A thesis submitted in partial fulfillment of the requirements for the Masters physiotherapy degree for the Department of Physiotherapy, University of the Western Cape

The use of information and communication technology to support physiotherapy students in South Africa

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ABSTRACT

The use of information and communication technology to support physiotherapy students in South Africa

Over the past few decades, there has been a global shift toward the use of information and communication technology (ICT) in healthcare, which has been shown to enhance the support provided to healthcare professionals, as well as to improve service delivery, patient care and student education. This study aims to investigate the use of ICT at South African universities to provide support to physiotherapy students and what the experiences and perceptions of those students are on the use of ICT as a means of receiving support. The study design was a cross-sectional, descriptive survey using a self-administered questionnaire. The survey population included all of the undergraduate physiotherapy students (n=1105) from six of the eight universities offering the physiotherapy degree in South Africa. The sample size consisted of the 529 students from the survey population who had completed and returned questionnaires, indicating a response rate of 47.8%. The results of the study showed that the use of ICT varied according to racial demographics, as well as the university attended and that there was a preference among students (94.7%) for face-to-face contact as the method by which support was accessed. Furthermore, confidence in the use of ICT for research and in promoting academic development was low (42.9% and 39.1% respectively), which raises concerns with the shift in healthcare toward evidence-based practices. In conclusion, there is a concern that with the move toward community based service delivery in South Africa, certain groups of physiotherapy students may not be well placed to make use of ICT services as a means of accessing support.

Keywords: Information and communication technology, physiotherapy students,

physiotherapist, support, healthcare, university, rural, remote, South Africa

Michael Rowe

May, 2008

DECLARATION

I declare that *"The use of information and communication technology to support physiotherapy students in South Africa"* is my own work, that it has not been submitted for any degree or examination in any other university and that all the sources I have used or quoted have been indicated and acknowledged by complete references.

Michael Rowe

Signature..... May, 2008

Witness..... May, 2008

Professor Patricia Struthers

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS

The following abbreviations are used in this thesis:

AHP Allied Health Professional

AIDS Acquired Immune Deficiency Syndrome

ANC African National Congress

ATA American Telemedicine Association

CCS Compulsory Community Service

CPD Continuing Professional Development

CSP Chartered Society of Physiotherapists

DHIS District Health Information System

ECG Electrocardiogram

EHR Electronic Health Record

EPR Electronic Patient Record

HIS Health Information System

HIV Human Immunodeficiency Virus

HPC Health Professions Council

HST Health Systems Trust

ICT Information and Communication Technology

ITAA Information Technology Association of America

KZN KwaZulu-Natal

MRC Medical Research Council

NGO	Non-governmental Organisation
NHISSA	National Health Information System for South Africa
NHS	National Health Service
OT	Occupational therapist
PDA	Personal Digital Assistant
PHC	Primary Health Care
SASP	South African Society of Physiotherapists
SPSS	Statistical Package for the Social Sciences
TB	Tuberculosis
UK	United Kingdom
UN	United Nations
UN ECA	United Nations Economic Commission for Africa
UNICEF	United Nations Children's Fund
WHO	World Health Organisation

CHAPTER ONE

INTRODUCTION

1.1 Background

Over the past two decades the use of information and communication technology (ICT) in all spheres of human endeavour has become increasingly apparent on a global scale. Phrases such as "user interface" and "social networking" are no longer only being used by technocrats, broadband Internet use is on the rise and "Google" has recently been added to the Oxford English Dictionary as a verb, meaning "to search online" (Oxford English Dictionary, 2008). Increasingly, people of all ages now make use of websites including, among others, YouTube, MySpace and Facebook, as means of interacting and communicating with friends, family and even strangers on a daily basis. The One Laptop Per Child (OLPC) initiative, which aims to place a laptop into the hands of millions of children in the developing world, is gaining momentum, albeit more slowly and with more difficulty than expected (Lerner, 2008).

Increasing use of the Internet and the World Wide Web, has resulted in access to information on a scale which is unprecedented in human history. New technology has infiltrated nearly every sector of our daily lives, from the installation of computer chips in motor vehicles and fridges, to enabling online shopping through the use of e-commerce websites. ICT has become increasingly prevalent and progressively more central to our ability to function efficiently and at the current rate at which society operates.

According to the South African Department of Trade and Industry report: *"Implications of the information revolution for economic development in South Africa"* by Louw and Hanmer (2002), it was estimated that by the year 2005, one billion people would be online worldwide.

Although this estimation is difficult to confirm, in South Africa alone there has been an increase in the use of local Internet services over the past few years (MyADSL, 2006), with 5.1 million confirmed Internet users in 2005 (CIA World Factbook, 2008)[1]. This trend has indicated a general increase in the uptake of Internet connectivity and of broadband connectivity in particular. Currently, there are almost 1 million wireless broadband connections in South Africa and this number seems certain to continue growing to a user base of 2 million broadband connections by 2010 (MyBroadband, 2008).

Social networking, consumer related online forum discussions and "video on demand" services indicate that the South African population is embracing this technology on a large scale. Despite this, the high cost of broadband Internet, low penetration of computer access in large sections of the public domain, as well as poor fixed line infrastructure (MyBroadband, 2008) means that South Africa lags behind developed countries in its widespread adoption of digital telecommunication services.

In the United Kingdom (UK), the use of ICT by the National Health Service (NHS) and the Chartered Society of Physiotherapists (CSP), provides a good illustration of how new technologies are able to improve professional practice through enhancing the support it provides to UK health professionals. The CSP is the professional, educational and trade union body for all of the United Kingdom's physiotherapists and serves to "...support its members and help them to provide the highest standards of patient care" (CSP, 2008). It provides advice on clinical guidelines, effective professional practice, learning opportunities related to Continuing Professional Development (CPD), helps to co-ordinate Clinical Interest Groups, as well as informing physiotherapists of the general state of the profession. To assist in

[1]The CIA World Factbook is a annual publication produced by the United States Central Intelligence Agency for the use of its government officials. It provides detailed information on the countries of the world, their governments, demographics, economy, communications networks and military (Wikipedia, 2008).

providing this comprehensive list of services the CSP makes prodigious use of an online presence, this being in the form of its official website (http://www.csp.org.uk) and regularly reminds its members to visit the site for access to professional support, new learning opportunities and profession-specific news.

In South Africa, the South African Society of Physiotherapists (SASP) has an online presence, although it can by no means equate to that of the CSP in terms of the breadth and depth of information and support it offers its members through its website. It should however, also be noted that although the benefits of providing information to physiotherapists and physiotherapy students are generally well accepted, merely moving information online and improving channels of communication is of little use if these, and future healthcare professionals are unaware of the contribution that ICT can make to the quality and scope of their professional practice.

1.2 Statement of the problem

The use of ICT as a means of providing professional support to physiotherapists has been shown to be feasible in several countries. However, little evidence is available pertaining to its implementation in the South African context in the field of healthcare and more specifically, in the field of physiotherapy. The current support system for physiotherapists working in South Africa may be limited in terms of what can be demonstrated, illustrated and recorded for later review. While the SASP is optimistic about providing new physiotherapy graduates with support, their website lacks any description of how it intends to provide such support (SASP, 2005). Even though some studies have touched on the issue of support in community service posts in South Africa (Mostert, Bergh, Groenewald, van Jaarsveld and Massyn, 2005), there is a need to develop a more comprehensive understanding of the type of

support currently being provided to physiotherapy students and its effectiveness, as well as the use of ICT at universities to provide this support. The investigation and exploration of physiotherapy students' experiences and perceptions related to the use of ICT for support, is also of value in terms of not only ensuring the information provided is useful, user friendly and appropriate but more importantly, in the early identification of potential barriers which may hinder the successful implementation of such ICT support services.

1.3 Research question

How is ICT utilised at South African universities in providing support to physiotherapy students and what are those students' experiences and perceptions regarding the use of ICT to seek and receive support?

1.4 Aim of the study

To investigate the use of ICT at South African universities to provide support to physiotherapy students and the experiences and perceptions of those students pertaining to the use of ICT as a means of seeking and receiving support.

1.5 Objectives of the study

The objectives of this study were to:

1. determine what ICT facilities are available to physiotherapy students attending university in South Africa;
2. determine what physiotherapy students are using ICT for at their respective universities;
3. determine physiotherapy students' experiences and perceptions of ICT as a means of

receiving support;

4. determine how physiotherapy students are currently being supported;
5. determine if physiotherapy students are prepared to access support through ICT once they graduate;
6. determine if there are any differences, in terms of race or university attended, between those who use ICT and those who do not.

1.6 Description of terms used in this study

Broadband Internet – a form of Internet access characterised by high speeds of data transmission.

Information and communication technologies (ICT) – technologies utilising computers and computer software, peripheral devices and connections to the Internet that are intended to fulfil information processing and communications functions.

Support – used to encompass various types of support, including:

- clinical support – mentoring and supervision services.
- educational support – access to and provision of educational materials.
- emotional support – counselling services.
- social support – age and community specific support.

1.7 Chapter outline

Chapter One

The first chapter provides an introduction to the study by outlining the background against which the study took place. It states the problem that the study would address, the research

question, the aims and objectives of the study, as well as a description of terms used within this thesis.

Chapter Two

The second chapter consists of a review of all available literature consulted during the completion of the study. This includes literature evaluating the use of ICT as it relates to general healthcare and more specifically within the field of physiotherapy across international, national, local and at institutional levels. It describes how ICT has been shown to be beneficial in providing support, enhancing administration and decision making, improving education and training of healthcare professionals, facilitating continuing professional development, reducing the effects of geographical, professional and social isolation and increasing evidence based practice. Finally, it presents the challenges facing widespread adoption of ICT in healthcare.

Chapter Three

The third chapter includes a discussion of the methods used throughout the duration of the study. It provides details regarding study design, the setting in which the study took place, as well as descriptions of the population and study sample included. The design of the instrument, a questionnaire, is discussed in detail, in addition to the procedures used for data collection and analysis. Finally, the various ethical considerations pertaining to the use of human subjects is evaluated and assessed.

Chapter Four

The fourth chapter presents the results of the study as well as providing a brief description of each. Results are presented in the form of tables and the chapter is divided into sections that correspond to those of the questionnaire. It represents the demographic data pertaining to the respondents, the use of ICT by physiotherapy students at the various universities, as well as evaluating their past experiences and perceptions of the use of ICT for the provision of support. The final section of this chapter presents the results of an open-ended question that was analysed qualitatively.

Chapter Five

The fifth chapter includes a discussion of the results of the study, as well as highlighting the relevance of these results within the context of the literature reviewed. This chapter follows the same outline as the previous one.

