and responsibilities. The experience is explained by the following nurse who states that:

> *Nurse:* *I think there's more technology now that's impacting on surgical nursing, I think that nurses are becoming more familiar with the technology and they're using it more in their practice, and I think that the other health professionals may be seeing nurses using this technology as well and maybe in some cases, because the nurses are able to use a wider scope of technology to give information, perhaps some of the other professionals are needing to do, can just get the information from the nurse, rather than going and getting it themselves, because nurses are more able to use some of the technologies and things. So hopefully that just gives us a better idea of where we're at with a patient and what we can do to contribute to their care.*
>
> (20,11)

Summary

Nurses experience technology as increased respect and autonomy. Association with the instrumental use of machinery and equipment along with increasing knowledge and skills enhances professional standing, collegiality and their recognition as intelligent health care providers who are responsible for valued aspects of health care delivery. The development of respect and credibility reverses a chronic sense of professional inferiority. The respect and autonomy generated by machinery and equipment use manifests as increasing reliance by doctors on nurses for clinical information and their use of objective means in the assessment, diagnosis and treatment of patients. The outcome of the experience is understood to be increasing inclusion in decision making, autonomous practice, professional consultancy and collegiality. Technology is experienced by some nurses as a phenomenon capable of elevating nurses from their role of assistant to the doctor, to that of autonomous and respected professional.

CATEGORY OF DESCRIPTION FIVE (5)

Technology in contemporary surgical nursing as control of clinical practice

This conception is manifest as nurses gaining control over, and seeking to manage various clinical practices through the instrumental use of machinery and equipment. Central to the conception is the desire to create order in busy, demanding and complex clinical environments. Nurses experience lack of certainty in clinical practice (unpredictability; varying demands on time; numerous roles and responsibilities) and look to objective means in order to: control increasing clinical demands; monitor and assess patients; assist to foster a relationship with patients; and systematically organise time consuming responsibilities.

Control is important to understanding technology in contemporary surgical nursing. In the daily practice of nursing, control is a pivotal defining characteristic in understanding the phenomenon. The degree to which technology is valued as assisting nursing practice and patient care is judged specifically by how well machinery and equipment assists with the difficulties of clinical practice. It must be able to reduce the time required to master and complete roles and responsibilities. Technology needs also to be efficient and effective. Nurses spoke often of experiencing technology positively when it assists by: alerting the nurse to alterations in patient condition and treatment; and providing a better quality of care through effectiveness and efficiency; providing the nurse with time to spend with patients.

Nurses expressed the meaning of control not as a clear goal but as a feeling or value such as

good or *advantageous*. Other nurses explain technology in terms of it being a *helper*. Technology assists the nurse to gain control by helping to meet the daily demands of the job effectively. Helping is linked specifically to the substitution of a nurse's physical presence or intellectual commitment by machinery, equipment or a system. A nurse explained her experience by making the following statement:

> *Nurse:* *Generally machines that are designed to try and make work easier, to give you a spare pair of hands or to do something that otherwise would take more time. Make it more efficiently or more exactly. I suppose the drugs and dressings we use would be considered technology in that they are there to make life easier or to make, give better control over situations, particular condition, particular type of wound.*
>
> (16,4)

The conception can be characterised as instrumental. Nurses understand technology in relation to the use of machinery and equipment. The primary function of objective means is to decrease workload, save time and make patient care manageable. It provides for the nurse a helping hand and the ultimate outcome of increased effectiveness and efficiency. When technology attains these outcomes it benefits patients, nurses and other health care providers, as the following statements from two (2) nurses show:

> *Nurse:* *...an adjunct, just to try to make life easier, to save time often. To do things I couldn't do by myself that I couldn't do at all, rather. And in some respects to improve the quality of care for the stay of the patient...*
>
> (16,5)

> *Nurse:* *When I look through the day, we get information about patients on a computer and we put information about them, updating it, in the computer. We get all our drug results, we don't have to wait until the bits of paper are hand delivered, we can access them more immediately. The technology has made pain relief better for patients. It's made lying in bed easier, it's made mobility easier, it's made nutrition better, it's made recovery quicker, it's made management of the wound a lot better, well you've got a much wider choice of what you're going to do and how you're going to approach things with individual patients that you did in the past.*
>
> (13,10)

Accuracy of data from machinery and equipment and the power to predict the outcome of nursing and medical treatment allow clinical decisions to be made on the basis of technological efficiency. The ability to predict the outcomes of care, make nursing practice efficient, and reduce to rational explanation many of the elements of nursing practice is essential in the control of care. Technology assists to attain these goals. It measures patient progress, determines patient needs, is used in patient assessment, and assists nurses to fulfil their duties. As the following two (2) nurses explain:

Nurse: *I think it's given me more information about the patient, yes, it has probably contributed to making nurses more aware of things that they can assess or be involved in and therefore, if they get a result from a machine like that, which is easy to use, they think, hey, this patient is only three days out from surgery, yes their oxygen saturation should be about that level and if they're not, the nurse can make the decision themselves to, OK, well I'd better put them on a bit of oxygen, a couple of litres, where as I would say a couple of years ago, maybe I'm wrong, but I think it makes it easier for nurses, less hassle, they can do more themselves.*

(20,2)

Nurse: *I used to work in a general medical ward where people used to come in really sick, go home a little bit better, and come in, go out, come in, go out, and then die, and you never actually got them better, whereas here you're getting them to a point where they can go out and they can live a happy, healthy life that every other normal baby who's born at term can do, but they can't until we give the intervention - otherwise they would die.*

(2,2)

A characteristic of the conception is that as a consequence of experiencing technology as new and innovative machinery and equipment, as discussed in category one (1), nurses do not understand that the control they seek to attain is related often to controlling existing (older) technology. For example, most nurses identify an IVAC machine to be useful in controlling the delivery of intravenous fluids, but many do not identify the intravenous fluids and intravenous giving set to be technology. Technology is experienced as the control of *patient*

attachments rather than other technology (i.e. patient attachments tend to be less sophisticated technology such as a naso-gastric tube). Nurses spoke of the experience of controlling clinical practice with particular emphasis on those attachments that require time to monitor and operate, as evidenced by the following statement from a nurse:

> *Nurse:* *With surgical nursing, you're going to have drips and you're going to have catheters and you're going to have the added attachments because people have been operated on and things like that, so you have technology there to help you look after the patient and keep a record and keep track of things...*
>
> (15,11)

Control occurs when technology monitors treatment and allows the nurse to physically leave the patient and his or her attachments. The ability to leave the patient is an essential characteristic of control and is particularly important to time saving. Appropriate technology must be able to undertake treatment and monitor a persons condition whilst the nurse is absent. Technology is *a helper* when the nurse is provided the freedom to attend to other duties whilst care is being provided to a patient. According to numerous nurses technology provides a *hand to nurses to care for their patients* (16,8).

The experience is explained by another nurse who states that:

> *Nurse:* *...with technology, it can aid in monitoring more patients. You know you can have people further away and if they've got a machine, that's just a simple machine, like monitoring a drip, and it is going through too fast, then that will alarm, as well as the nurse going down and checking say, every hour, if within that hour it's going too fast, it will alarm. It's more or less a safety net. But it does aid in monitoring.*
>
> (10,9)

A further characteristic of the conception is the experience that nurses must not rely on technology to monitor and treat patients. Nurses understand that the inclusion of objective means in clinical practice requires the nurse to check or safeguard regularly its accuracy and

appropriateness. Technology is understood to be a controlling element in the provision of care that must be managed by nurses who monitor its effectiveness and efficiency. Nurses must always maintain control of the technology as it can malfunction or be inappropriate. Appropriate use of technology includes monitoring the machinery and equipment. Failure to remain observant of objective means can lead to clinical practice being *out of control* and impacts directly on the patient, the nurse, and health care delivery, as stated by the following two (2) nurses:

Nurse: *Technology? I think it's great. Technology they've developed over time is fantastic and it is, well I do not know whether I am being hypocritical, but it is timesaving, it really is. As long as you safeguard it, you check it*

(10,6)

Nurse: *You don't rely 100% on technology, you never know it might run through, or if a battery goes flat, if it does, it normally alarms, but there may be a fault in the machine so you always keep a wary eye on it, but not as much as you would if you had a plain drip up and you were waiting for it to run through the whole time.*

Interviewer: *How do you keep a wary eye and what's the difference between a plain drip and an IVAC.*

Nurse: *Because with your IVACs you pretty much know they will alarm if anything goes wrong and so when you walk in the room and you normally look at the patient first or talk to the patient and as you are talking to the patient, you check the machine and whatever, whereas when you have the drips, you normally walk in or walk past the room, continually looking at the drip to see if it is running through. Not that they are normally that out of control but if you are having a busy day, it always seems to be the way.*

(15,9)

Nurses spoke often of experiencing the potential for clinical practice to be out of control. Inappropriate technology causes a lack of control and the nurse to mistrust it as a helper. The resultant lack of control and uncertainty this brings to the clinical environment adds to the burden of clinical practice and makes it more difficult and demanding. Rather than

technology being *a helper*, the machinery and equipment become a hindrance. As the following nurse says:

> *Nurse:* *When they work properly and they do the job we would like them to do, a helper in the sense that, I mean I like my IVACs when I've got something that needs to be monitored very closely, anything with additives, that I like to be monitored, they're good, they're especially good when we do urine chasers, when we are chasing big amounts per hour, and ECG machine that worked would be great, but I must admit that the technology we've got in our ward isn't helpful at the moment. I would expect technology to be helpful.*
>
> (18,3)

Lack of control entices criticism of technology and is associated with increased work. Technology that does not save time attracts suspicion and does not commonly possess the qualities of ease of use, reliability, or clear problem solving processes. The absence of these qualities make it hard for nurses to experience control because the technology does not possess the qualities necessary to achieve the type of clinical outcomes nurses both desire and expect. Nurses who *are in the advantage of technology* are understood to have time to complete their roles and responsibilities in a calm manner and are able to be with their patients in a meaningful way. When control is expected, a failure to gain control is a matter related directly to either the limitations of technology, the nurses' ability to use objective means or the availability of appropriate machinery and equipment. In the following statements two (2) nurses explain the experience and state that:

> *Nurse:* *I think, because you're not in control of things. You've got to worry more about this sort of thing.*
>
> *Interviewer:* *The machine?*
>
> *Nurse:* *Yes. I mean you have to worry about the person in the bed, you've still got to watch all their physical things, like urine output and things like that, but you know, you waste time thinking about how these things work.*
>
> (11,9)
>
> *Nurse:* *...technology has so many advantages so that if you are without it and*

> *you are busy, you do notice the difference. You tend to be more rushed and you don't have as much time to stop and chat and I think if you can't talk to your patients, then something has got to be wrong, either you need more staff or better management skills or something and you should be able to talk to your patients and not just have to worry about all the attachments.*
>
> (15,10)

In the following graphic (figure five (5)) the nurse depicts the difference between the practice of nursing with technology (technology meaning new, innovative and electronic machinery and equipment) and the practice of nursing without it. On the right side of the picture the nurse is not physically with the patients due to time constraints. She *does not have the advantage of having machinery and equipment* to assist with patient care and both she and her patients are unhappy (as illustrated by the sad expression on their faces). On the left side of the picture, the nurse and patients *have the advantage of machine technology*. The nurse has time to sit and talk with the patients, patient care is controlled and predictable and each person is happy (as illustrated by the smiles on their faces). The picture presents an idealised conception of technology that portrays a tendency of the nurse to displace the responsibility of addressing numerous major practice issues associated with an inability to fulfil daily roles and responsibilities from the nurse to technology. Technology is understood to be able to solve the many problems, which nurses face. Appropriate use of machinery and equipment in order to control the clinical environment of care allows the nurse to be with patients in both a physical and psychological sense.

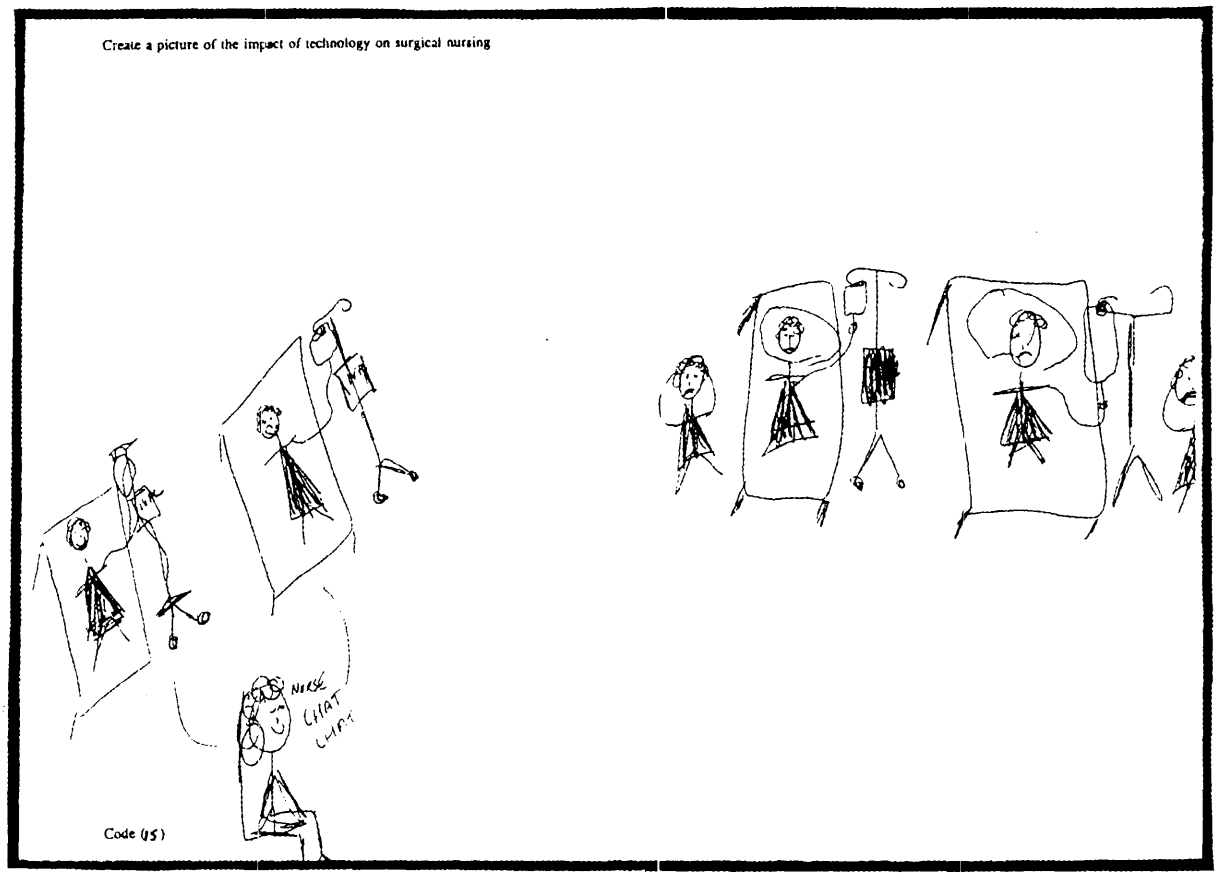

Figure 5: Gaining control with and without machinery

Nurses desire to obtain control over the processes of care and in particular gain extra time (or more correctly re-claim time) from roles and responsibilities that involve technical tasks such as administering drugs and observing intravenous fluids. As the following nurse says:

> *Nurse:* *I would hope the impact of technology on surgical nursing could, maybe, just give me that extra bit of time to spend with the patient.* (18,13)

Some nurses explain the experience of control in relation to three features of the clinical environment. The three features are: monitoring of patients' physical condition; the daily care of the person; and the patients' experience of the outside world. In the following graphic (figure six (6)) the nurse explains the characteristics of control in terms of an a-x-i-s point.

The a-x-i-s point is a strategic point in the ward where the senses of the nurse can access three (3) key areas of care. The three (3) key areas of care are manifest as the outside world (through the window), the machinery of health care (as boxes with lines, etc.) and the patient (in each bed). The nurse is described as calm, possessing time to be seated near the patient and positioned purposely at the foot of the bed in order to observe and access the key areas.

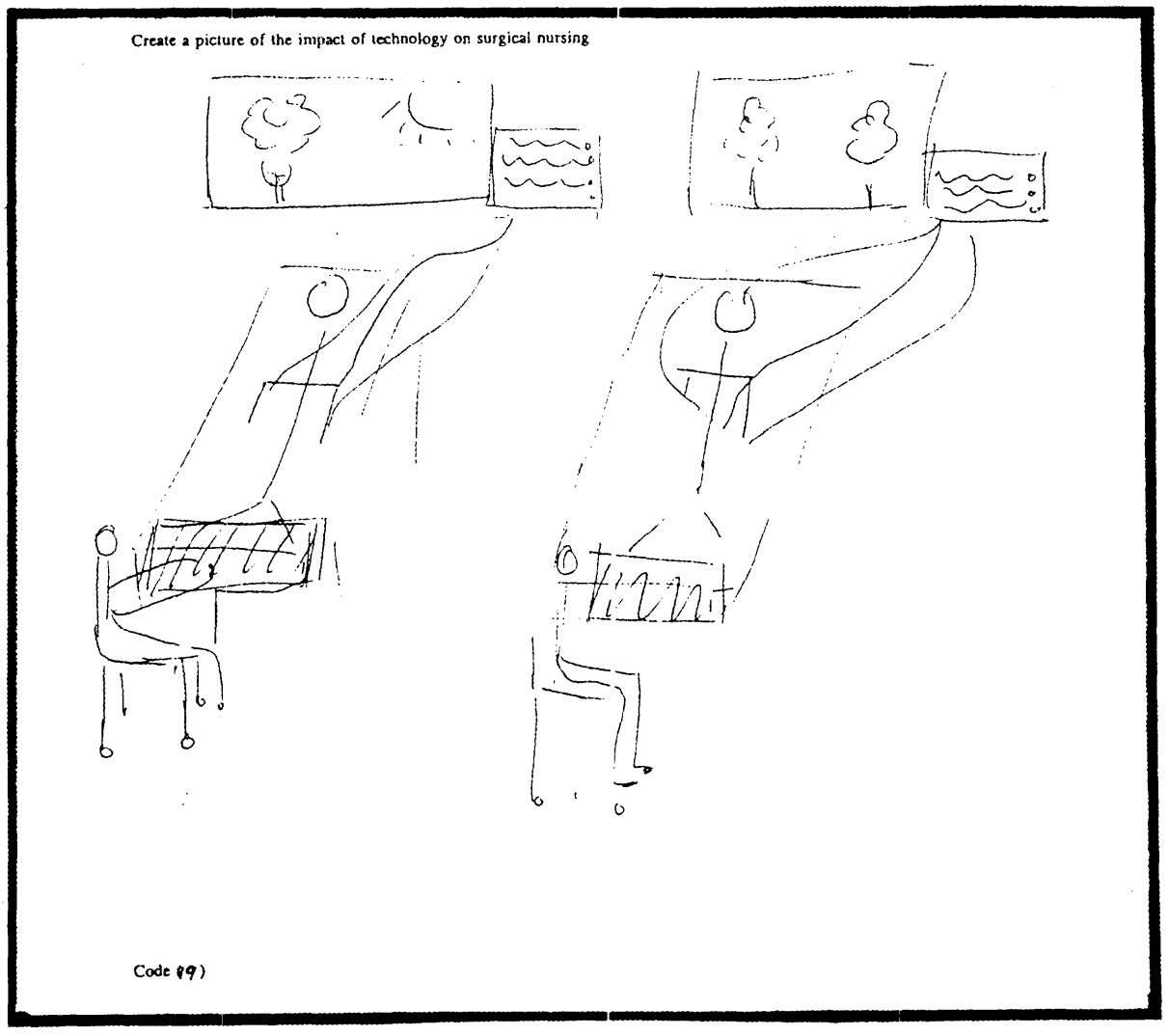

Figure 6: Control and the a-x-i-s point

When asked to explain what the graphic (figure six (6)) the nurse stated that:

Nurse: *I think it represents a lot of control. That the patient really is lying there without much control, they're just the recipient of the technology and of the care and the way I've drawn it shows that there's no real*

interaction that, and I think I used the term conduit didn't I, that the nurse sitting at the bed has access to two or three areas, the outside, the monitor, and the nurse is translating information or being a conduit of the information to the client who is passively receiving it.

(19,9)

Interviewer: *Why is the nurse at the end of the bed, not next to the patient?*

Nurse: *Well, I think it's a control thing again. I guess that, at that point, the nurse is, that's where all the documentation is centrally located, but also at an axis point, as in a-x-i-s point, being able to see the monitor, the patient and the outside. If they're standing next to the patient, they won't have all those inputs.*

(19,9)

The nurse is understood to be the focal point where pertinent aspects and information originating from the patient are collected, organised and translated into nursing care, patient information and health care practices. Nurses are the organises at the central point (a-x-i-s) where the three features of technology, the patient and the outside world come together. Nurses control the experience of the patient, control the various parts of information, which are available and assist to interpret care and the outside world for the patient. The experience is understood to be of benefit to the patient and assists the nurse to gain poise in his or her busy clinical practice. Technology is central to the experience of control as it provides the rationality and efficiency necessary for effective and prudent nursing practice. The need to access all aspects of the clinical environment as a fundamental component of control is a common characteristic of the conception and is drawn similarly by other nurses who portray also their experience of an a-x-i-s point. In figure six (6) and figure five (5) the nurse was positioned central to the three features of control (technology, patient and the outside world) and is clearly also the focus of attention in the following graphic (figure seven (7)). The nurse is positioned central to the experience of the patient. He or she controls the environment of care, the outside world, and the machinery and equipment. The nurse is portrayed in a

position most amenable to best practice. That is, at the a-x-i-s point, in which every aspect of care can be monitored, assessed and controlled.