Chapter Six

The sixth chapter is concluded with an assessment of the results of this study and attempts to contextualise the study outcomes in order to establish some perspective for future research into this field of study. Finally, recommendations for future studies are presented, as well as highlighting the various limitations noted in this study and in the study design.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This review of the literature describes the current state of the use of information and communication technology (ICT) to provide support in a healthcare setting. While it focuses on this use in South Africa, it also describes ways in which ICT has played a beneficial role in supporting healthcare professionals at an international level. It looks at the use of ICT in healthcare with regards to its effectiveness in providing support to health workers in rural areas, in enhancing the delivery of health services, improving patient care and facilitating continuing professional development (CPD). It establishes the emergence of ICT as an enabling technology within the field of healthcare, as well as its increasing importance to both health professionals and patients. Overall, it highlights the movement of technology into the sphere of healthcare and raises the question of whether or not South African physiotherapy students are prepared to function effectively in an increasingly digital work environment.

The literature review covers the time period from 1994 to 2008 and includes journal articles, published and unpublished studies, news articles and email communications with physiotherapy educators and managers in South Africa. Literature was sourced from PubMed, the University of the Western Cape online library and general Internet searches, using the following keywords: physiotherapy students, physiotherapists, information and communication technology, support, healthcare, education, rural, remote and South Africa.

2.2 Information and communication technology

ICT can be defined in many ways depending on the service or field in which it is being used.

For the purposes of this study, a broad definition of ICT used by the Information Technology Association of America (ITAA) will be used. Information technology (IT) is defined as:

> The study, design, development, implementation, support or management of computer-based information systems, particularly software applications and computer hardware. In short, IT deals with the use of electronic computers and computer software to convert, store, protect, process, transmit and retrieve information, securely. In this definition, the term "information" can usually be replaced by "data" without loss of meaning. Recently it has become popular to broaden the term to explicitly include the field of electronic communication so that people tend to use the abbreviation ICT (Information and Communication Technology).
>
> (ITAA, "*Information Technology Definitions*", p. 30)

2.3 South African policy regarding ICT in healthcare

A National Health Plan for South Africa was drawn up in 1994 by the African National Congress (ANC) with input from the World Health Organisation (WHO) and the United Nations Children's Fund (UNICEF). This policy discussed the appropriate use of highly sophisticated technology as an important factor in the success of Primary Healthcare (PHC). However, the plan also lists the dangers of relying solely on the use of ICT as a complete solution to the problems in healthcare. It stressed that the acquisition of technological solutions to solve problems created by lifestyle choices was something that healthcare professionals should be aware of. In addition to this, decisions regarding the use and acquisition of new technologies should be based on several factors. These factors, or main tenets of the policy on the use of ICT in healthcare included the following (ANC, 1994):

- Technology must be easily understood and put to use by community health workers and by the individuals in their communities.
- "Appropriate health technology" should be considered as part of a national strategy for

PHC, in which preference should be given to equipment manufactured locally with locally sourced materials.

- Specialised equipment should be distributed according to decisions made locally and will be based on the "needs, availability of local expertise, effectiveness, affordability, quality and assurance of adequate maintenance of the equipment."
- The entire community should benefit from the equipment purchased and not only a minority.

The National Health Plan for South Africa also emphasised the importance not only of technology, but of the people involved in the use of that technology, implying that acquiring appropriate technology was only a part of the overall solution. The idea that new, sophisticated technology used in South Africa must be sustainable, cost-effective and locally supported through capacity building, is discussed in the South African government's draft white paper on e-education (South African Department of Education, 2004). This is echoed by Samuel, Coombes, Miranda, Melvin, Young and Azarmina (2004), who report that "...equipment alone is useless unless people are able to use it effectively and to be informed of the potential benefits of its use". This idea that technology forms only a part of the healthcare solution in conjunction with community members is in accordance with one of the points laid out in the Declaration of Alma Ata (1978), in which PHC is defined as:

> ...essential health care based on *practical, scientifically sound and socially acceptable...technology* [italics added] made universally accessible to individuals and families in the community through their full participation and at a cost that the community and country can afford to maintain at every stage of their development in the spirit of self-reliance and self-determination.

The policies of the National Health Plan for South Africa (ANC, 1994) that relate to the use of

appropriate technology were to be implemented through the following mechanisms:

- The creation of the National Commission of Health Technology, which would seek to regulate and administer the application of potentially expensive technologies in the healthcare sector.
- Training schemes that would work in conjunction with clinical and laboratory services were to be formed, to ensure that equipment at all levels of the national health service is adequately used and maintained.
- Academic and research institutions would form linkages with the National Commission of Health Technology and would evaluate the cost-effectiveness and social implications of the development of new technology and technological procedures.

So, while the National Health Plan for South Africa advocates the use of ICT within healthcare in South Africa, it saw these potentially expensive healthcare technologies as being national resources and that as such they should be used equitably and effectively within the communities in which they were to be located. Thus providing enhanced services to the majority of community members, rather than only to a few.

2.4 The benefits of ICT in healthcare

The World Health Organisation (WHO) discusses the benefits of using ICT in the PHC setting in the document, *"WHO strategy for 2004-2007: eHealth for Health-care Delivery"* (WHO, n.d.).

These benefits include the following:

- Improved data exchange leading to better access to information, as well as improving the cost-effectiveness of institutions.
- Facilitating CPD by allowing the transfer of training materials to rural areas and for communication between teachers and students.
- Using the Electronic Patient Record (EPR) and the Electronic Health Record (EHR) to improve quality of care and patient safety.
- Providing learning tools for healthcare professionals, patients and the community.
- Provide the opportunity, through tele-conferences, for primary healthcare centres to have access to clinical specialists.

These benefits were echoed at the United Nations Economic Commission for Africa (UN ECA) panel on the Digital Divide (UN ECA, 2001), which found that ICT could play a positive role in reducing the extent of some of the problems in healthcare. This would include improving access to health services, educating the public, improving the decision making abilities of health professionals, enhancing the effectiveness of health institutions and promoting the exchange of information between researchers and students. Chandrasekhar and Ghosh (2001) looked at the advantages of using ICT in the healthcare sector in India with the idea of expanding that to other developing countries. They found that healthcare workers were better able to remain informed of advances in their fields through access to information. Additionally, the delivery of healthcare services, access to emergency advice and educational materials for healthcare workers was improved and the efficiency and availability of public health services was also improved.

2.5 ICT in administration and decision making

While it seems that there are benefits to the use of ICT within the field of health, and it is self-

evident that ICT has significantly increased the amount of data available to health professionals, merely having access to information is not the same as making effective use of it. This section describes how the use of ICT can enhance the administrative support provided to healthcare professionals and so lead to an improvement in the efficiency of healthcare services. The current use of ICT to provide administrative support in the health sector covers a wide range of tasks, from basic computer systems used for patient records and research, to sophisticated diagnostic equipment used in tertiary hospitals (Heywood & Wilson, 2001).

Graves and Reddy (1999) showed that the use of portable computers by healthcare workers in rural areas had the potential to reduce the amount of time spent on administrative tasks, eliminate duplication of data entry, streamline the flow of information to senior management and produce data in an electronic format for further processing. The administrative tasks mentioned by Graves and Reddy are similar to the ones that form part of the key responsibilities of South African physiotherapists who are working in compulsory community service (South African Society of Physiotherapists, 2005). Some of the tasks that these physiotherapists are expected to perform include:

- Effectively documenting all treatments.
- Carrying out administrative tasks efficiently.
- Providing statistical data for the organisation they work for.
- Providing input on departmental budgets.
- Reporting low stock levels and shortages of consumables, as well as the malfunction of equipment.

However, in an unpublished qualitative study of 52 physiotherapists in KwaZulu-Natal (KZN) Province, Elet Steyn (2005), the South African Society of Physiotherapy (SASP) community service representative, found that some physiotherapists working on community placement lacked even the most basic resources (e.g. books, equipment and Internet access) to help them accomplish these administrative tasks. On a positive note however, many physiotherapists who took part in the survey mentioned learning a lot about managing a department and independent decision making. Limitations of the study were that it had a low response rate (30%) and that it included physiotherapists in only one province of the country, making generalisation difficult.

2.5.1 Health Information Systems

One prominent use of ICT in the area of administration and decision making is in the deployment of Health Information Systems (HIS). HIS are a subdomain of the field of health informatics, which deals with the effective and efficient use of information within healthcare. Health informatics includes the setting of standards to enable the flow of information between various systems and organisations, defining medical vocabulary and the use of hand held computers or personal digital assistants (PDAs) to assist with data entry. HIS look specifically at the software and hardware architectures used to manage the movement of the information described above, in terms of patient records, billing, scheduling and research, as well as seeking to guide and inform the decision making process (Wikipedia, 2008)[2].

As disease moves across borders in Africa, especially in the case of HIV/AIDS in Southern Africa, it is the responsibility of the South African national health service to provide

[2]The use of Wikipedia as a resource for academic work has been the subject of much debate. However, in a 2005 study by the British scientific journal, *Nature*, Wikipedia was found to be "...about as accurate as the Encyclopedia Britannica...", particularly with regards scientific entries (British Broadcasting Corporation, 2005).

information systems that take this into account. The dissemination of quality healthcare information to relevant personnel can facilitate collaboration across international boundaries, as well as improve many other components of the healthcare system (Louw & Hanmer, 2002). However, in order to manage the effective flow of information, a HIS needs to be able to communicate effectively with other systems, either nationally or internationally. Therefore, the development of any HIS in South Africa, whether in the public or private sector, is expected to conform to the framework of the National Health Information System of South Africa (NHISSA), a comprehensive HIS supporting all aspects of South African healthcare and coming under the auspices of the National Health Information System Committee (WHO, "*Review of Health Information Systems in various countries*", n.d.).

Louw and Hanmer (2002) looked at the use of ICT and its role in the flow of information to support decision making at all levels of the healthcare system, in both the public and private sectors. One of the conclusions of their work was that the public healthcare system in South Africa was inefficient in terms of knowledge management, largely because of poor Internet connectivity and insufficient telecommunication infrastructure and staff training, with the private sector making better use of ICT to enhance efficiency. This is in keeping with a general finding in the same report that healthcare systems in the public sector in South Africa are uncoordinated and inefficient and that making better use of ICT may have a positive effect in improving the coordination and efficiency of healthcare departments and services. However, the results obtained by the more efficient use of data by the private sector are unable to filter to the public sector, as there is little integration between systems (WHO, "*Review of Health Information Systems in various countries*", n.d.). Edejer (2000), in her evaluation of the role of the Internet in disseminating health information, also found that ICT had not been systematically harnessed to improve healthcare in developing countries. However, the situation is not all bleak. In the Western Cape, the successful implementation of

the District Health Information System (DHIS), led largely by the School of Public Health at the University of the Western Cape, has resulted in it being used as a national standard, as well as in other countries like Mozambique and Cuba. The DHIS aims to address all of the various components of HIS, including: data quality, user interface design and human resource development (Louw and Hanmer, 2002).