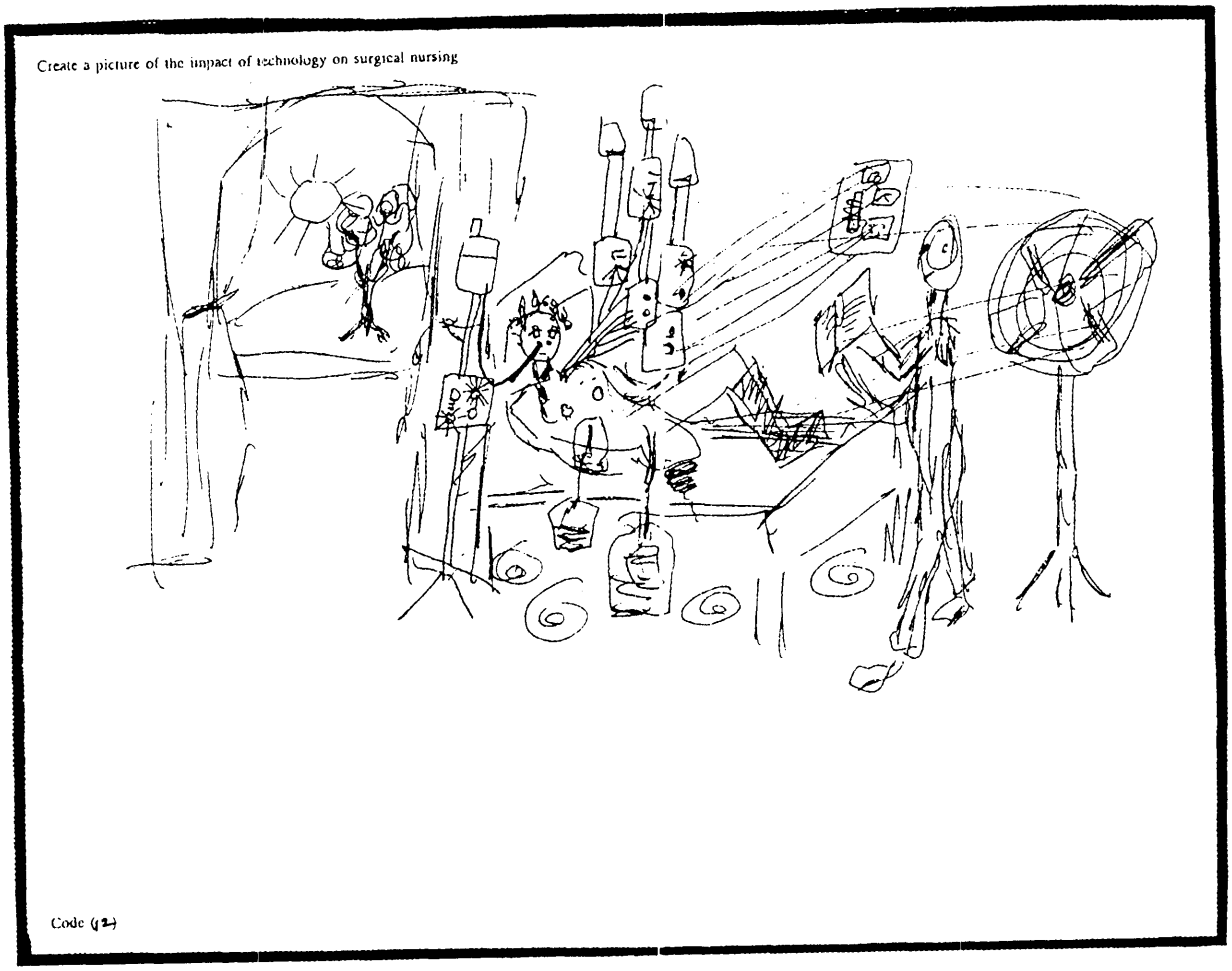

Figure 7: Technology and control of clinical practice

The experience of control is important to all aspects of clinical practice. Nurses are responsible for providing physical care and using technology for the patient, as well as providing a link to the outside world. As the following nurse says:

Interviewer: *Why is the window pane painted with a lovely tree in it?*

Nurse: *Well, she can't see out.*

Interviewer: *And is that significant?*

Nurse: *Yes, that's significant because they're actually away from that at the moment and they can't have apart of that at the moment unless somebody brings some to them.*

(12,10)

Nurses coordinate various elements of the clinical environment. The clinical environment is understood to need control and technology maintains equilibrium in what can be a hectic and demanding clinical practice.

Summary

Control is central to the experience of many contemporary surgical nurses. Technology manifests as objective means and is understood to be capable of creating order in a busy and demanding surgical practice. Control through objective means introduces increasing rationality and consciousness to patient care and the goal of efficiency and effectiveness. Technology permits the nurse to be with the patient on a personal level and when used appropriately fosters a clinical environment which allows the nurse to leave the person whilst objective means facilitate treatment and monitor the clinical condition of the patient. Technology is a helper to the nurse who seeks to juggle the many demands of contemporary surgical practice.

The characterisation of three control features in the clinical environment (the patient, the machinery and equipment, and the outside) reflects the experience of nurses. Technology makes nursing practice and the assessment of patients more accurate, quicker and efficient. Technology makes obvious and conscious the clinical practice of nurses and is foundational in the experience of control. Without technology nursing is understood to lack control and nursing practice is experienced as more difficult and demanding. Machinery and equipment

help the nurse to care for patients and participate in the health care team in busy and demanding clinical environments where rationality and efficiency are key elements to quality care.

Technology is experienced from an instrumentalist perspective and an understanding relies on the belief the technology is a neutral phenomenon and that nurses control or master the technological phenomenon around them. They have mastery over means and control the many extraneous elements of care (e.g. patient attachments) in order that they can focus on other roles and responsibilities.

One of the most important characteristics of the conception in terms of demonstrating the way nurses understand technology is the failure of many nurses to identify that technology is being used to control other technology (e.g. patient attachments). Their emphasis on new and electronic technology disassociates their experience from other technologies of practice. Many nurses fail to understand that machinery and equipment is associated often with other technological activities such as monitoring intravenous infusions, recording patient information, providing medications, maintaining nutrition, measuring vital signs, etc. A great deal of the experience and understanding portrayed by this conception relates to nurses seeking to use technology as a means of maintaining themselves afloat in a sea of work rather than rising out of the ocean to focus on all aspects of surgical nursing. Although technology is experienced as improving the efficiency and effectiveness of nurses, particularly when needing to monitor various *patient attachments*, etc., there is ambiguity regarding exactly when time is saved and to what the saved time is then transferred.

CATEGORY OF DESCRIPTION SIX (6)

Technology in contemporary surgical nursing as being reliant on the clinical environment

This conception is experienced as the relationship between machinery and equipment and the suitability of the clinical environment to foster their use. Clinical environment refers to the ward area, the institution or place of care, and the inter-connecting arrangements between people, machinery, equipment, patients, policies, resources, ergonomics, politics, funding, etc. The conception describes a relationship between the physical forms of technology (machinery and equipment) and the environment of care (e.g. policies, ergonomics, economics, and politics) in terms of instrumentalism. Nurses understand the environment of care to influence directly the use of technology but do not understand the clinical environment to be part of the phenomenon that is technology. That is, nurses understand machinery and equipment to be technology and recognise environmental factors such as the availability of electricity or building design to impact on the usefulness or appropriateness of objective means, but do not identify phenomena such as electricity or building design to be technological. Even though they are identified as fundamental to the use of objective means, nurses experience conceptual disassociation between technology manifest as machinery and equipment and those arrangements that facilitate its application and use.

Nurses do however understand that there is an important relationship that is established between the environment of care and objective means. For example, if a clinical environment is not designed appropriately for the use of modern machinery and equipment (e.g. in terms

of ergonomics) it makes their use difficult and nursing practice extremely demanding. The experience is explained by the following nurse who stated that:

> *Nurse:* *If people have a Christmas tree of IVACs in their room and humidification and suction bottles and other things in their room, you really need a work environment that is conducive to the modern medical environment of, if you're going to treat people, you need the environment to treat them, you need the power points, you need space to be able to get around the bed, space to put the table so they can eat if they're ready to eat, space for a chair for a visitor, space to be able to make a bed, you need wall oxygen, more suction, you need better design, a better designed area to cope with the new stuff that we are using.*
>
> (12,6)

Nurses spoke of the need for practice environments to support machinery, equipment, people, nurses, etc. Practice environments that are poorly designed or inappropriately resourced are unsuitable to accommodate modern machinery and equipment and the practice of contemporary surgical nurses. Unfortunately, they spoke often of experiences where limitation to ward design and lack of appropriate resources (e.g. electrical outlets, health and safety issues, ergonomics, oxygen supply, funding, policies, and staffing) limited their practice. They are expected often to maintain standards of care in technologically inappropriate clinical environments with machinery and equipment that are complex. They understand that poorly designed and resourced practice areas can be dangerous to nurses, patients, visitors and hinder nursing practice. The experience is explained by two (2) nurses who state:

> *Interviewer:* *So what does it mean if you haven't got the environment?*
>
> *Nurse:* *Safety risk for staff and visitors and patients. Electrocution, water on the floor, fluids falling over, electrical equipment, tripping over fans, standing fans, standing TV's, tables, IV poles, because you can have up to half a dozen IV poles. There are jugs on the floor, tubes going everywhere, they can get them mixed up. If you get tubes mixed up, there is a danger of giving a drug that might not be compatible with something else. The danger of falling over. Electrocution, I think I've*

said that one. Bad lighting. You like people to have a rest during night duty if possible and patients not to be disturbed too much, so you tend to use a torch or a lamp and you've got to find somewhere to put the lamp and the most convenient place seems to be on the oxygen meter, which isn't very safe

(12,7)

Nurse: *...it can be frustrating and overwhelming at times. Look, fair enough, in intensive care it might be fine; you've got a whole wall full of power outlets, all the machines. Like, you've got more than enough - well, they've got plenty in there, but in - like you know, I mean, every person with an epidural, they have to have the pulse oximetry; it's part of the protocol; they have to have that on, and if they're having an - you know, like, if they've got a - say a blood transfusion, that's in another pump; that has to get plugged into the wall, and if they have got really bad hypotension - like, quite often they do come from recovery; you know, all of a sudden, their blood pressure disappears in the lifts, and we get them and they're all, you know, 70 on 50, you know, and we've got to push the fluids, and more pumps and machines and things.*

(1,10)

A further variation to the experience is the use of objective means that are outdated, poorly designed or inappropriate. If machinery and equipment are unsuitable for surgical practice they become a burden rather than a benefit to nurses and patients. Busy clinical environments do not allow for excess time and effort to be spent attending to technology which is not efficient and effective.

Notwithstanding, their negative experiences are attenuated by the notion of progress. Nurses look to the future of nursing and the potential of technology to resolve current limitations and dilemmas. The following two (2) nurses explain this experience:

Nurse: *I haven't really got a very positive idea of the technology at the moment. Maybe because of the inadequacies in our ward at the moment. Probably at the moment, I'm probably feeling the inadequacies outweigh the advantages on the surgical side at the moment. Because I'm not in an area where we're using high-tech stuff that is working well. Maybe I'm looking to the future.*

(18,13)

Nurse: *...logistically, they're - in this early fledgling stage of just normal nursing on the ward, they can be a bit of - bit time-consuming and frustrating sometimes.*

(1,10)

A lot of technology is useful to nurses and assists nursing care. However, some machinery and equipment must be *made to fit* clinical environments. An approach to this challenge is the introduction of guidelines (e.g. policies and procedure manuals) which direct nursing practice in the clinical area (e.g. drug infusions, the use of equipment and monitoring processes). Policies and procedure manuals contain directives from authorities such as hospital committees and institutional managers who endorse rules and processes associated with the use of technology. Policy and procedure manuals contain information and advice that reduce machinery and equipment use and other clinical practices to rational explanation. They assist to maintain order, predictability and universality, as explained by the following statements from two (2) nurses:

Nurse: *I think some sort of protocol or policy, not that I'm an absolute stickler for these sorts of things, is really important. I see it as a guideline, as a safety factor.*

(20,6)

Nurse: *it is good, so long as everyone along the line goes by the protocol.*

(10,2)

Nurses are encouraged generally by the availability of guidelines for practice because they provide direction and are an efficient mechanism to regulate the use of objective means, etc. Some nurses however are encouraged less by the increasing number of standards, policies and practices that must be assimilated by the practicing nurse. Policy and procedure manuals specifically instruct nurses how to use objective means and give directives regarding the efficient and effective use of machinery, equipment and the resources of health care. Increasing technology manifests as increasing policies and procedures that create a link

between objective means and the rationality that is sought to be achieved. In the following graphic (figure eight (8)), the nurse portrays her experience of technology from the perspective of the environment of care with reference particular to the way machinery, equipment, patient care and associated resources, procedures and policies, etc., influence her day. The nurse does not question the place of the various components that form part of the clinical environment but remains in a quandary regarding how to accommodate the various demands of technology into her clinical practice. The nurse portrays the experience that technology can make the practice of surgical nursing demanding, difficult, and significant for its lack of available time.

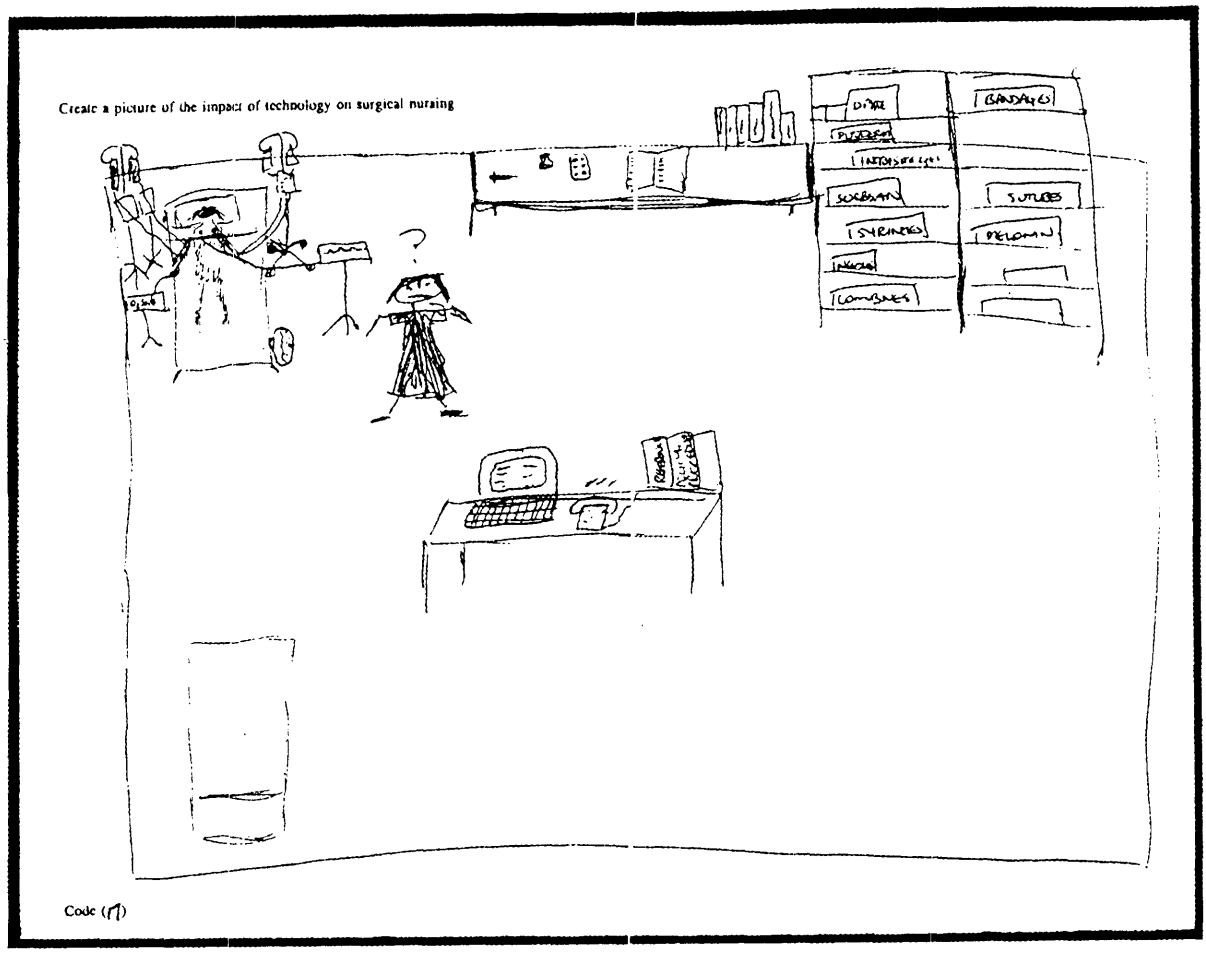

Figure 8: Technology and the rationality of the clinical environment

The nurse explains her experience stating that:

Nurse: *That's our desk, we have more manuals than that at our desk, a bookshelf, a bookcase in fact, with folders marked with things to read, items of interest, journal articles and in your spare time, in amongst looking after six acute surgical patients and admissions and discharges and answering the phone and going to inservice, you read all these things and you have to update the computer all the time with current information.*

(17,11)

Nurses spoke of the need for guidelines but were less positive about their experience. They understand directives related to policies and procedures restrict and make predictable the decisions and actions of nurses and by their very nature exclude individuality from nursing practice. Clinical practice is experienced as a process of following guidelines and policies in ordered or arranged clinical environments. Nurses spoke of being *trained* to fulfil tasks and being *forced* to practice within organisational requirements that are characterised as universal, monistic, rational and autonomous. They spoke of policies and procedures oppressing their practice and controlling the discipline of nursing. They experience the surgical practice environment to be organised for technology rather than nursing practice. The understanding is explained by the following nurse who stated that:

Nurse: *Well, you just learn how to do new techniques, new procedures.*

Interviewer: *What do you learn?*

Nurse: *What do I learn?*

Interviewer: *Yes. What is it that you learn about the procedures?*

Nurse: *Trained like a monkey, learn skills.*

Interviewer: *Trained like a monkey?*

Nurse: *Yes. That's all it is really.*

Interviewer: *Can you give me an example of that?*

Nurse: *How to change a central line. It's written down in the policy so you can go and read it, and go right, I need this, need that, need this and I have to do that, that, that, etc. A, B, C, D, E, F, G - it will tell you exactly how to do something. From a mouthwash, cleaning a denture, anything. It may not be right. But it will tell you. And you just learn more complex skills, depending on what place you're working.*

(12,5)

Surgical nursing practice can become frustrating and demanding also when machinery and equipment do not fulfil the needs of practice. Nurses spoke of inadequate design of machinery and equipment and political-economic influences on clinical practice. Inadequate understanding of the inter-relationship between the practice environment and its machinery and equipment are understood to obstruct quality health care and nursing practice. Demands on nurses to use particular equipment either because of economics, politics, policies, or the requests of medical staff can become a burden when technology is either not available, is inadequate for the environment or simply does not work. As the following nurse says:

Nurse: *... you wonder sometimes -like, some machines need to have more time spent with them because of the - they're just not the right design and all, you know. Some machines are easier and more useful than others, obviously. I can't think of an example, but I know I have used machinery that you - oh, yes, just even yesterday, all I had to do was this - even in the medical ward now - isn't that amazing - we had to use a machine. Pulse oxymetry in a medical ward - a guy with COAD and asthma and a chest infection; they* [doctors] *want to know what his oxygen sats are going to be. You know they're not going to be fantastic, but anyway, they want to know what it is now, and the machine, well, I put it on and they* [nurses] *said, "Well, you've got to fiddle with the thing to make it go," and of course I'm fiddling with the thing - 10 minutes I think I fiddled with it. I couldn't get the signal properly, and they said, "Well, you've got to do it like this," and then I got somebody else and they had a go and they couldn't do it, and then another girl came and finally she said, "Yes, I got it." That's great, but that took half an hour to get one reading, and I said, "Can't you send it down to the workshop to get it fixed?" He said, "It spends all its life down at the workshop getting fixed." And then they said, "Well, you can go and borrow the one from the ward next door," and I thought, oh, no. You know. In that way I think it would make life more difficult. I mean, I spent a lot of time trying to get the machine to work. I got two other people involved in it. I could have had another ward*

involved in it.

(1,8)

One reason for the experience of inadequate technology is the *left over effect*. From time to time machinery and equipment are passed on to wards from specialist areas or from other wards where new technology has been purchased. Rather than disposing of obsolete technology, older machinery and equipment are passed down to other ward areas. The equipment is experienced at times to be inappropriate to ward design and/or inadequate for the needs of patients, nurses or the modern health care unit as explained by the following nurse who stated that:

Nurse: *Things just arrive, or like, we'll get left-overs from other wards. Like, we got this pulse oxymeter, right, when I was working on the orthopaedic ward only because recovery ward, that you used to go and borrow it from, got all new ones, so all the old ones were farmed out to special wards.*

(1,8)

Other nurses characterise the experience as the economics of health care, noting particularly the influence of inadequate funding on the effectiveness and efficiency of technology. Restriction to technology, clinical practice and the environment of care, as a result of economic constraints severely limit the quality of nursing and health care. Lack of money to purchase required resources necessary to operate existing machinery and equipment, or the inability to purchase technology necessary for quality nursing is a source of constant frustration for nurses, as the following statements from two (2) nurses show:

Nurse: *...we've got an ECG machine that doesn't work very well, which is the bane of my life. We have no pulse oximeters, which we need, we have reasonably OK sphygmomanometers, but we have three stethoscopes, we use a lot of IVACs, they are good, they come down from Equipment Holding, what else do we have, equipment wise, what about things like pan hoppers and things like that, are we going into that sort of thing. Don't start me on the pan hopper. They've been condemned years ago and we're still trying to get them replaced. Two of those, one has only been working since yesterday, which is a little difficult. Scales, stand*

on scales which is a revolution, everyone can step on scales now, we don't have to push the big set around. Technology, that's about - oh, there's the flow rate machine, which is great, there are a couple of little drawbacks with that, but we have to get back to the manufacturer about those or we'll develop our own.

(18,2)

Nurse: *...we have got a new humidifier at the moment and there are endless problems with it because management refuses to get the rest that makes it work properly and the humidifier should have a bag that gravity feeds into the chamber and they just won't buy them because they're too expensive and of course, we've been topping up this extra small chamber with sterile normal saline all the time and it keeps beeping and it's driving everybody insane.*

(16,2)

Nurses are required to practice in busy clinical environments where machinery and equipment, complex procedures and economic rationalism are features of a changing health care system. Although old or failing equipment and the constraints of inadequate funding may not be the experience of every nurse or ward area, the need to understand the relationship between the clinical environment and objective means in contemporary surgical nursing is experienced as fundamental to adequate nursing practice and is a challenge to quality health care.

Summary

The clinical environment is experienced as important to understanding the use of technology in contemporary surgical nursing. Nurses understand funding, ward design, appropriate technology and adequate power supply, to be examples of crucial elements necessary for the use of machinery and equipment. When clinical environments are restricted by influences such as funding, politics, the leftover effect and ergonomics, the experience of technology in surgical nursing is one of frustration and decreased efficiency and effectiveness.

The environment of care is experienced as being central to the appropriate and effective use of machinery and equipment and is related directly to the quality of nursing care delivered. The conception is a more holistic interpretation than previous levels of understanding in that a relationship between technology and the world where technology operates is identified. However, the experience does not transpose into a more complex definition or description of the phenomenon. The environment of care and its machinery and equipment are not experienced as inter-linked conceptually as technology, but interlinked in recognition of a relationship which exists between the environment of care and the successful use of objective means. Appropriate environments foster instrumental use (i.e. function, design, funding and organisation of a ward). Even though nurses do not define technology in terms of levels of the phenomenon (as defined by Barnard (1996a)) it is clear that technology is influenced by the environment of care (and vice-versa) and that the influence has implications for the quality and type of nursing care provided for patients.

CATEGORY OF DESCRIPTION SEVEN (7)

Technology in contemporary surgical nursing

as the need to include the patients'

experience and clinical presentation

The focus of this conception is the relationship between the patient, the physical and objective nature of illness, and the reliance on machinery and equipment in clinical practice. The conception is characterised by the belief that nurses need to focus better not only on technology but the person who experiences health and illness. Nurses indicate that when objective means are included in patient treatment there is a propensity (on the part of nurses and doctors) to focus on machinery and equipment rather than the patient. The experience of the patient can become less important than information obtained from machinery and equipment. Subjective experience can become secondary to rational and conscious evidence.