There are also non-governmental organisations (NGOs) involved in the implementation of HIS in South Africa, one notable example being Health Systems Trust (HST). It is the largest health-orientated NGO in South Africa and is an organisation dedicated to promoting:

> ...scientific research into health systems in South Africa with the principle objective of designing and planning programmes and evaluations thereof towards restructuring of the health system and the development of a comprehensive National Health System based on equity (HST Trust Deed, 1992).

One of the projects within the HST, Healthlink, has four main aims (Day, 1999):

- To provide a simple and appropriate computer networking system for use in health services, particularly in under-resourced areas.
- To develop the use of email as a tool for improving the management of health services.
- To provide isolated health workers with access to information resources.
- To be a major non-governmental source of health information.

Healthlink has played an active role in maintaining the lines of communication in some of the most rural and disadvantaged communities in the Eastern Cape (Day, 2000), especially in

terms of providing technical support that allow healthcare workers to stay connected to the Internet. An evaluation of the Healthlink programme (Day, Boulle, Shongwe, & Ramduny, 1998) showed that it had made a positive impact by using appropriate technology and had made progress in "...addressing the inequity of access to communication and information." Ultimately, the programme was shown to have successfully used ICT to improve the delivery of healthcare services in rural and under-resourced areas.

2.5.2 Telemedicine

Telemedicine is defined by the American Telemedicine Association (ATA) as "...the use of medical information exchanged from one site to another via electronic communications to improve patients' health status" (ATA, n.d.). It includes videoconferencing between healthcare workers, the transfer of digital images, access to educational resources to facilitate CPD, monitoring of vital signs over a distance and nursing call centres (Fraser, 2002).

Early examples of the successful use of telemedicine in healthcare included delivering psychiatric care and group therapy to patients and instruction to medical students at the Nebraska Psychiatric Institute in 1959. It was also used to conduct more than 1000 patient examinations via a video link at Massachusetts General Hospital in 1968 and improved access to medical care in remote local communities in Queensland, Australia in 1985 (Fraser, 2002). From this it can be seen that telemedicine is not a new concept and has already been shown to be successful in delivering information and enhancing patient care from a distance.

In 1998, the South African Government identified telemedicine as a "...strategic tool for facilitating the delivery of equitable healthcare and educational services, irrespective of

distance and the availability of specialised expertise, particularly in rural areas" and the Department of Health adopted the National Telemedicine Project Strategy (South African Government Information, 2008). According to Louw and Hanmer (2002), the Department of Health, in conjunction with the Medical Research Council (MRC) and South African academic institutions, set up the Telemedicine Lead Programme in order to provide ICT solutions for the delivery of healthcare services to all.

Telemedicine certainly seems capable of enhancing the provision of health services in rural areas. In its document, *WHO strategy for 2004-2007: eHealth for Health-care Delivery* (n.d.), WHO states that "By connecting health workers to primary healthcare centres and connecting these centres electronically to departments and referral centres in hospitals for the exchange of data, access and cost-effectiveness may be affected". This electronic connection between healthcare workers and healthcare centres is a difficult proposition in rural South Africa, large areas of which do not have a dedicated fixed line communication infrastructure. Louw and Hanmer (2002) suggest the use of wireless networks and satellite communication as an alternative that needs to be considered.

A telemedicine system that was set up by the Tygerberg Children's Hospital and the Rotary Telemedicine Project, between Tygerberg and outlying facilities in 1999, has proven successful in improving paediatric patient care in those areas. X-ray images, laboratory and electrocardiogram (ECG) results and case histories are scanned at the remote hospitals and sent over the Internet to be examined by more experienced clinicians at Tygerberg. Diagnoses and treatment plans can then be returned to the outlying hospitals (Smetherham, 2003). While the initial system at Tygerberg Hospital cost about R50 000 to implement, the system in other hospitals consists of a desktop computer, printer, scanner, software, digital camera, and light-shelf for viewing X-rays ("Tygerberg children's hospital," 2003). This approach, which

favours “off the shelf” solutions rather than commercial telemedicine systems has ensured that the project is affordable and that it makes use of appropriate technology, rather than sophisticated equipment that would be difficult and expensive to maintain.

From these examples it seems clear that the use of ICT within the field of healthcare in South Africa is becoming an increasingly important aspect of clinicians professional practice, improving the delivery of health services and communication and enhancing the decision making process through the efficient flow of information. One estimate is that by 2010, 30% of a medical practitioners time will be spent using ICT (Skinner, Biscope, & Poland, 2003). This raises the question of whether or not the future healthcare professionals of South Africa are adequately prepared to function effectively in an environment that is already so focussed on the use of digital technology? While the benefits of using ICT to improve administrative tasks and enhance decision making seem evident, Coyne (1995) has argued that the vast amounts of often contradictory information available on the Internet, often published by dubious authors, can actually lead to more difficulty in the ability to make decisions. Edejer (2000) agreed with this and felt that the “...quality of health information available on the web is inconsistent, and the visibility of research from developing countries is limited”.

2.5.3 Satellite interactive television

Mindset Health is a satellite television (TV) broadcasting channel in South Africa and is a joint venture between the Department of Health, Mindset Network and Sentech (a state owned multimedia service producer) that was set up in October, 2003. It currently broadcasts educational programmes in a variety of languages, on HIV, AIDS, TB and other health topics (e.g. maternal and infant health, and gender violence) to clinics and other facilities. Growing from 48 sites in the pilot phase to almost 300 (as of March, 2007), Mindset Health aims to

continue growing its audience until it reaches 4000 sites and providing educational health material to 97 000 nurses and 36 million South Africans (Mahlangu, 2007). Both patients and healthcare professionals are targeted (Medical Research Council, 2008), with the service having different aims for each group. One of the objectives for healthcare professionals is the "...improvement in knowledge and usage of IT and ICT technology to access health education". A study by Deverell, Kachieng'a, Wynchank, Molefi, Olorunju and Wilson-Strydom (2006) looked at the usage and acceptance of the channel, as well as the efficacy of the video content in terms of improving the learning, attitude and motivation in healthcare professionals. The study concluded that the use of interactive TV could contribute to the fields of education, training and professionals development and that the service offered a valuable training resource in rural areas of South Africa. Other features of the service are that community volunteers and lay health workers have been trained in the use of the technology and that regional coordinators maintain relationships with provincial and regional NGOs to ensure that they take ownership of the Channel (Health communication partnership, 2008). Thus, it seems that the Mindset Health project is following the key tenets that govern the use of ICT in healthcare in South Africa, as laid out by the National Health Plan for South Africa (ANC, 1994).

In the United States, a study by an interactive TV company called Lodgenet Health, has found that American patients are increasingly placing emphasis on the use of the service to enhance their stay in hospital. Some of the benefits of an interactive TV system include the following:

- Patients have easy access to "...hospital information, patient surveys, medical information, meal menus and staff members..."
- Patients are able to be educated with regards their stay in hospital, as well as post-

discharge care.

According to a press release by the company (Lodgenet Health, 2008), patients were more likely to recommend a hospital with an interactive TV system than one without. While this particular use of ICT within hospitals seems to enhance patient satisfaction, it needs to be borne in mind that this particular study was conducted by the same company that produces the product, which may introduce a conflict of interest.

It seems evident that by taking clinical specialists in a virtual sense to the PHC setting through teleconferences, interactive TV and telemedicine has been shown to be an effective means of providing educational services in remote areas, not only to healthcare professionals but also to patients.

2.6 ICT in the education and training of healthcare professionals

In addition to ICT having a positive role to play in administrative tasks of health institutions, it may also have a beneficial effect in education, both of healthcare professionals and patients. The impact of ICT in providing a resource for education is mentioned in the South African government's "*Draft White Paper on e-Education*" (Department of Education, 2004), which states that "...ICT has the potential to improve the quality of education and training" (p. 8), specifically naming the healthcare sector as a focus area in which development needs to take place.

Devitt and Murphy (2004) surveyed doctors' use of computers for clinical tasks at an acute hospital in the UK NHS. The reasoning behind conducting the survey was that in order to implement the NHS information strategy, "*Information for Health*" (NHS, 1998), doctors in

the UK must be computer literate. The concern was that doctors who trained before formal IT education was included in their degree, would not be adequately equipped to function in the "modern NHS". It was recognised that the role of IT in the future of healthcare would be significant and that doctors would need to be prepared for this role. The study concluded that even though formal computer training was included in current medical degrees, most doctors (66%) reported that self-directed learning was the means by which they acquired their computer skills. The most commonly requested training needs identified by the doctors were setting up databases, spreadsheet training and preparing presentations. The study concluded that although most of the doctors surveyed were computer literate, spending an average of five hours per week at a computer, their computer skills were the result of self-directed learning, rather than attendance at formal IT courses. Ninety five percent of doctors used computers to conduct literature searches, 80% for writing clinical reports and a similar number for preparing presentations. Together with the ICT skills mentioned above, the ability to type accurately and at speed without looking at the keyboard, known as touch typing, is key to users being able to efficiently utilise the benefits of ICT. While it is possible to make use of ICT without being able to touch type, it is self-evident that being able to type 40 words a minute is better than being able to type 20. It has been recognised as such a fundamental component of basic ICT literacy that it is included in the first year curriculum of Eton College in the UK, as part of a broader IT literacy course that culminates in a professional computer literacy qualification (Extreme Networks, 2006).

While the situation in the UK appears positive, medical students in Africa seem to be losing out on the benefits that ICT has to offer. Samuel et al., (2004) looked at the use of ICT by medical students at a Tanzanian university, as well as a pilot ICT mentoring programme by elective UK medical students at the same university. They found that Tanzanian medical students had a low level of ICT literacy but that mentoring by the UK students had the

potential to improve this situation, with only about five hours of input required to double ICT competency scores. The authors suggest that programmes to increase ICT skills are required, as well as improving access to computers for medical students. These results were similar to those of Ajuwon (2003), who found that first year medical and nursing students in Nigeria had not made full use of ICT as a means of enhancing their medical education. This was partly because of the high cost of accessing ICT services and low ICT penetration. Another finding of the study was that only 60.7% of all students had ever used the Internet. The recommendations made were similar to those of Samuel et al. (2004), that is, to improve access to ICT by including computer education in medical and nursing training and the establishment of computer laboratories for use by students.