Technology is understood to encourage purposeful rejection of personal experience and is more significant than mere fear of technology or dehumanisation. According to their experience and understanding technology encourages a clinical environment and practice which fosters a willingness to reject the human experience for the objective experience of mechanical artifice. The nurses' attention is focussed towards the various buzzers, alarms and lights of machinery and equipment rather than the person to whom the technology is attached. The experience is described by the following two (2) nurses who state that:

Nurse: *I think people can get a bit caught up in that mentality of not looking at a patient first.*

(17,6)

Nurse: *I've thought about it and I've got this thing, that we've still got to remember that there's a patient. I mean, you have a baby in the nursery on monitors and some people, when the alarm goes off, go and check the monitor to see what it is doing, but with the pulse oximeter and a baby, if they move, shake, rattle or roll, they will set it off, so it's more important to go and check what the baby is doing, is it breathing or shallow breathing, than it is to see what the monitor is reading, it is more important to go and look at the baby than look at the machine. Yes, the monitor can say, come and see what is happening, but you should see what is happening with the baby, not what is happening with the machine. I do think that is something that is happening more these days, we focus on noises and machines, we forget that they are here to alert us to the patient.*

(8,9)

Nurses spoke of trusting machinery and equipment to reveal particular features of a patient's condition. They experience a tendency towards thinking machinery and equipment are infallible and reveal to the nurse irrefutable evidence necessary for diagnostic accuracy and intervention. The understanding encourages attitudes that are overly optimistic about the potential of machinery and equipment and an acceptance of its role in treating and assessing the patient. Nurses describe a tendency of colleagues to transfer to technology responsibility for clinical assessment and decision making, as explained by the following two (2) nurses who state that:

Nurse: *...we* [nurses] *put a lot of faith into all the technology, instead of the faith into us.*

(8,10)

Nurse: *I was probably thinking along the lines that maybe this little machine was quite infallible up to that point and it wasn't the machine, it was something to do with, well this is what the doctor said to me, something to do with something or other can mask with something else. So they whizzed her off to ICU then and that was it.*

Interviewer: *Your idea that the machine is infallible, is that an idea that you have for a lot of machines you use?*

Nurse: *No. I probably did when I first started nursing. I was probably in awe of them, the machines more than anything else, but experience has*

shown that they're not the be all and end all, you've got to still monitor things as well.

(18,4)

A characteristic of the conception is a willingness of some health care professionals to replace, justify or bolster assessment skills through reliance on information from machinery and equipment. They spoke of working with nursing and medical personnel who focus often on information from technology when deciding upon treatment and care without adequate consideration of the patient's actual clinical condition. As the following nurse says:

Nurse: *I have seen younger, newer nurses who have gone, oh that patient is in atrial fibrillation, and you say, well are they? And they say, the machine, you know. And I have that in practice. And particularly, I think, in the ward area, if a patient has chest pain and people do not feel really comfortable with the technology, or with what's happening to the patient because they're unstable, they may tend to rely on the technology a little bit, they think, well something is happening, I'm not sure what is going on here.*

(20,3)

A further characteristic of the conception is the rejection of the subjective experience of the patient. Even though patients are aware often of changes that occur in their own body, etc., their clinical testimony is bypassed or devalued in diagnosis, treatment and care. The experience of the person can become secondary to evidence available from machinery and equipment. Technology encourages health care practices that diminish the importance of clinical evidence and judgement and the process leads to a decrease in the patient's confidence and trust. In describing her experience of technology and nursing care a nurse explained that:

Nurse: *She was probably going into a type of cervical shock type thing, that rapid opening of the cervix and that's the sort of thing they do. It's that shaking and shivering and really distressed and nothing is showing on the contractions, but everything is happening to her physically, but if you don't acknowledge your experience, and say, well look, the monitor says nothing is happening but this patient is obviously doing*

something, and the patient said afterwards, she only just looked at the monitor, she didn't see what was happening with me. You know, she was just worried about the monitor and she had lost faith in that sister to take care of her because she wasn't acknowledging what the patient was doing.

(8,10)

Health care providers can rely unreasonably on machinery and equipment. Nurses understand that there is a need for renewed confidence in both the experience of the person and the nurses' experience, ability, and knowledge. Personal symptoms, signs and history need to be balanced against the use of appropriate machinery and equipment. Technology is understood to be of benefit to health care practices so long as technology is both assessed for its effectiveness and evaluated in relation to the experience of the patient. As the following nurse says:

Nurse: *We were talking about what patients were doing with pulse oximetry, you might rely on this monitor saying they are sitting on 90, and it keeps alarming just below average, but this patient is alert and sitting up and pink, well, you know, you've got to say the patient, the one that is healthy and whatever, why isn't he sitting on 92/93, you've got this patient who is really grey, sinking into the bed, more and more, you've got to be saying what's happening, is it just because pulse oximetry, is there nothing else going wrong. Should we be checking other things, we've got to have faith in ourselves to go and check through and say what is happening with this patient.*

(8,10)

A final characteristic of this conception is the experience that patients can be exposed excessively to technological intervention. Nurses spoke of increasing degrees of technological intervention without appropriate assessment of a patient's personal preference. Nurses experience a tendency towards a technological imperative that nullifies both personal choices regarding assessment and treatment and the encouragement of personal growth and acceptance. Technological intervention that is provided without reflection or inquiry into the needs and desires of each person is of concern to nurses. They understand and experience that

technology can be of varied benefit for patients and when included inappropriately in care it can lead to increased rather than reduced suffering. Intervention and treatment need to be counterbalanced by compassion and knowledge of the person, as the following statements from three (3) nurses show:

Nurse: *I just couple it up with frustration and you know, is this all necessary. Are we really doing what this person wants in the bed, ...quite often I've come up with women, not just women, but men, who just want to die. They just want to die, they've had enough. And they want to do this test and they want to do that test, be connected to that, it's just not fair sometimes.*

(11,8)

Nurse: *Technology is great. There is a need for it. In a lot of surgical wards there isn't a lot of need for technology. People get better on having a more positive attitude towards their health and making them feel special. For some people it doesn't work but it helps a lot. Probably more so than technology.*

(4,10)

Nurse: *We're getting very clever at making people live and I just have my doubts about quality of life and that's directly related to the technology.*

(7,7)

Summary

This conception of technology is more than fear of the phenomenon. It expresses an understanding and experience that demonstrates that the complex technological world of health care can reject subjective evidence and personal experience. Medicine and nursing are understood to foster an excessive diagnostic interest, rely unreasonably on technology and science and reject the human condition for mechanical artifices.

The experience can be aligned to the arguments of Reiser (1978:161) who stated that modern medicine and health care are dominated by a *contemporary faith in science and technology, and a belief that a scientific spirit entered clinical practice through technology.* The intuitive

and subjective world of human experience is no match for the conscious, rational world of technology. The rejection of the human condition, the secondary consideration of the subjective, the over reliance on machinery and equipment in assessment and diagnosis and the failure to consider appropriately the patient s physical condition in assessment, are all experiences which form the conception that contemporary surgical nurses need to understand better the relationship between technology and the patient.

CATEGORY OF DESCRIPTION EIGHT (8)

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

In this conception nurses experience technology as a change to their will or volition. Technology to a greater or lesser extent alters free will to determine and accomplish individual goals, professional approaches to care and principles of nursing practice. The daily practice of nursing is experienced as being altered by the demands of machinery and equipment. Technology demands levels of attention, time and commitment that can be inappropriate to the needs of patients and the clinical environment and arduous for the nurse. Demands can lead to neglect of practice principles and can conflict with professional roles and responsibility. Machinery and equipment are experienced as altering the volition of nurses and are understood to affect potentially the practice of nursing.

This conception describes technology as paradoxical to the idea of instrumental use in that the practice of nursing must be responsive to the demands of technology rather than the technology being only responsive to the demands of nurses. In particular, nurses understand that technology affects significantly a person's available time to establish a nurse-patient relationship. Contrary to the experience of technology in other conceptions, machinery and equipment are understood to reduce time available for nursing care. Rather than technology saving time and allowing nurses to concentrate better on the principles of practice, technology makes the daily practice of nursing more demanding, time consuming and distracting. The experience is described by the following nurse who says:

Nurse: *They bleep and blare and do all sorts of things and they catch your attention before the patient, the patient is probably not doing anything in the bed. All those alarms and monitors, they're geared to catch your attention aren't they? I mean, that's why they have alarms. So the first thing you do when you have alarms is go to it. It's like telephones at home. The first thing that you do when the telephone rings, it doesn't matter how busy you are, you drop everything to go and answer the phone, instead of saying, it's just a phone, leave it ring. I mean you put telephone answering machines on telephones these days, because the phone has to be answered doesn't it? We're geared to, these days, to attending to noises and equipment before we attend to other people.*

Interviewer: *I notice you've drawn the technology between the patient and the nurse. Did you do that purposefully?*

Nurse: *Yes. I think sometimes it does.*

(8,9)

In a complete reversal of the portrayal of technology presented in figure five (5), the nurse is not in control of her clinical practice as a result of the assistance of machinery and equipment. Nurses experience technology as a demand on their time and attention. The demand is manifest as clinical activities such as checking equipment and responding to alarms. For example, figure nine (9) describes a different experience of nursing than has been described previously. Technology reduces the ability of nurses to spend time with patients because they are called upon to meet the needs of machinery and equipment. The nurse understands that being able to spend time with patients is a pre-technology experience of nursing which has been superseded in modern practice (Pre-technology in this case means prior to *modern electronic machinery and equipment* and is a simplistic idea which demonstrates further the failure of many nurses to understand technology from both an historical or developmental perspective. To claim nursing has ever been *pre-technological* is to fail to understand that nurses have always used technology machinery, equipment, tools, etc., in one form or another to fulfil their responsibilities). The experience of technology in a *modern* sense as described by this nurse highlights an experience of technology in which sophisticated electronic

technology dominate the daily practice of the surgical nurse. The picture portrays machinery and equipment as coming between the nurse and the patient. Despite a desire to attend to the patient on a personal level, the demands of technology are so persistent that the will of the nurse to be with the person is bypassed and made secondary to the will of machinery and equipment.

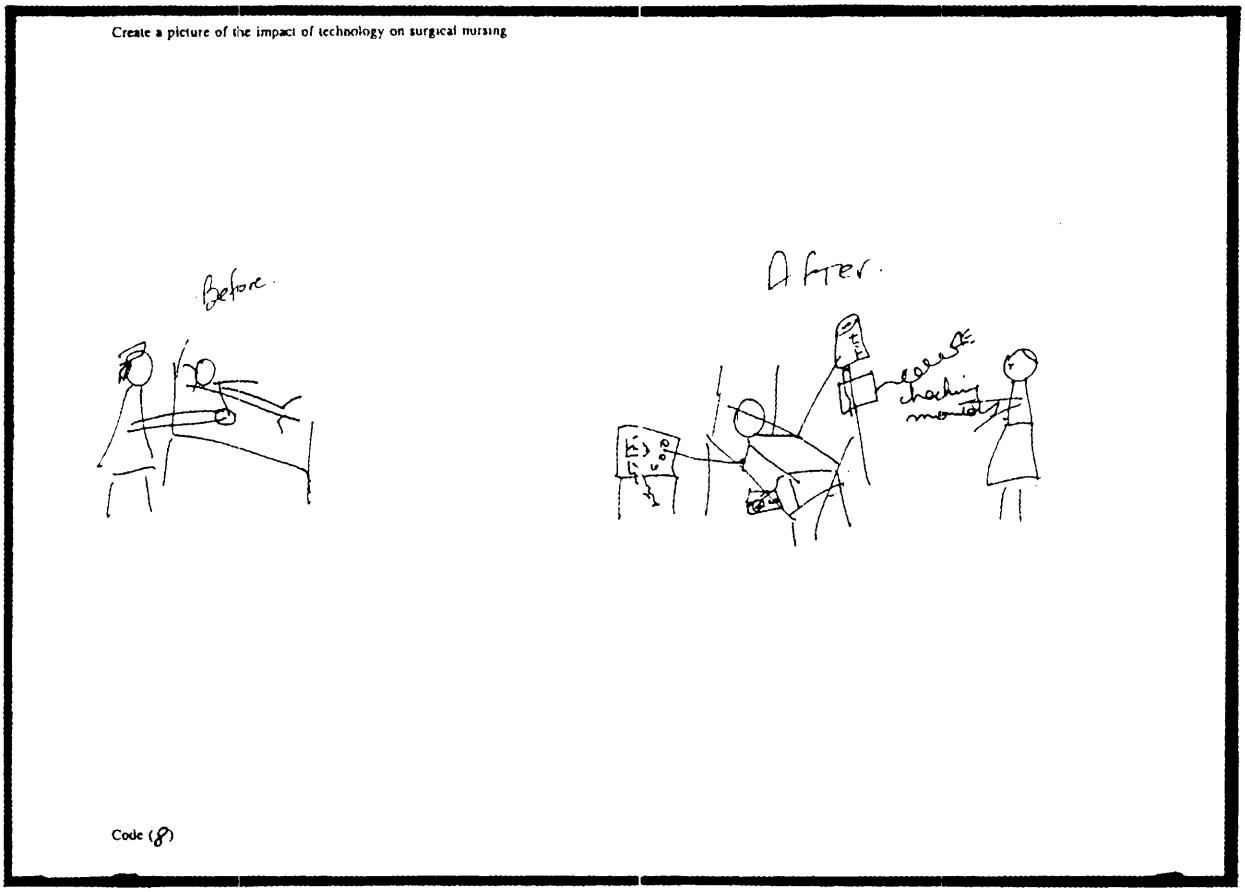

Figure 9: Technology and the alteration of will

Nurses spoke of experiencing alteration of will due to the demands of various systems that are designed specifically to attract attention. Nurses understand that devices such as alarms, buzzers and telephones purposefully draw them away from many of their professional roles

and responsibilities, as the following statements from two (2) nurses show:

Nurse: *The different machines, they all have alarms and there is usually one going off in the ward at any given time. You're always wondering, is that mine, you could be scrubbed up, in the middle of a dressing or something like that, there is always something there to drag a bit of your attention away from what you are doing. It's annoying.*

(16,3)

Nurse: *... and the phone, I mean, you don't even need to talk about the phone, it just rings constantly. I hate the phone. I really do not like the phone. Especially in the afternoons. We have a receptionist during the day, but the phone in the afternoon is very, very bad, because we have to come from the back of the ward to answer the phone and it's often completely irrelevant.*

(17,11)

Because of technology nurses experience alteration in their practice and a sense of being distracted away from what they know to be important in their clinical day. Some nurses are less able to explain what is happening to their practice (the experience being at the limit of their external horizon), even though they experience uneasiness regarding the lack of available time to fulfil their clinical roles and responsibilities. They understand something is happening to alter their practice but are less able to explain exactly what is their experience. However, despite their lack of clarity it is clear they experience a loss of time during the course of their daily practice, and a complexity in their clinical roles and responsibilities that they are unable to explain. As the following nurse says:

Nurse: *... there seems to be more than enough to do, so I don't know, there seems a lot more, but it's nothing different. I can't put my finger on it, I've thought about this before.*

(9,4)

Other nurses are more cogent in explaining their experience of technology. They remain unconvinced that technology leads to time saved or increasing professional advantages. Their experiences are described by the following nurses who state that:

Nurse: *...we've got all these devices, but we now think that because we've got*

these devices, we can do all these other things and so we pack our lives full of other things and then expect the technology to do the things that normally, in the past, 100 years ago, you did manually and it would have taken the whole week, now we want it to only take up a very small space of time and it doesn't necessarily.

Interviewer: *Can you give me an example?*

Nurse: *Yesterday, as I was leaving for work, the washing machine, the hose pipe burst and that was very irritating because I thought, you know, here's a thing that's supposed to be saving time and it's not. I mean it's, with anything that involves mechanics, machinery, devices, whatever, they're going to break down and they're going to need attention and that sort of thing. They don't last for ever.*

(13,5)

Nurse: *I probably think it's because, I'm blaming technology here, because I'm not getting the time when I'm busy to spend with the patient, maybe that's why I'm using technology as an excuse, or maybe I think it's the prime reason. But don't tell me that, I will have to go back and revise everything.*

(18,13)

Characteristic of the conception is not only the experience of not fulfilling adequately daily routines, but the distraction of attention away from people. Technology often negates a nurse's choice to spend time with a patient and is understood to be the principal reason why nurses do not develop adequate nurse-patient relationships. Nurses spoke of technology interfering directly with their ability to form relationships based on authentic trust, compassion and clinical judgement. The conception describes the difficulty some nurses' face when they desire to spend time engaging in clinical responsibilities that are not subject to technological control. Technology requires nurses to focus on meeting its needs and discourages clinical practice not subject to rationality. In contemporary surgical nursing technology is understood to limit genuine and undistracted relationships and the experience is described in the following statements by two (2) nurses who state that:

Nurse: *... everything is geared these days to catch your attention, alarms and monitors and this and that and sometimes it catches your attention to*

the exclusion of other things, like the patient.

(8,11)

Interviewer: *Can you just tell me the sorts of things you feel you should be doing?*

Nurse: *Spending more time with people, just assessing them on a different level than just, how is your wound going? Are you feeling all right? Are people visiting you? Are you feeling isolated? Anything like that. And if they are, to give them the time to try at least provide some relief for the social sort of problems they might have. And especially if you're in the middle of say talking to a girl who's 16, who was driving a car which she shouldn't have been driving, had an accident and lost one leg and can't use the other, talking to her about how she feels about not having a leg any more and not being able to get out of bed for a long time and not being able to do very much for herself at all and a buzzer goes off and I have to go off and answer that and give a pan to somebody when somebody else could do that, but they wouldn't answer the buzzer because it wasn't their patient - they've got their own things to do as well. Or an IVAC goes off for no reason, no reason whatever sometimes it seems. It's hard to excuse yourself from a situation where you're trying to develop a rapport with somebody and have to say, "just a moment, I'll be back in a sec". They're starting to feel comfortable and you run away.*

Interviewer: *So you feel these buzzers and things, they impinge on what you're trying to do?*

Nurse: *Yes, because all the buzzers, they're an alarm for something, somebody else needs your attention as well, they're a machine that's not working properly that needs to be and they all require your attention. They're just very insistent, me now.*

(16,4)

Some nurses attributed technology to be the reason why their clinical practice does not fulfil the requirement of caring better for patients. Technology is understood to interfere with their ability to attend to people on a personal and meaningful level. The conception specifically attributes a lack of involvement with patients to be a consequence of the instrumental demands of technology. Even patients who are sick and need particular attention from nurses are secondary to the demands of various machinery and equipment. Objective means can be as equally a demanding distraction as the person to whom it is attached. Patients and

technology compete continually for the attention of the nurse. At another level, a patient may be stable in terms of his or her surgical condition but the needs of technology associated with his or her care can continue to preclude the nurse from being with him or her in a meaningful human sense. Technology interferes directly with the will of nurses to spend more time with their patients. The experience is described by two (2) nurses who say that:

> *Nurse:* *It can be time consuming and depends on how many things they've got. How many catheters, how many drips, nosogastric, things like that, if they've got more of those things, it takes more time to look at those things than the person.*
>
> (15,1)

> *Nurse:* *I like my patient contact. Like, today, more than anything, even though I was busy, ... my biggest disappointment was that I didn't have the time to talk to this lady.*
>
> (18,11)

The experience of technology in contemporary surgical nursing is one of repetitive demands from machinery and equipment. Technology is understood to be designed specifically to catch each nurse's attention. Their design can be an asset to clinical practice as it informs the nurse of changes in condition or treatment, but it can also oblige nurses to give it equal priority with other important roles and responsibilities. As the following two (2) nurses say:

> *Nurse:* *... this sounds really ridiculous I know, but it's just the way I like to see nursing. It's just me giving energy to this person to use in whatever way they want to use it and its as if it flows favourably, this is all sort of, there is no free flow of energy going this way because of all these things stuck in the way.*
>
> (11,8)

In the following graphic (figure ten (10)) the experience of technology occurs as an alteration in the ability of the nurse to focus her energy on the patient. The nurse experiences machinery and equipment to be a barrier between herself and the human experience of the patient because a lot of time, expertise, physical presence and intellectual strength is given over to machinery and equipment rather than the patient. Not only is the experience understood to be

undesirable for the patient, but it causes confusion for the nurse (as indicated by the many asterix and question marks drawn on the picture between the nurses and machinery) because the focus on technology is contrary to the nurses' desires and beliefs and nursing practice.

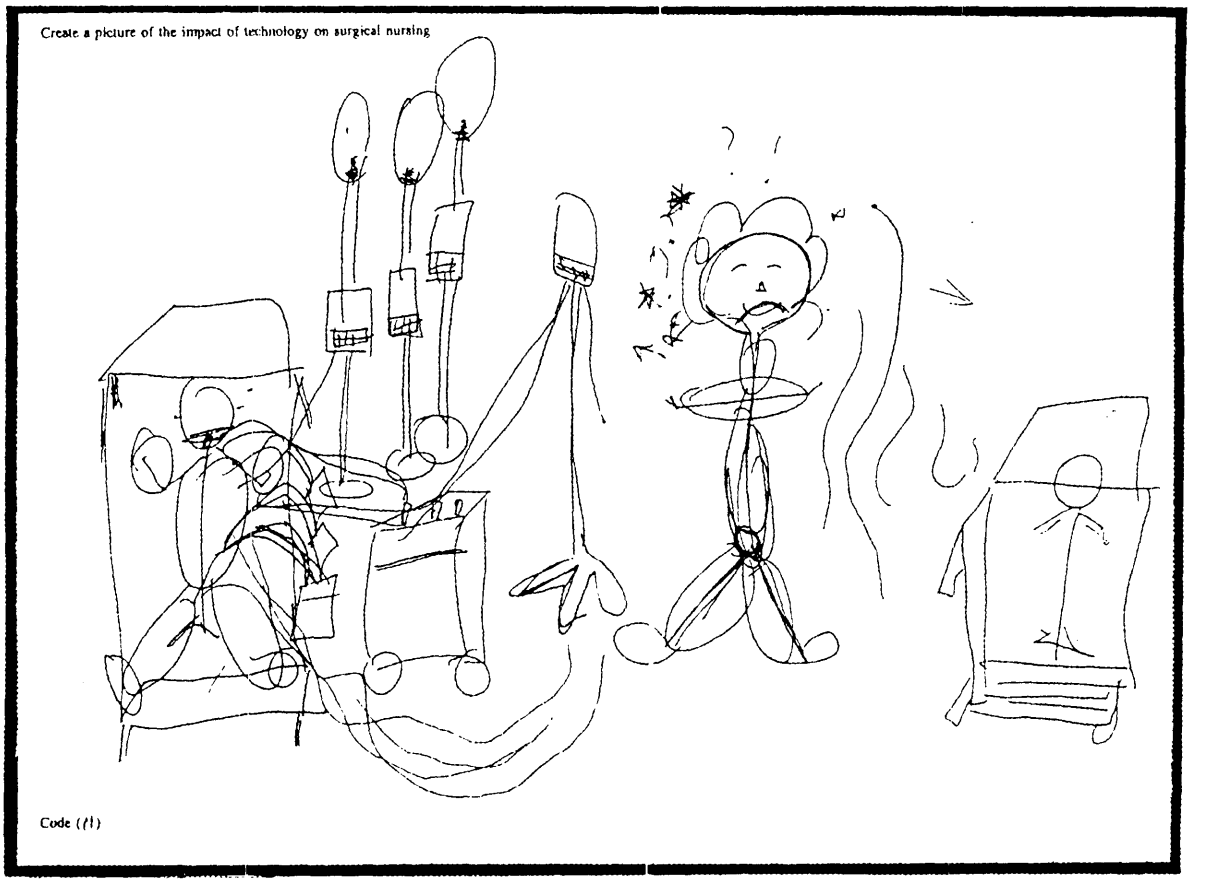

Figure 10: Technology as a barrier between the nurse and the patient

A further characteristic of the conception is the experience that restrictions to time and energy are a consequence of increasing involvement with medical technology. Nurses understand

machinery and equipment to be a form of medical dominance over the practice of nursing. The requirement to use machinery and equipment associated with medical practice alters the ability of nurses to care adequately for patients and distracts nurses from their own clinical practice. The experience is explained in the following statements from three (3) nurses who say that:

Nurse: *It's taken us away more from the basic care and sort of dragging us away from a lot of that stuff, the social stuff. The stereotypical stuff if you like of wiping somebodies brow and it's made us into pressing buttons and putting IV drugs in and I'll get to that, I'll get to that, in a moment I'll get you a drink of water, in a moment, but I've just got to do this, priorities. This IV drug is more important than giving you a glass of water straight away. So that's a bit of a negative. It's a development I suppose, a more medical development.*

Interviewer: *Can you explain what you mean by that?*

Nurse: *A scientific medical viewpoint of looking after people, as opposed to a nursing view point of looking after people, a cure viewpoint.*

(12,6)

Nurse: *Other days you work your butt off, get through the day and you know. Sometimes I'll stay back after work, in my own time, just to talk to someone because I felt like I cheated them a bit, I wasn't there for all their needs.*

(7,8)

Nurse: *I think nurses do quite enough at the moment, if not perhaps more and doctors need to be more responsible and they're not, for their patients.*

(9,5)

The scientific medical viewpoint is experienced to discount the importance of nursing practice. The increasing focus on medical technology decreases the principles of nursing in order to meet the needs of other health care professionals. Nurses experience frustration and disappointment when the basic needs of patients are not met and understand a major reason for their experience is their increasing involvement with medical technology. Their failures to meet the nursing needs of people (e.g. hygiene needs) is a reflection of their inability to

balance nursing goals with the requirements of technology. Pressure to keep up with the demands of intervention, monitoring, treatment and education, over-ride the need to provide what many nurses understand to be adequate care. Nurses desire to provide the best nursing care they can but are prevented from achieving their desire. The following nurse explains the dilemma that many nurses experience and states that:

Nurse: *Years ago not every patient had an IV, opposed to now, all these different machines we have to deal with, so comparing it I just think we've got so many things extra to do, all these different drugs we give that we never had, machines to run, just to mobilise a patient these days is pretty hard, because a lot of our patients actually get TPN, total parental nutrition, so you've got three IVACs to push and the patients can't mobilise alone, so I think equipment and everything is really good, because it monitors our drips, but it's hard to actually, it makes your work a little bit harder to get into the shower and there's not a free person to push the trolley and all this sort of thing. I don't know, I just think that all this technical stuff that is getting done and a lot of the other stuff is being neglected because they don't have time to do it.*

Interviewer: *Can you give me an example?*

Nurse: *OK. The nurse has got a busy cube, she's got a few patients that need assistance in the shower, right. A lot of patients, it's happened on many occasions in our ward, that their first day post operative, when they've had major abdominal surgery and they've got a narcotic infusion going and they might have an NG tube in their nose and they might even have oxygen, they may require to mobilise with oxygen, they actually get taken out for a shower, but because the nurse has got something else to do, she actually leaves them to do themselves. There is no way in the world they can. They shouldn't be left, they can't because, they just can't, they're sick, so I think because of their work load people aren't assisting people enough, so therefore they only do what they can, so I believe their hygiene care is neglected because they're not able to and the patients look down and see duoderm or a wound and a ileostomy bag and drain bag and they think, I won't touch that, they're frightened. That happens a bit. They get left. Because of, I just think, simple things, it might sound really picky, but teeth, people don't clean teeth because they're busy doing dressings, giving drugs or just doing urine outputs hourly, all these different things, they just forget to do the more basic things which aren't life threatening but they are necessities because people can get thrush in their mouth and different things. Mouth care is absolutely non-existent on my ward but*

if you ever have an oxygen mask on your face, you dry out pretty quick. And I know they are taught it.

(14,3)

Summary

In this conception nurses experience alteration in their ability to fulfil basic nursing roles and responsibilities due to their involvement with machinery and equipment. They understand that the demands of objective means can be detrimental to maintaining adequately the fundamentals of nursing practice. The demands of electronic alarms, telephones, buzzers, etc., distract nurses away from patients and duties. Technology is experienced to be compelling on a nurse's time, physical commitment and intellectual attention. The demands of medical technology in terms of monitoring patients, assessing equipment and delivering treatments are distractions which alter the nurse's ability to care for patients in ways which are judged to be most appropriate for quality care. They experience medical technology in contemporary surgical nursing to be both perplexing and frustrating particularly when they find it impossible to meet the basic nursing needs of patients.

The conception is characterised by a sense of disappointment regarding their inability to engage in meaningful relationships with patients. The need to attend to machinery and equipment rather than the patient is a source of constant dissatisfaction. They understand their role as a professional nurse to be curtailed overly by the demands of machinery and equipment use.

The conception is a more advanced level of understanding than previous conceptions because it acknowledges the dialectic relationship between control obtained through the rationality and efficiency of technology and the many aspects of nursing practice which are less able to

be reduced to control and explanation. The process of including increasing amounts of technology in clinical practice is not unidirectional. Nurses' describe that along with rationality and efficiency comes an increasing realisation that technology is not a neutral phenomenon. Their experience acknowledges that the will of nurses can become secondary to the will/demand of machinery and equipment and that technology in surgical nursing alters clinical practice.

Summary of categories of description

A phenomenographic approach to research has revealed eight (8) conceptions of the understanding and experience of technology in contemporary surgical nursing. The conceptions are: technology as machinery and equipment; technology in contemporary surgical nursing as changes in skills; technology in contemporary surgical nursing as increasing knowledge; technology in contemporary surgical nursing as professional recognition; technology in contemporary surgical nursing as gaining control and predictability in clinical practice; technology in contemporary surgical nursing as clinical resources of the practice environment must meet the needs of technology; technology in contemporary surgical nursing as the need to include the patients experience and clinical presentation; technology in contemporary surgical nursing as alteration in the free will of nurses. In the following section the conceptions are presented in the form of an outcome space.

DESCRIPTION OF THE OUTCOME SPACE: UNDERSTANDING TECHNOLOGY IN CONTEMPORARY SURGICAL NURSING

The outcome space described is a diagrammatic portrayal of the qualitatively different ways by which nurses understand and experience technology in contemporary surgical nursing and the logical relations between the conceptions.

The outcome space and the relationship between categories of description

The outcome space (figure eleven (11)) portrays the relationship between the nurse (subject) and technology (object) as expressed by eight (8) categories of description and is a map of the conceptions that nurses hold of technology. It is an empirical representation of the logical relations between the qualitatively different ways technology is experienced and understood by contemporary surgical nurses. Conceptions are arranged in the outcome space as both referential and structural aspects.

The outcome space is described as hierarchical and consists of four (4) levels of understanding which range in accordance with insight into the use of machinery, equipment and objective means. **Insight** means *wisdom and understanding in dealing with people or facts: insight meaning penetration; the ability to go deeply into things and to see fine distinctions and relations* (Barnhart & Barnhart, 1994:1092). The description of the outcome space as an hierarchical arrangement refers to the fact that the understanding and experience of technology as the use of machinery, equipment and objective means is the background, framework or context of understanding (external horizon) and the other conceptions are delimited as related parts (internal horizon). The relationships between conceptions as represented by the outcome space are determined in accordance with the referential and

structural aspects that depict the *what* and *how* of the experience and understanding of technology in contemporary surgical nursing.

The referential aspect

The **referential** aspect of the outcome space depicts *what* is the experience and understanding of technology and has been identified by this research to be differing insight into the phenomenon of technology as experienced and understood in relation to the use of machinery, equipment and objective means. That is, insight into the experience of technology evolves as a consequence of, and is associated with, the various ways nurses' experience and understands the effect of their use of machinery and equipment. The four (4) levels of insight described by the outcome space are:

Technology as machinery and equipment: Level one (1)

The most basic level of experience and understanding of the phenomenon is technology as machinery and equipment. Technology is experienced and understood to be machinery and equipment used as functional tools in the practice of nursing in order to achieve certain ends. It is a conception of technology shared by every nurse who participated in the research. The understanding is commonplace to nursing and society (*commonplace* in the sense that technology as machinery and equipment is a commonly acknowledged basic or rudimentary understanding of the phenomenon) (Barnard, 1996a; Borgmann, 1983; Ellul, 1964; Pacey, 1983; and Winner, 1977). In fact, if a person did not understand technology as machinery and equipment he or she would have no awareness of the phenomenon. This conception is the background from which other awareness develops and is the outer boundary of nurses understanding. That is, the understanding of technology as the use of machinery, equipment

and objective means can be seen as a background (i.e. backdrop or framework) that other experiences and understanding is placed within. Each additional conception of technology is positioned in the foreground of the experience, that is, enveloped by the pre-existing backdrop or framework (i.e. hence the presentation of the outcome space (figure eleven (11) as a picture hanging on a wall). The level one (1) understanding described by this research constitutes the external horizon of nurses' understanding and experience of the phenomenon and conceptions do not in any way move away from the experience of technology at its most rudimentary or basic form.

Therefore, conceptions described at level two (2), three (3) and four (4) coexist with the conception described at level one (1) (coexist: meaning *to exist together or at the same time* (Barnhart & Barnhart, 1994:401)). Conceptions of the phenomenon at levels two (2), three (3) and four (4) do not negate a level one (1) experience. That is, subsequent understanding and experience of technology in contemporary surgical nursing originate from the conception that technology is machinery, equipment and objective means (i.e. further experience and understanding of the phenomenon are additional to a level one (1) understanding but do not in any way negate or change the level one (1) conception). Conceptions at levels two (2), three (3) and four (4) are unique experiences which originate from, and occur in addition to, the original or primary experience that technology is machinery, equipment and objective means. For example, even though technology at level two (2) is experienced as two conceptions (i.e. changes to skills; increasing knowledge), these conceptions are experiences that coexist with a level one (1) understanding. It is argued further that given the reliance on the establishment of a level one (1) understanding and experience any additional conceptions of technology are preconditional on a level one (1) understanding of experience and coexist with the

establishment of this most basic yet rudimentary conception.

Readiness for clinical practice: Level two (2)

The experience and understanding of technology at level two (2) consists of the conceptions that technology is *changes to skills*, and *increasing knowledge*. Level two (2) relates specifically to the readiness of nurses to participate in clinical practice as professionals who are prepared adequately for the demands of surgical nursing. Participation in the use of machinery and equipment requires the development of skills and an increase in knowledge. Technology is experienced and understood as the addition and alteration to skills and/or knowledge in response to the changing demands on nurses to use machinery and equipment. The ability of nurses to use technology is dependent particularly on their level of educational and professional preparation for their changing roles and responsibilities. Notwithstanding, despite the underlying belief that technology is machinery and equipment, conceptions of technology at level two (2) are unique (unique in the sense that each one is a discrete and specific experience of the phenomenon), are not necessarily experienced by every person, and include those conceptions which describe technology in terms of being able to engage with machinery and equipment as a result of educational development.