The use of ICT to facilitate learning by physiotherapy students was well demonstrated in Japan by Maeno, Fujita, and Iwatsuki (2004), who showed that first year physiotherapy students could be taught basic assistive techniques using ICT. An institution-home environment was simulated by installing a video-conferencing system in two rooms and instruction given to students on the correct performance of techniques such as “sit to stand” and “walking stick use”. Tests before and after the students watched the videos showed that their use of techniques had improved after watching the videos, suggesting that some rehabilitation techniques could be taught or revised over a distance.

Any situation in which the teacher and student are separated in time and space and the gap between the two is bridged by some form of online technology, as in the study mentioned above, can be defined as e-learning (Wikipedia, n.d.).

The positive role that e-learning has to play in the field of education was highlighted by Johns (2003), who described five ways in which web-based learning materials bring a host of

advantages to the educational process. These advantages include:

- Coursework being accessible to students at any time, wherever they are.
- Web-based material allows students to engage more actively with the content, rather than learning being a passive process.
- E-learning enhances activities such as problem-solving and information-gathering skills, which allows ‘‘deep learning”3 to occur.

A more recent study of the use of e-learning at two South African universities, although not among physiotherapy students, confirmed that e-learning does indeed have a positive role to play as an alternative mode of instruction in higher education (Rohleder, Bozalek, Carolissen, Leibowitz, Swartz, 2007). The main advantage reported by students taking part in this study was an improvement in communication between students and facilitators through the use of online forum discussions and email. Other advantages included a cost saving of working in a paperless environment, as well as easier submission of assignments. Some students also highlighted how the use of e-learning would be beneficial for communicating over distances. However, the authors found that some students experienced difficulty with e-learning, in particular having to deal with the regular power cuts that shut down the system. There was also a strong preference for face-to-face interaction that would be problematic for an e-learning module to provide. An important finding regarding culture and background was that some coloured and black students from the University of the Western Cape (UWC) were not computer literate when they began their studies and so found the e-learning system difficult to manage. This inequity between the two universities was highlighted when the researchers

[3] Deep learning describes an enhancement of the learning process whereby knowledge acquires meaning, is analysed and conceptualised. It contrasts with surface learning, which is the reproduction of knowledge by rote learning (Prosser & Trigwell, 1999).

discussed unequal access to computers, with students from UWC often not having access to computers and the Internet at home and having to wait in long queues at computer labs on campus, which were often crowded and noisy.

Eksteen (2005) looked at the use of e-learning among physiotherapy students at the University of Pretoria as a means of enhancing physiotherapy students clinical reasoning and lifelong learning skills, as well as their interaction with each other and lecturers. She concluded that e-learning has the potential to decrease contact time between teachers and physiotherapy students. However, the response to e-learning is related to each students individual style and approach to learning. Eksteen also reports that while e-learning provides a well-structured way of working through problem solving and clinical reasoning situations, it does not provide the interaction that is possible with direct teacher-student contact. This sentiment is well presented by Ballantyne (1999), who describes the essential feature of good teaching practice in face-to-face situations: "...the importance placed on interacting with students, reflecting the belief that effective teaching requires two way communication, not one way 'broadcasting'....". In other words, e-learning may have an influential role to play in education but is not the sole means by which teaching and learning should be addressed. Davies, Ramsay, Lindfield and Couperthwaite (2005) looked at the use of traditional classroom teaching techniques combined with an e-learning approach to develop physiotherapy students' neurological and analytical skills. They found that the use of video footage of real patients, combined with student theoretical knowledge of neurological conditions gave students a better appreciation of what to expect from their clinical placements. Significantly, the authors relied on the multimedia resources as a way to add value to already established teaching techniques, rather than trying to substitute one for the other.

As well as an e-learning programme, the University of the Western Cape has also implemented an electronic thesis and dissertation library as a means of cataloguing the university's research output in one digital repository (van der Waldt, 2005). The objectives of the project are to enable better communication between postgraduate students and lecturers/examiners, as well as between faculties and other relevant bodies within the university structure. It also seeks to enhance progress tracking, automate administrative tasks and to assist with thesis publication, archiving and future access. The project was launched in 2006 and is currently operating successfully, with users able to access all of the research output produced by the university since 2004, as well as selected titles prior to that. This electronic thesis library is a significant resource that should be utilised by South African physiotherapy students, as well as practitioners in the public and private sectors.

With the use of ICT in the form of e-learning, digital content creation and digital repositories of new knowledge and research being integrated into South African academic institutions, it is a concern that such a wealth of information is sometimes neglected by the public and private sectors of healthcare. Louw and Hanmer (2002) mention three prominent data gathering and processing environments; the public, private and academic or research sectors and discuss the importance of ensuring that these systems do not develop in isolation within each of these sectors and that the ability to provide interfaces that allow the flow of information between them, exists.

2.7 ICT and continuing professional development

ICT not only has the ability to enhance the education and training of healthcare professionals, but can also provide a channel by which CPD can be effected, through the use of telemedicine and teleconsultation (WHO, "*eHealth for Healthcare Delivery*", n.d.).

In Australia, Mitchell, Robinson, McEvoy, and Gates (2001) used a combination of videoconferencing, telephone, video-tapes, the Internet and printed material to show how telemedicine was able to play a role in the professional development of health, education and welfare professionals in two small mining towns. They concluded that the customised support provided over a two year period played a positive role in the successful development of an educational and support network for the staff involved. Hill and Alexander (1996) found that health professionals (in this case, nurses and health education staff) in rural parts of Australia were disadvantaged when it came to accessing CPD, mainly because of their geographical isolation. Other reasons that caused rural healthcare workers to find continuing education problematic included the cost of travel and accommodation, time spent away from family and finding replacements to work while they are away. They implemented a project whereby healthcare workers in remote parts of South Australia could make use of ordinary telephones to access a CPD module on diabetes care. The module was developed by experts sourced from throughout the country and the content developed by specialists from various hospitals and educational institutions, establishing a "...credible, relevant and high-quality learning experience." The project assembled two modules, one for registered nurses and another for all other healthcare professionals, that could be delivered as tutorials by phone, as well as a series of audioconferences. Students and experts in the field were then able to interact and learn from each other using this telephone network, through discussions and debate. The project continues to receive positive evaluations. The above studies in Australia by Mitchell et al. (2001) and Hill and Alexander (1996), show that the use of ICT as a training tool helped healthcare professionals to access CPD information, receive professional support, improve healthcare delivery to patients and to improve confidence.

In her survey of 52 physiotherapists working in community service in KZN Province in South

Africa, Steyn (2005) found that there were no CPD courses offered specifically to accommodate rural physiotherapists. These physiotherapists also reported that the few courses available to them were too expensive, too far away from their placements and unrelated to community work.

2.8 ICT and the problem of geographical isolation

Rural environments are often associated with lower numbers of healthcare workers, as is found in Australia, where capital cities have as many as 60% more allied health workers per 100 000 population, than regional areas (Australian Institute of Health and Welfare, 2001). This geographical isolation has been found to be an influential factor affecting the attraction of healthcare workers to remote areas (Hill & Alexander, 1996), with the following seen as disincentives to rural work (Struber, 2004):

- Lack of management support.
- Lack of professional supervision, support and/or mentoring.
- Difficulties accessing professional development opportunities.
- Lack of support for ongoing/post graduate education.
- Professional isolation.
- Lack of resources.

Struber (2004) found that, together with the points mentioned above, social and cultural isolation were also relevant in terms of healthcare professionals choosing to work in rural areas. This was examined by Mitchell (1996), who found that the perceived inhibitors to rural practice among Australian physiotherapists were not related purely to professional isolation, but also took into account social and recreational factors. Mitchell (2001) found that isolation

from family, friends and partners and the lack of access to entertainment were also relevant in terms of the retention of staff in rural areas. Taylor and Lee (2005) found that occupational therapists (OTs) in Western Australia were also struggling with the stresses of geographical isolation and its social and professional impact. They found that OTs lacked access to clinical support and CPD opportunities, which led to limited career opportunities, poor management of resources, lack of orientation to different communities and excessive travelling to attend relevant courses. It was suggested by the authors that the use of ICT in rural parts of Australia may influence the recruitment and retention of OTs who work under difficult conditions.

In South Africa, similar results were found among physiotherapists working on compulsory community placement (Steyn, 2005). While the majority of those surveyed felt that the year spent in community service was a positive experience, some negative aspects were reported. These were similar to those already mentioned among Australian healthcare workers in rural areas (Taylor & Lee, 2005) and included:

- Feelings of isolation brought about by being the only physiotherapist based at a particular facility (professional isolation).
- Vast distances were a problem, especially for attending CPD courses (educational isolation).
- Social isolation.
- Banking and shopping (one physiotherapist mentions being 200 km from the nearest bank).
- Only three out of the 52 physiotherapists surveyed wanted to remain in their current post, while the majority preferred to return home or go to bigger cities.

De Villiers (2004), in a study of doctors' views of working conditions in rural hospitals in the Western Cape, found that one of the three major themes that emerged from the study, was the importance of support structures. The study showed that a perceived lack of management support could have a negative impact on how doctors view employment in rural hospitals. She stresses that unless the problems, including lack of support, are addressed, there will continue to be difficulty in retaining medical staff in rural areas. De Villiers suggested that one way in which the recruitment and retention of doctors working in rural hospitals in the Western Cape in South Africa could be positively influenced, was through appropriate education and training. In an email exchange with Professor de Villiers, she stated that ICT would be more likely to play a role in assisting with recruitment of healthcare professionals in rural areas, as "...it may be more attractive for healthcare professionals to go to a place which has access to these technologies, as it symbolises a more modern up-to-date environment" (M. de Villiers, personal communication, 10 August, 2006). However, in terms of retention, she found it unlikely that ICT support alone would suffice to retain staff if other factors, such as general working conditions, were unacceptable.

It seems that the use of ICT within the context of minimising the problems associated with geographical isolation (e.g. a lack of educational opportunities, social and professional isolation) for healthcare professionals working in rural areas has been shown to be effective. This is in agreement with WHO, who in their document, "*eHealth for Healthcare delivery*", have suggested that the use of ICT can reduce the effects of professional isolation (p. 10).

2.9 ICT and evidence based practice

Evidence-based practice (EBP) is fast becoming the standard by which assessment and

treatment interventions are measured. It is "the conscientious, explicit and judicious use of current best evidence in making decisions about the care of individual patients" (Sackett, Rosenberg, Gray, Haynes & Richardson, 1996). According to a statement regarding EBP by the Health Professions Council in the United Kingdom, physiotherapists must "be able to use research, reasoning and problem solving skills to determine appropriate actions" (CSP website, 2008). The Sicily statement on EBP by Dawes et al. (2005), described it in the following way:

> Evidence-Based Practice (EBP) requires that decisions about health care are based on the best available, current, valid and relevant evidence. These decisions should be made by those receiving care, informed by the tacit and explicit knowledge of those providing care, within the context of available resources.

According to the CSP "*Core standards of physiotherapy practice*" (2005), the available resources to be considered refers to the "patient, relatives/carers, other health care professionals, library facilities, electronic sources, journals and local policies" (CSP, 2005).

In a study of the attitudes and barriers of evidence based practice (EBP) among physiotherapists in Tanzania, Maigeh (2003) showed that most participants (91.3%) considered EBP to be useful in their practice. They also found that although most physiotherapists surveyed had a good knowledge of EBP, lack of access to literature limited them from incorporating this into practice. In a survey of Australian physiotherapists, Grimmer-Somers, Lekkas, Nyland, Young and Kumar (2007) found that barriers relating to "...lack of time, uncertainty about what the research reported, scepticism about the value of research and being isolated from peer support and literature sources", were other factors that limited the use of EBP. These results echoed those of Guyatt, Meade, Jaeschke, Cook and Haynes (2000), who found similar barriers limiting review of the literature. However, the

authors suggested that these skills could be taught and that practitioners could use electronic knowledge bases or increasingly, Health Information Systems (HIS) to conduct research. Grimmer-Somers et al. (2007) suggested that strategies to encourage EBP were to place greater focus on research during education, to facilitate knowledge transfer within the workplace and to ensure dedicated time and support for research activities in the workplace.

It seems evident from the studies mentioned above that EBP is increasingly being seen as a requirement for good practice among healthcare professionals. While there are obstacles when it comes to incorporating EBP into professional practice, they can be overcome with several strategies, including greater access to resources, the use of new technologies to conduct research and to increase support for professionals within the workplace. The use of research to inform professional practice is becoming increasingly important as the drive to improve patient care based on the latest evidence gains momentum. Patient empowerment through increased access to information also places greater importance on health professionals' ability to justify treatment interventions.

2.10 ICT and support

In Japan, Jin, Ishikawa, Sengoku, and Ohyanagi (2000) established a project to show how ICT can play a positive role in providing support to physiotherapists working in rural areas. In their study an isolated community physiotherapist working in a remote town used video-conferencing to meet regularly with senior physiotherapists at a participating university. Physiotherapists working in remote parts of Japan struggle with similar problems to those in Australia and South Africa, such as an increase in responsibilities and feelings of isolation that can negatively impact their professional practice. The use of video-conferencing to meet with more experienced staff allowed the physiotherapist to gain confidence in her ability to

work in a remote environment. In another Japanese study, Iwatsuki, Fujita, Maeno, and Matsuya (2004) found that digital video sequences of patients' movements could be sent by physiotherapists in a rural hospital to a university physiotherapy department. There, a 3-dimensional motion analyser was used to help prepare a treatment plan that could be sent back to the rural physiotherapists who were then able to provide a better service to their patients. While video has been shown to be an effective means of facilitating education and providing support for physiotherapists in more developed countries, this technology is currently not feasible in a South African context because of high bandwidth costs (Louw and Hanmer, 2002). The high cost of video is also mentioned by Fraser (2002), who recommends the use of appropriate technology to ensure cost-effective solutions to healthcare problems.

As can be seen from the studies described above and in previous sections, the concept of support features prominently in the minds of healthcare professionals, with a lack of support being a barrier to the recruitment and retention of those professionals in remote areas. In 1997, Bent found that a lack of management support for Allied Health Professionals (AHPs) in rural posts in Central Australia was a key factor in the high turnover of staff and recommended the development of strategies to improve the support that they receive. This was similar to the results of a survey of 84 physiotherapists in Victoria, Australia by D'Amore, McMeeken and Williams (2007). They found that the challenges of working in rural areas of Australia were compounded by a "...lack of career path, professional support, access to professional development and postgraduate education". The authors conclude that strategies to retain physiotherapists working in remote areas must include the development of support systems, enhance access to education and to highlight the existing positive aspects of community work. These include "... part-time employment opportunities, independence as primary health providers, practice variety and community recognition".

In the United Kingdom, the Chartered Society of Physiotherapists (CSP) aims to support its members in a variety of ways, one of which is the CSP website. The full content of the CSP website is accessible to all registered members, however, even non-registered members can access much of the information provided. Some of the features of the CSP website include providing information (or links to information) on the following:

- National health policy in the UK.
- Sourcing evidence upon which to base professional practice.
- Networking and collaboration with colleagues.
- Consumer health information resources (i.e. patient handouts and pamphlets)
- IT, information literacy and research skills development.
- Education, training and career development.

This is just one example of how ICT has been utilised to provide a wide variety of services to physiotherapists in the UK and seems to be a cost-effective means of distributing profession specific information to the majority of practitioners. However, Steyn (2005), found that many physiotherapists working in community service did not have Internet access at work, which excludes them from the many potential services that are available. Indeed, the importance of access to the Internet access at work was highlighted by Louw and Hanmer (2002), who suggested that South African provincial government departments allow unrestricted use of the Internet for healthcare professionals to access relevant health information.

Mostert et al. (2005) looked at the impact of physiotherapists working in compulsory community service Gauteng Province in South Africa. They found that in order to deliver a quality service, support of various kinds needed to be provided, including support from different levels of management. The current system of providing support to physiotherapists

working in community service in South Africa is known as the "Buddy" system. The SASP tries to link graduated members with physiotherapists working in community service. Telephonic contact is advised but some mentors/supervisors are encouraged to conduct face-to-face visits (M. Smith, SASP manager, personal communication, 14 September, 2006). Each province is responsible for establishing the system in that particular area, allocating the buddies to newly graduated physiotherapists and informing them about the programme. However, there appear to be some problems with the current system. Steyn (2005) found that physiotherapists working in community service in KZN Province complained of poor mentoring by universities, their buddies and the SASP. In that year, only two physiotherapists reported having been contacted by their buddies and that there was a general complaint of poor supervision by senior staff. Sue Mars (2006), chairperson of the KZN branch of the SASP explained that, based on verbal feedback from users of the buddy system, only the outlying community service physiotherapists needed access to their buddy. She also said that qualified physiotherapists are seldom called upon except in unusual circumstances, which suggests that the level of support needed by physiotherapists working in community service may be perceived by managers to be low (S. Mars, personal communication, 16 August, 2006).

While the idea of support has been shown to be an important factor in the minds of health professionals working in remote areas, Steyn (2005) showed that physiotherapists working in community service in KZN are not provided with the necessary support to successfully perform their duties. They were not given resources for CPD and sometimes not even books were available for reference. Physiotherapists reported having "no" or "minimal" access to the Internet, universities or libraries and no opportunities for even basic research. This was similar to the results of the study by D'Amore, McMeeken and Williams (2007), who found that in addition to issues with support and professional development, physiotherapists

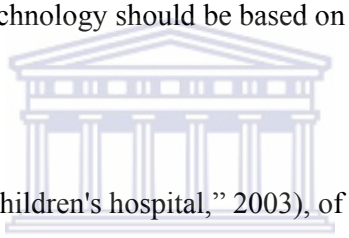
working in rural parts of Victoria, Australia also struggled with "...the costs and time to attend courses and conferences, travel/distance, and inadequate resources".

2.11 Challenges facing ICT adoption

The previous sections have discussed the importance of ICT in the health sector in terms of improving efficiency in administration, enhancing communication, providing support and improving service delivery through access to CPD. However, not everyone is singing the praises of the use of ICT in healthcare. Coyne (1995) argued that the implementation of ICT can lead to a widening of the gap between rich and poor, as well as of the "digital divide", described by WHO as being "more dramatic than any other inequity in health or income" (Edejer, 2000). By this it is meant that the difference between those with access to technology and those without, is greater than the difference between rich and poor. The tragedy is that those who need the vast resources of the Internet the most, are the ones with the least access (Samuel et al., 2004). Godlee, Pakenham-Walsh, Ncayiyana, Cohen and Packer (2004) discuss the problems that ICT was supposed to solve, in *"Can we achieve health information for all by 2015?"*. They argue that there is little evidence to suggest that healthcare workers are any better informed now than they were 10 years ago and also report that a lack of access to information is still a major barrier to healthcare in the developing world. It was suggested that in order for a system to develop reliable, usable information it requires the cooperation of several groups of professionals, including healthcare providers, policy makers, academics, publishers of information and technology experts. Currently, they argue, the system is not working because it is not well understood, is unmanaged and under-resourced. They offer a list of possible solutions, including developing:

> Strategies for achieving universal access [that] include funding for research into barriers to use of information, evaluation and replication of successful initiatives, support for interdisciplinary networks, information cycles, and communities of practice, and the formation of national policies on health information (Godlee et al., 2004, p. 1).

The National Health Plan for South Africa (ANC, 1994) mentions that while the use of ICT is regarded as an important factor in the future of healthcare in the country, it should by no means be blindly adhered to and that the benefit to the community should be weighed against its cost. The use of ICT should be based on proven success, rather than populist beliefs. While new technology is certainly capable of enhancing service delivery within the healthcare sector, care should be taken to avoid falling into the trap of viewing ICT as a panacea for all of its problems. The use of technology should be based on its relative merit, not merely for its own sake.



Dr. Etienne Nel ("Tygerberg children's hospital," 2003), of the Department of Paediatrics and Child Health at Tygerburg Children's Hospital discussed the telemedicine project that was implemented there in 1999 in terms of both the benefits the system offers, as well as lessons learned and precautions to be taken. Inadequate technical support, poor computer literacy, typing skills and time spent learning to operate the system were all mentioned as potential problems to be overcome. There is currently no literature on the availability of these skills in the general physiotherapy population, including students. Dr. Nel also mentions the high cost of equipment as a potential barrier to entry. While this is certainly the case, Fraser (2002) points optimistically to the falling cost of hardware and bandwidth, better imaging devices and compression technology, the increasing use of the Internet and the use of appropriate technology in developing countries, as important factors in the adoption of ICT.

Even though the telephone network is still inadequate for the wholesale adoption of all

Internet technologies, in particular the transmission of digital video, South Africa's communications infrastructure is the "best developed and most modern in Africa", which is a positive indication of the potential to improve (CIA World Factbook, 2008). While Dr. Nel ("Tygerberg children's hospital," 2003) did mention the difficulty of accessing networks from areas with poor Internet connectivity because of a lack of infrastructure, wireless and satellite networks could be considered as an alternative (Louw and Hanmer, 2002). A study by Merrell, Merriam and Doarn (2004) among medical students in Kenya found that technological assistance could enhance service delivery in rural areas by using Personal Digital Assistants (PDAs) and HIS, consisting of an Electronic Medical Record (EMR), satellite communications, medical software and solar power. Nineteen medical students performed clinical evaluations on 2700 patients in areas where there was no power or telecommunication infrastructure and that these services could be provided at a reasonable cost ($0.28 per patient visit).