The outcomes of technology use in clinical practice: Level three (3)

Level three (3) of the outcome space includes conceptions of technology as: *respect and autonomy*; *control of clinical practice*; *clinical resources of the practice environment must meet the needs of technology*; and *the patients' experience and clinical presentation*. The conceptions describe the understanding and experience of machinery and equipment use in terms of its effect upon clinical practice. Conceptions described pertain to the effectual nature

of objective means in the daily practice of nursing (i.e. what does technology do and how does it function in its application). Technology is experienced and understood as an instrumental phenomenon not from the perspective of what is required of a nurse to use technology (as in level two (2)), but from the perspective of what are the outcomes or effects of machinery and equipment use in nursing practice.

Even though each conception at level three (3) is a discrete experience of the phenomenon, there is a unity of experience related to the effect of machinery and equipment use. That is, technology is understood and experienced to possess a quality that transforms the clinical practice of nursing. Technology is experienced to effect clearly the daily practice of nursing and patient care. Conceptions at this level highlight specifically the way in which machinery, equipment and objective means combine to create particular effects on contemporary practice. For example, *new* and *modern* technology that is resourced appropriately can be efficient because they can make patient care, diagnosis, and assessment, a rational and objective process. In addition, technology can be experienced as powerful due to its effect on controlling many of the challenges of clinical practice, and it can be experienced as respect and autonomy. Technology is conceived to be responsible for causing certain outcomes (deterministic in nature), and the conceptions highlight the functional or instrumental nature of experience and understanding.

Volition and nursing practice: Level four (4)

Level four (4) includes the conception of technology as *alteration to the free will of nurses*. It differs from previous levels of insight because the conception describes understanding and experience in terms of the way technology alters the goals, behaviours and practices of

nurses. The level four (4) understanding describes technology in relation to the way machinery, equipment and objective means alter the practice of contemporary surgical nurses. The conception describes experiences that are contrary to the commonplace view that technology is a neutral phenomenon. It is significant as a level of experience that focuses on the reciprocal effect of technology on both the environment of care and the people who use it. It is a sophisticated experience that describes a level of awareness where the phenomenon of technology is responsible for influencing nurses as practitioners. It is a level of awareness that describes technology in terms of its ability to divert their attention and effort during their daily practice by way of introducing time consuming and sometimes extraneous demands such as telephones, policies, alarms and the maintenance of machinery and equipment.

The conception highlights the rationality and efficiency of technology. Surgical nurses experience that they have little choice but to engage in a reciprocal relationship with machinery and equipment on a daily basis. Nurses are required to meet not only the needs of patients but also the needs of technology. They alter their roles and responsibilities in accordance with the needs of machinery and equipment. The conception at this level describes experiences that acknowledge not only the instrumental action of technology but understands the reciprocal effect machinery and equipment use has upon nurses as professionals and people. For example, nurses experience difficulty engaging in clinical relationships with their patients due to the demands of buzzers and alarms that compel them away from being with patients and their families. Technology alters the clinical practice of nurses to such a degree that the volition (will) of nurses to undertake particular roles and responsibilities is restricted by the requirement to use and maintain machinery and equipment.

The structural aspect

The **structural** component of the outcome space depicts *how* technology is experienced and understood by contemporary surgical nurses and is described as hierarchical. Although each of the eight (8) conceptions described are unique, they are integrated in a conceptual order which is depicted as a hierarchy of four (4) incremental levels. Conceptions co-exist in a hierarchy of order based on what has been argued in this thesis to be levels of greater insight or awareness of the phenomenon.

Experience begins at level one (1) (**technology as machinery and equipment**). It is the most rudimentary or basic level of understanding and includes category of description one (1). Level one (1) reflects that which is obvious and accepted in society and health care. Technology is machinery and equipment. Technology is described as an objective phenomenon and the *things themselves* are the focal or central point of awareness.

Level two (2) understanding of experience (**readiness for clinical practice**) includes categories of description two (2) and three (3). It describes how technology is understood from the perspective of knowledge and skills necessary to undertake safe and professional practice. Understanding is in terms of personal development and the ability to know and master the necessary skills and knowledge to engage with machinery, equipment and objective means in clinical practice. The focus of understanding is on internal or individualised clinical practice. In the latter categories of description the awareness turns to the outcome of technology use in the external environment. But at this level, as in level one (1), the attention is on the *things themselves* and *how they are used*, rather then the outcomes of their use.

Level three (3) understanding of experience (**The outcome of technology use in clinical practice**) is a level of awareness in which technology is understood from the perspective of how technology manifests in the external environment. The level includes categories of description four (4), five (5), six (6), and seven (7). Conceptions reflect ways of understanding from not only the perspective of machinery, equipment and their use, but also from the perspective of how technology influences and effects the patient, clinical judgement, the surgical ward or unit, and professional respect . Conceptions describe awareness of external experiences (as opposed to individual or internal experiences) and can be summarised as understanding that explicates how technology *engages and influences health care practice.*

The hierarchy of awareness concludes at level four (4) (**Volition and nursing practice**) where nurses describe their experience of technology from the perspective of how technology influences their clinical practice in the external environment. It is at this level that nurses experience conflict between the internal desire of the nurse to fulfill a certain role and responsibility in a particular manner, and the external forces that arise from technology. Understanding at this level portrays a level of awareness that describes a reciprocal relationship between the nurse and technology. It is a more advanced level of awareness then those conceptions described at levels one (1), two (2), and three (3). The nurse apprehends her or his relationship with technology from the perspective of *how her or his own practice can be altered*, even though she or he may have an adequate level of skill, knowledge, and desire to practice according to a particular philosophy or manner. The conception at this level describes a level of awareness, not from the perspective of what is required of a nurse to use

technology, but from the perspective of what a nurse requires of technology to practice adequately. It describes a way of understanding in which the person experiences what technology does for them, rather than what they do for technology. It is an advanced level of awareness that describes how technology can challenge a desire and ability to fulfill certain roles and responsibilities.

The four (4) incremental levels of understanding described by the research are; *machinery and equipment, readiness for clinical practice, the outcome of technology use in clinical practice,* and *volition and nursing practice*. It has been noted that all surgical nurses included in this research understood and experienced technology at level one (1). Not all nurses understood their experience of technology from the perspective of the additional conceptions included at the other three (3) levels of awareness portrayed by the outcome space.

The outcome space is the result of analysis of research data and portrays the relationship between the eight (8) conceptions as described by both referential (*what*) and structural (*how*) aspects. In accordance with the creation of pictures as a method of explaining experience and understanding of technology (used in this research), the outcome space is portrayed as a picture hanging on a wall. The outcome space illustrates the external horizon of experience and understanding (the background or backdrop of experience and understanding is the use of machinery, equipment and objective means) and additional qualitatively different conceptions of technology are presented as the foreground (internal horizon). The portrayal is in accordance with the description above and each of the four (4) levels of awareness are indicated on the left side of the picture. The hierarchical nature of conceptions is emphasised by the ascending arrow included on the right side

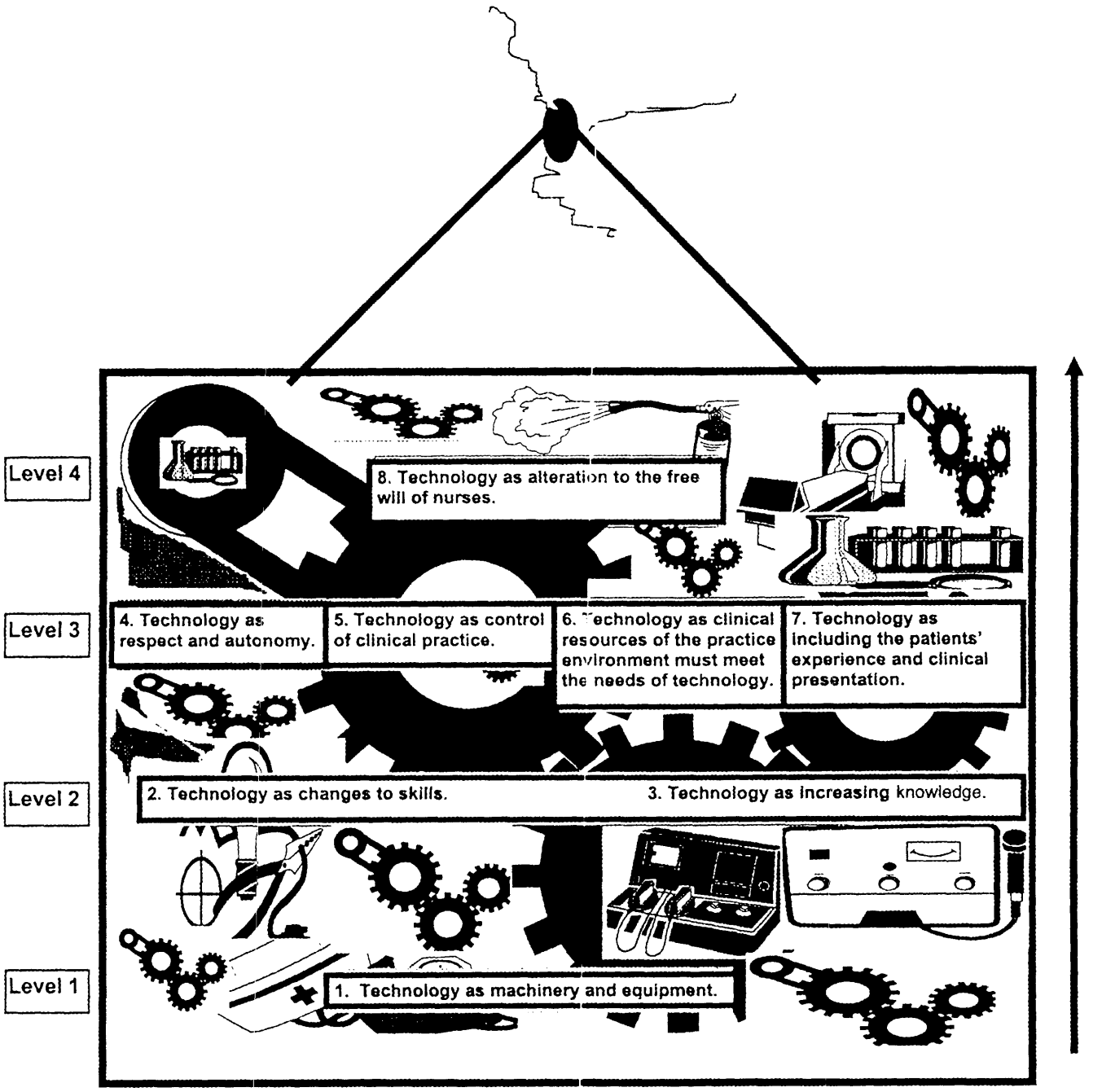

Figure 11: **Outcome Space: Understanding technology in contemporary surgical nursing**

Summary

The understanding and experience of technology in contemporary surgical nursing is described as a hierarchical relationship as depicted by eight (8) conceptions of technology,

and is based on an instrumental understanding of the phenomenon. The outcome space demonstrates the logical relations between the qualitatively different ways of experiencing technology. Conceptions are arranged according to four (4) incremental hierarchical levels of awareness or insight into the phenomenon.

CONCLUSION

This research has revealed eight (8) conceptions of the qualitatively different ways technology is experienced and understood by contemporary surgical nurses. The experiences are described as complex, instrumental and manifest as varying degrees of awareness. Variation is depicted by the outcome space (figure eleven (11)) which is hierarchical in conceptual order and demonstrates what Patton (1990) describes as qualities of internal and external homogeneity. Conceptions correspond in order to form clear relationships between each other (internal homogeneity) and they are different clearly in their portrayal and meaning (external homogeneity). Experience and understanding of technology is found to be distinct, limited in number and significant in terms of revealing awareness of the phenomenon.

In the concluding chapter a summary of the research is provided and the results of the research are considered in relation to current literature. Implications and recommendations to arise from the research are described, and a conclusion to the research is given.