In 1995, Glowniak had this to say about the use of ICT within the field of healthcare:

> As the cost of telecommunications decreases and the speed of telecommunications increases, new forms of computer communication, such as long-distance, real-time audio, and video services will become available. Computer networks in general and the Internet in particular are likely to play more important roles in many aspects of medicine in the future.

Now, more than ten years later these predictions have not only come true but have been surpassed. Who can tell what digital environments and information systems our current physiotherapy students will be expected to work with in the future and the question of whether they are being adequately prepared to function effectively within them, has never been more relevant.

2.12 Summary

This chapter began by defining ICT broadly as the use of computers to manage information and communication. It went on to look at South African national policy on the use of ICT within healthcare and found that the government is supportive of the idea with the condition that only appropriate technology be used in a way that entire communities will benefit. It stated that ICT is a valuable resource but only when used in the right context and that it should be seen as a part of the solution to problems, taking into account the role of people in such situations.

The use of ICT to enhance decision making through Health Information Systems (HIS) was discussed. It was shown to make more effective use of the vast amount of information available to healthcare workers, reduce time spent on administrative tasks, eliminate duplication of data and streamline the flow of information between relevant parties. It was shown that South African physiotherapists sometimes lack even the most basic resources to manage the administrative tasks expected of them.

Several studies showed how the use of ICT in education, especially in the field of e-learning, could play a positive role in higher education. However, there were obstacles in this pursuit, namely a preference among some students for face-to-face contact, low levels of computer literacy and poor access to computers.

The use of ICT was shown to facilitate CPD for those practising in geographically isolated areas by enhancing support, improving education and increasing access to information, which

was shown to have a positive effect on the recruitment and retention of health professionals in those areas. This was in contrast to a lack of CPD courses and low levels of support for South African physiotherapists working in compulsory community service.

EBP was determined to be an increasingly important aspect of professional practice. However, problems associated with incorporating EBP into practice included lack of time and support for this practice, isolation from peers and a lack of access to resources. ICT was suggested as a possible means of overcoming these problems.

Some of the challenges facing the adoption of ICT in healthcare were also discussed. They included the high cost of hardware and bandwidth, poorly developed infrastructure, poor ICT skills and a lack of access to information. However, it was also found that these challenges could be overcome.

Gaps identified in the literature included the following:

- No information could be found regarding the use of ICT to support physiotherapy students in South Africa and only one study looked at e-learning among this group.
- With the emphasis on research and EBP, South African physiotherapy students' ability to make effective use of new technology should be an important component of their training, yet no literature could be found on this.
- What, if any ICT services are currently being used by South African physiotherapy students?
- Are South African physiotherapy students are being prepared to function effectively in

an increasingly digital workplace?

The results of this study will address the gaps that were found, as well as inform the development of strategies to overcome some of the challenges facing the adoption of using ICT to support South African physiotherapy students.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This section will describe the research methods and procedures used in the study. The design of the study and the instrument used is discussed. The setting in which the research was undertaken is described, as well as the inclusion criteria, study population and sample. The concepts of reliability and validity are discussed within the context of the design of the questionnaire. The procedure used to collect and analyse the data is also presented. Finally, the ethical issues considered during the study are discussed.

3.2 Study design

This survey used a mixed model approach, including a quantitative component with close-ended questions and a qualitative component with an open-ended question to describe the sample. The research design was a cross-sectional, descriptive survey that was chosen because they are economical with respect to time and cost and because large numbers of people can be surveyed quickly and because a survey provides a snapshot of a given population at a point in time, thereby providing a baseline description of a group that can be built upon by other studies (Bowling, 2005). They are also useful for assessing the relationships between variables. The purpose of the open-ended question was to allow students to express themselves in their own words to obtain a deeper understanding of their ideas and concerns regarding support.

A postal survey was chosen as it has the advantage of being able to cover a geographically diverse population in a short period of time, is inexpensive and allows respondents time to

complete the questionnaire at their convenience. Disadvantages include traditionally low response rates, the population sample has to be literate, speak a common language and have their addresses available (Bowling, 2004). However, these disadvantages (apart from the response rate) did not apply to this sample because of the population that was chosen. The physiotherapy students were literate, spoke a common language and were contactable because of their attendance at university.

There are several common sources of error that are applicable in surveys (Mouton, 2003). Two of the most common are sampling error and a high rate of non-response. A survey of the entire population was undertaken in order to reduce sampling error and and to reduce the consequences of a high rate of non-response. Another common error is related to questionnaire design and includes ambiguity and misunderstanding of questions. These errors were reduced by the inclusion of a cover letter explaining the details of the study, as well as making use of simple language throughout the questionnaire in order to avoid misunderstanding. Finally, data capturing errors were minimised by randomly checking the data and the inappropriate selection of statistical techniques was reduced by consulting a statistician.

In order to maximise response rate, several strategies were adopted, which included using stamped, rather than franked envelopes provided with the questionnaires, as there is evidence to suggest that this positively affects response rate (Bowling, 2004). In addition, the relevance of the study was emphasised in a cover letter, as this has also been shown to positively affect response rate (Bowling, 2004). By being explicit in terms of how the data may benefit physiotherapists and physiotherapy students, it was hoped that response rates would be increased as well as more honest. Finally, an incentive of a R300 gift voucher each for three randomly selected respondents was offered. While it has been shown that offering

financial incentives has a positive effect (Frankfort-Nachmias & Nachmias, 1992 and Burgess, 2001) and no effect (Hoffman, Burke, Heizlsouer, & Comstock, 1998) on response rate, the researcher felt that it was worthwhile if it meant even a slight increase in response rate. The gift vouchers were posted to three randomly selected universities and class coordinators were asked to select and award the gift vouchers to three students who had participated in the study.

3.3 Research setting

The study was carried out in the physiotherapy departments of six of the eight South African universities that offer the physiotherapy degree.

3.4 Study population and study sample

The study population consisted of the undergraduate physiotherapy students in the physiotherapy departments of the six universities that offer the physiotherapy degree (N=1105). The final sample size was determined by the number of students who completed and returned the questionnaires. The universities that participated were the:

- University of Cape Town
- University of KwaZulu-Natal
- University of Limpopo
- University of Stellenbosch
- University of the Western Cape
- University of the Witwatersrand

It was intended for the University of the Free State and the University of Pretoria to also participate in the study but they could not be included. The University of Pretoria agreed to participate in the study but due to difficulty with communication owing to the restructuring of the email system at the university, emails were either lost or not replied to. The reason that the University of the Free State was not included was that the procedure to apply for and receive ethical clearance from the university was too time consuming for the researcher to feasibly include them in the study in the time frame that was available.

3.5 Inclusion criteria

All the undergraduate students who were enrolled and attending class at the physiotherapy departments at six of the eight universities offering the physiotherapy degree during 2007, were asked to participate in the study. No students were excluded for any reason.

3.6 Instrument design

A self-developed questionnaire was used because a reliable, validated instrument could not be found for the purpose of this study. The structure and content of the questionnaire was based on literature relating to the design of questionnaires, an IT-related questionnaire used in the survey of computer literacy of Otorhinolaryngologists in the UK (See Appendix II) and the researchers' personal experiences.

Bhattacharya (n.d.) discussed the development of questionnaires with the following considerations in mind:

- It should ultimately provide the data necessary to fulfil the objectives of the study.
- It should be sensitive to respondents and their environment.
- It should be interesting.
- It should only ask the questions that are necessary.
- It should be designed around a specific respondent.
- It should take ethical issues into consideration.

In order for respondents to commit to answering a self-administered questionnaire, Burgess (2001) mentioned that questions should be seen as interesting, adding value, short, clearly thought out and well presented. Respondents may also be induced to participate through the offer of incentives. In a presentation prepared by Cohn, Martindale, May and Rollins (2006) addressing the "questionnaire design and survey methodology for medical education research proposals", several design suggestions were implemented in this questionnaire, including:

- Considerations regarding the study objectives, population sample and question formats.
- Making use of tips to reduce non-response.
- Taking heed of advice regarding layout and structure.

The development of the questionnaire also made use of the questionnaire used in an IT-related study completed in the UK. In their survey of the computer literacy of Otorhinolaryngologists, Clamp, Virdi, Vats and Pothier (2007) used a questionnaire in which

some questions, especially those regarding the use of software and the Internet were relevant to this survey and were thus adapted and included.

A small focus group was held during the design of the questionnaire, as focus groups have been found to enhance discussion of a topic, leading to a deeper understanding of the subject being discussed (Kitzinger, 1995). The group consulted consisted of academics in the physiotherapy department at the University of the Western Cape, physiotherapists and occupational therapists and IT professionals. A balanced representation of gender and age was sought during the group selection process. During the discussions, group members, who were living in different geographical locations were questioned, either together or individually after going through the questionnaire alone initially and then with the researcher. The questionnaire was refined as a result of feedback obtained during these focus groups. The length of the questionnaire was initially five pages long, which was reduced to four pages based on this feedback. This fits in with Sudman and Bradburn's recommendation (1983) that postal surveys should be between two and four pages when a topic that may be poorly understood is covered. The questionnaire was tailored to be four pages long, as this was the shortest length it could be while still capturing the relevant information. It was important to reduce the length of the questionnaire, as longer formats have shown reduced response rate (Cartwright, 1988).

The questionnaire was divided into three sections based on the areas in which information was sought and that would satisfy the objectives of the study:

1. Physiotherapy students use of ICT at university;
2. Physiotherapy students experiences and perceptions of support and;
3. Physiotherapy students demographic information and use of ICT outside of university.

The questionnaire mainly made use of Likert scales with the options of "Strongly agree", "Agree", "Uncertain", "Disagree" and "Strongly disagree", "Yes/No" answers and one open-ended question. Bowling (2004) reports that Likert scales are the most common format (after simple "Yes/No" questions) in health-related studies, as it is easily administered, understood and interpreted.

The questionnaire began with simple questions seeking to focus quickly on the most important areas of the study (Burgess, 2001). This ensured that the most significant information was not lost if respondents became tired or frustrated. Loaded questions were avoided (Bowling, 2005). Simple language was used throughout the questionnaire and technical terminology was avoided so as not to intimidate or threaten respondents. Where technical terms had to be used, a brief explanation or example was given to ensure respondents had the necessary information they needed to give an accurate response.

Following the development of the final draft of the questionnaire, a small pilot study was conducted among four South African physiotherapists who had graduated from university in 2006 and who would therefore not be included in the study. The aim of the pilot study was to detect and correct any flaws before using the questionnaire in the main study (Burgess, 2001). While it would have been more appropriate to conduct the pilot study on a sample of the population, current physiotherapy students could not be included for the reason that they would be involved in the actual study. The results obtained during the pilot study were not captured and analysed as it was felt that it was too small a sample to be significant. However, the participants of the pilot were questioned on certain aspects of the study, such as the time taken to complete it, the presence of ambiguous, technical or confusing language and whether

or not the questions asked were suited to the objectives of the study. Their responses were then used to further refine the questionnaire (See Appendix III for an example of the questionnaire).

3.7 Reliability and validity

Reliability and validity are especially important in any study, as they provide credibility to the results obtained. Reliability refers to the ability of an instrument to consistently gather the same data, regardless of who administers it and validity refers to the ability of an instrument to measure what the researcher intends to measure. Ensuring the reliability and validity of an instrument are important factors to address in designing a questionnaire. This is done in order to increase the effectiveness of the questionnaire and thus the survey (Babbie & Mouton, 2006).

3.7.1 Reliability

Reliability can be described as the ability of an instrument to consistently produce the same result, regardless of who administers the test. Parameters such as test-retest, inter-rater reliability and internal consistency must be satisfied before an instrument can be termed reliable (Babbie & Mouton, 2006). No formal tests, for example weighted kappa to evaluate correlations, were performed to determine the instrument's reliability. While this may be seen as a shortcoming of the instrument, it should be noted that some very well-established instruments such as the International Classification of Functioning, Disability and Health (ICF) published by WHO, have scored very low on test-retest reliability (Okochi, Utsunomiya Takahashi, 2005).

3.7.2 Validity

Validity is the ability of an instrument to measure what it intends to measure and needs to have been tested repeatedly within the populations for which it was designed (Bowling, 1995). As a validated instrument for this study could not be found, a self-developed questionnaire was used that had been subjectively assessed and in which the questions appeared to be relevant, unambiguous and clear (Bowling, 1995). This refers to the superficial concept of face validity. In terms of content validity, the questionnaire was assessed by a qualified physiotherapist who had practiced in a rural area following graduation, an IT expert and a university academic, and was found to include a balanced and comprehensive approach to the subject being measured. Construct validity was not assessed.

3.8 Data collection procedure

Initial letters requesting permission to include students were emailed to the various departmental heads via the contact email addresses provided on the websites of each physiotherapy department on 27 June, 2007 (see Appendix I). After discovering that some of the email addresses provided on those website were incorrect, the researcher contacted the physiotherapy departments of each university by telephone and obtained the correct contact details. The letters seeking permission were then resent over the period 02 – 06 July, 2007 to those universities who did not receive the initial cover letters. After receiving permission from the departmental heads of six of the eight physiotherapy departments, emails were sent to each class co-ordinator at the six universities, including the cover letter explaining the study and requesting the number of students in each class.

Questionnaires were hand delivered to the physiotherapy departments at the three universities that are situated in Cape Town (the University of Stellenbosch, the University of Cape Town

and the University of the Western Cape) to save time and costs. Individual packages for each of the four classes were posted to the class coordinators at the three universities in the other provinces (the University of Limpopo, the University of KwaZulu-Natal and the University of the Witwatersrand). Included with each questionnaire was an accompanying cover letter and a self-addressed, prepaid (stamped) envelope. Class coordinators distributed the questionnaires during class when all the students were on campus. Consent to participate in the study was implied by students completing and returning the questionnaires, which was explained in the cover letter.

The data was collected from June to September, 2007, which was appropriate as all the students in all four years were present in their respective physiotherapy departments at some stage during this time period. Questionnaires were distributed to each class by their class co-ordinator at a time when all the students were present. The students were then responsible for completing the questionnaire and returning it to the researcher by post in the prepaid, self-addressed envelopes that had been supplied by the researcher.

Hoffman et al. (1998) showed that posting a second questionnaire to non-responders improved response rate but it was decided that this option was not feasible because all 1105 questionnaires would have to be resent. Instead, email reminders were sent to the class coordinators on 19 August, 2007. Most of the coordinators responded that they had reminded the students of the study and that the students were continuing to complete and post questionnaires in their own time.

The questionnaires that were hand-delivered to the University of Cape Town, the University of Stellenbosch and the University of the Western Cape, were collected by the researcher

when class coordinators reported that the students who had agreed to participate had completed the questionnaires. All other completed questionnaires were posted to the physiotherapy department at the University of the Western Cape, where they were collected by the researcher.

Figure 1 (on the following page) describes the procedure that was used for the collection of data.

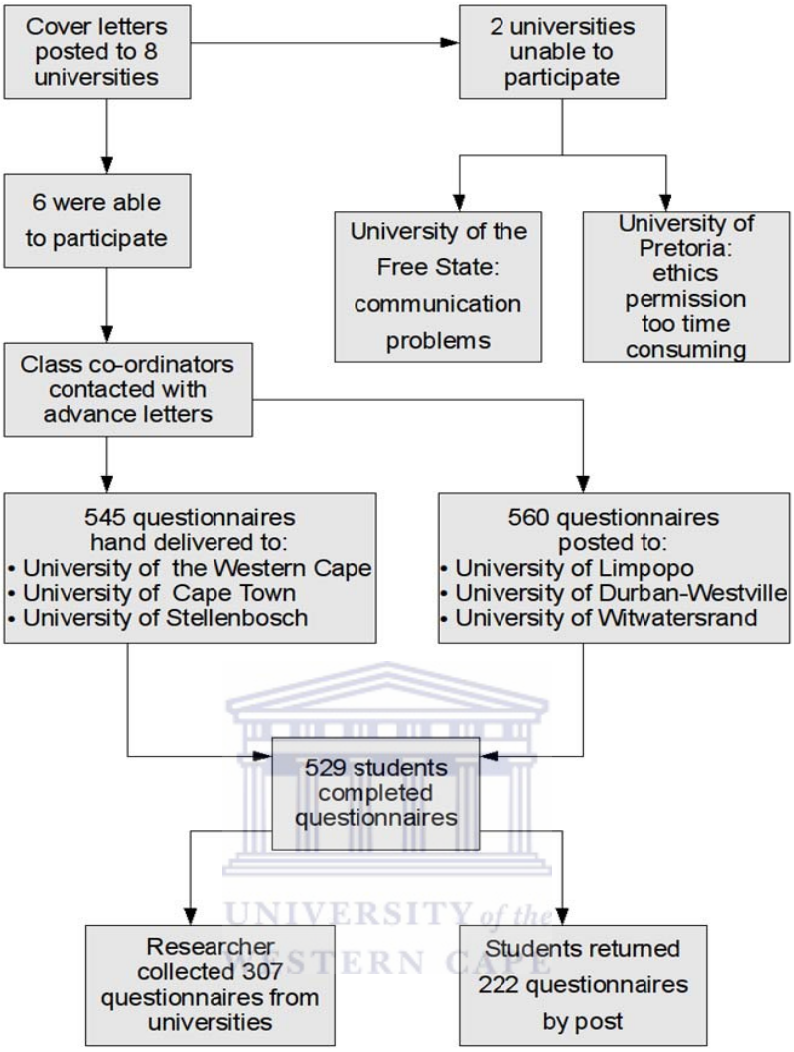


Figure 1: Data collection procedure used

3.9 Data analysis

Data from the questionnaires were captured after all the questionnaires had been received. Questionnaires were given a reference number during the capturing process so that the captured results could be checked against the original questionnaires during the data cleaning process. Data were initially coded and then captured on a spreadsheet using OpenOffice Calc. Data analysis was performed using the Statistical Package for Social Science (SPSS), version

16. Descriptive statistics were used to describe the demographics of the population and presented using tables. Cross tabulations were used to describe the relationships between variables. Inferential statistics were used to determine the statistical significance of the relationships using chi-square values.

The results of the open-ended question where students were asked to list the areas in which they felt support was lacking, were analysed qualitatively. Each free text response was coded and then assigned to one of the ten themes that emerged from the data, according to the area in which the respondent felt that support was lacking.

3.10 Ethical considerations

Permission to conduct the research was obtained from the University of the Western Cape's Faculty of Community and Health Sciences Higher Degrees Committee, then the Senate Higher Degrees Committee, as well as the six physiotherapy departments who agreed to participate in the study (See Appendix IV). An advance letter providing details of the study was sent to the head of each department, to each class coordinator and was also included with the questionnaire. This was to ensure that participants and everyone involved were fully informed at all stages of the study. It was explained in the advance and cover letters that response was voluntary. Consent to participate was implied by the completion and return of the questionnaire. Anonymity and confidentiality of the participants was ensured by not requesting any personally identifiable information from them. The researcher's e-mail and postal address were provided on the cover letter so that respondents or potential respondents had two means of contact by which they could obtain more detailed information. There was no obvious risk in participating in the study. The method of determining the three recipients of the R300 gift voucher was chosen to ensure the anonymity (to the researcher) of the respondents and the practice of offering incentives to participants was approved by the Dean

of Research at the University of the Western Cape, Professor Renfrew Christie, as being ethically sound.

3.11 Summary

This chapter described the methodology used by the researcher in carrying out the study. It described the setting in which the research was undertaken as the physiotherapy departments of six of the eight universities in South Africa that offer the physiotherapy degree. The population was described as all the undergraduate physiotherapy students of each department that had agreed to participate in the study and the sample as those students who had completed and returned the questionnaire.

A cross-sectional descriptive study design was chosen utilising quantitative methods but which also included an open-ended question. As no reliable, validated instrument could be sourced, a self-developed questionnaire was used. A small pilot study and focus group was held and the questionnaire refined based on feedback from these sessions. The issue of validity and reliability during the design of the questionnaire was a concern, in that it may have had an effect on the quality of the data collected, as well as their relevance in answering the research question.

Permission was sought and obtained from the heads of department of six of the eight universities offering the physiotherapy degree in South Africa and contact was made with class coordinators to arrange distribution of the questionnaires. Advance and cover letters were sent, which provided background information and the aims and objectives of the study. Students returned the questionnaires in prepaid, self-addressed envelopes, which the researcher collected. An assistant was hired to capture the data, which were checked by the

reseacher and analysis of the data was performed using SPSS.

Permission to conduct the research was obtained from the University of the Western Cape's Higher Degrees Committee, as well as the Senate Higher Degrees Committee and an incentive was provided to encourage students to participate.

CHAPTER FOUR

RESULTS

4.1 Introduction

In this chapter the results are presented using tables, each table accompanied with a brief description of those results. The chapter is divided into four sections. The first section describes the demographic data of the respondents, including gender distribution, age group, universities attended and race. The second section describes physiotherapy students' use of ICT at university, frequency of use, activities undertaken related to ICT use and the reasons for the use of ICT. The third section describes physiotherapy students' past experiences of ICT and perceptions relating to the use of ICT as a means of providing them with support. In the final section, the results of the open-ended question are presented within the dominant themes that emerged during the analysis of those results.

4.2 Demographic data of respondents

A total of 1105 questionnaires were distributed to the physiotherapy departments at six of the eight universities offering the physiotherapy degree in South Africa. Five hundred and eighty five questionnaires were returned, of which 56 were blank and were thus excluded. Thus, a total of 529 completed questionnaires comprised the final sample size, indicating a response rate of 47.8%.

Table 1: Questionnaires distributed and returned

University	Questionnaires distributed to each university(N=1105)		Questionnaires returned from each university (N=1105)		Response rate by university (N=529)
	n	%	n	%	%
University of Cape Town *	152	13.8	73	6.6	48
University of KwaZulu-Natal	205	18.6	75	6.8	36.6
University of Limpopo	158	14.3	68	6.2	43
University of Stellenbosch *	179	16.2	103	9.3	57.5
University of the Western Cape *	161	14.6	132	11.9	82
University of the Witwatersrand	250	22.6	78	7.1	31.2
TOTAL	1105	** 100.1	529	** 47.9	

** Questionnaires were hand delivered to the university.*

*** Discrepancies in percentage totals are a result of rounding off.*

Table 1 shows the total number of questionnaires sent to the six universities that participated in the survey, as well as the number of questionnaires returned from each university. Questionnaires were hand delivered to the University of Cape Town, the University of Stellenbosch and the University of the Western Cape and posted to the University of KwaZulu-Natal, the University of Limpopo and the University of the Witwatersrand. The highest response rates were from the universities where questionnaires were hand-delivered; the University of the Western Cape (82%), the University of Stellenbosch (57.5%) and the University of Cape Town (48%).

Table 2: Demographics of physiotherapy students (N=529)

Variable	n	%
Gender		
Female	432	81.7
Male	97	18.3
Age		
16-20	270	51
20-25	244	46.1
26-30	11	2.1
31-35	2	0.4
35-40	2	0.4
Race		
Black	117	22.1
Coloured	126	23.8
Indian	64	12.1
White	219	41.4
Other	3	0.6

Table 2 shows a summary of the results from the gender, age and race demographic section of the questionnaire. There was one 16 year old respondent from the University of Limpopo. The oldest students were 37 (n=2). The mean age of respondents was 20.7 years and ranged from 16-37 years. For a detailed breakdown of the age of respondents from each university, refer to Table 26 in Appendix VI. Of the three respondents who defined their race as "Other", one reported being "South African", the other "African" and the third did not specify.

Table 3 shows a detailed breakdown of the gender distribution at each of the universities that participated in the study.

Table 3: Gender distribution of physiotherapy students at each university (N=529)

University	Female		Male	
	n	(%)	n	(%)
University of Cape Town *(n=73)*	64	(87.7%)	9	(12.3%)
University of KwaZulu-Natal *(n=75)*	67	(89.3%)	8	(10.7%)
University of Limpopo *(n=68)*	40	(58.8%)	28	(41.2%)
University of Stellenbosch *(n=103)*	94	(91.3%)	9	(8.7%)
University of Western Cape *(n=132)*	100	(75.8%)	32	(24.2%)

University of the Witwatersrand *(n=78)*	67	(85.9%)	11	(14.1%)
TOTALS	432	(81.7%)	97	(18.3%)

Table 3 indicates that the average number of male students at each university is 16.2 (18.3%), compared to 72 females (81.7%). There is a significant association (p = 0.000) between gender and university attended. Table 4 shows a detailed breakdown of the race distribution at each of the universities that participated in the study.

Table 4: Race distribution of physiotherapy students at each university (N=529)

University	Black n (%)	Coloured n (%)	Indian n (%)	White n (%)	Other n (%)
University of Cape Town *(n=73)*	13 (17.8%)	20 (27.4%)	6 (8.2%)	34 (46.6%)	0
University of KwaZulu-Natal *(n=75)*	21 (28%)	2 (2.7%)	38 (50.7%)	14 (18.7%)	0
University of Limpopo *(n=68)*	61 (89.7%)	2 (2.9%)	3 (4.4%)	2 (2.9%)	0
University of Stellenbosch *(n=103)*	0	19 (18.4%)	2 (1.9%)	80 (77.7%)	2 (1.9%)
University of Western Cape *(n=132)*	15 (11.4%)	81 (61.4%)	9 (6.8%)	26 (19.7%)	1 (0.8%)
University of the Witwatersrand *(n=78)*	7 (9%)	2 (2.6%)	6 (7.7%)	63 (80.8%)	0
TOTALS	117 (22.1%)	126 (23.8%)	64 (12.1%)	219 (41.4%)	3 (0.6%)

There is a significant association between the university attended and students' race (p = 0.000).

4.3 Physiotherapy students' use of ICT at university

In Table 5, the number and percentage of physiotherapy students who use a computer at university, as well as the frequency of use, are presented.

Table 5: Physiotherapy students use of computers at university (N=529)

Variable	n	%
Computer use at university		
Yes	484	91.5
No	45	8.5
Frequency of use		
Daily	203	38.4
Weekly	186	35.2
Monthly	63	11.9
Very rarely	32	6
Missing	45	8.5

The most common reason students gave for not using a computer on campus was that they had one at home (n=25). Other reasons included: "Not computer literate" (n=1), "Textbooks" (n=1), possibly meaning that the respondent used textbooks instead of computers and "Study" (n=1) with no further explanation given. One respondent reported being "too lazy" to use computers at university.

Table 6: Computer use at each university (N=529)

University	Computer use at university			
	Yes		No	
	n	(%)	n	(%)
University of Cape Town *(n=73)*	72	(98.6%)	1	(1.4%)
University of KwaZulu-Natal *(n=75)*	61	(81.3%)	14	(18.7%)
University of Limpopo *(n=68)*	67	(98.5%)	1	(1.5%)
University of Stellenbosch *(n=103)*	103	(100%)		0
University of Western Cape *(n=132)*	117	(88.6%)	15	(11.4%)
University of the Witwatersrand *(n=78)*	64	(82.1%)	14	(17.9%)

While each university had more than 80% of its students making use of computers at university, it was only at the University of Stellenbosch that 100% of students indicated that they had used a computer at university.

In Table 7, the relationship between computer use at university and race are presented.

Table 7: Computer use at university and race of student (N=529)

Race	Computer use at university			
	Yes	%	No	%
Black *(n=117)*	116	99.1	1	0.9
Coloured *(n=126)*	122	96.8	4	3.2
Indian *(n=64)*	58	90.6	6	9.4
White *(n=219)*	186	84.9	33	15.1
Other *(n=3)*	2	66.7	1	33.3

There is a significant association between the use of a computer at university, and race ($p = 0.000$).

Table 8: Frequency of computer use at each university by physiotherapy students (N=529)

University	Daily		Weekly		Monthly		Rarely	
	n	%	n	%	n	%	n	%
University of Cape Town *(n=73)*	47	64.4	24	32.9	1	1.4	0	0
University of KwaZulu-Natal *(n=75)*	15	20	37	49.3	4	5.3	5	6.7
University of Limpopo *(n=68)*	34	50	27	39.7	4	5.9	2	2.9
University of Stellenbosch *(n=103)*	48	69.6	21	30.4	0	0	0	0
University of Western Cape *(n=132)*	28	21.2	53	40.2	22	16.7	14	10.6
University of the Witwatersrand *(n=78)*	5	6.4	17	21.8	31	39.7	11	14.1

Note: Percentages within universities do not add up to 100 because of missing data and percentage totals do not add up to 100 because of rounding off.

Table 8 indicates that while 100% (n=103) of physiotherapy students at the University of

Stellenbosch used a computer at least weekly, only 61.4% (n=81) of students at the University of the Western Cape did. There was 1 (1.4%) missing result from the University of Cape Town, 14 (18.7%) from the University of KwaZulu-Natal, 1 (1.5%) from the University of Limpopo, 15 (11.4%) from the University of the Western Cape and 14 (17.9%) from the University of the Witwatersrand. There was a significant association (p = 0.000) between the university attended and the frequency of computer use.

In Table 9, the frequency of computer use by physiotherapy students at university, and the race of students, are presented.

Table 9: Frequency of computer use at university and race (N=529)

Race	Daily		Weekly		Monthly		Rarely		Missing	
	n	%	n	%	n	%	n	%	n	%
Black *(n=117)*	60	51.3	46	39.3	8	6.8	2	1.7	1	0.9
Coloured *(n=126)*	44	34.9	55	43.7	15	11.9	8	6.3	4	3.2
Indian *(n=64)*	18	28.1	30	48.9	5	7.8	5	7.8	6	9.4
White *(n=219)*	80	36.5	54	24.7	35	16	17	7.8	33	15.1
Other *(n=3)*	1	33.3	1	33.3	0	0	0	0	1	33.3

Table 9 indicates that 90.6% of Black physiotherapy students use a computer at university at least weekly, compared to 78.6% of Coloured students, 77% of Indian students and 61.2% of White students. The "Missing" column indicates respondents who do not use a computer at university. There were 45 (8.5%) missing results in total. There was a significant association (p = 0.000) between frequency of computer use by physiotherapy students at university and

race. Table 10 presents physiotherapy students' awareness of Internet access at their universities, the activities they use the Internet for and the reasons they use the Internet.

Table 10: Physiotherapy students' use of the Internet at university (N=529)

Variable	n	%
Aware of Internet access at university	526	99.4
Use of the Internet at university		
Search engines	447	84.5
Online library	332	62.8
Physiotherapy websites	322	60.9
Online databases	280	52.9
Online journals	255	48.2
Email	252	47.6
Department websites	217	41
Reason for use of Internet		
To prepare assignments	438	82.8
For personal interest	252	47.6
For academic development	226	42.7
To seek advice or guidance	124	23.4

Table 10 indicates that 526 students (99.4%) were aware that they had access to the Internet on campus. The most common use of the Internet by students at university was searching online to find course-related information (84.5%) and the least common use was accessing the physiotherapy department's website (41%). While 82.8% respondents reported using the Internet to access information for assignments, only 23.4% used it to seek advice or guidance.

See Table 11 for a detailed breakdown of activities performed online by physiotherapy students compared to university attended, and Table 12 for a detailed breakdown of physiotherapy students reasons for using ICT compared to university attended.

Table 11: Activities performed online by physiotherapy students at each university (N=529)

University	Activities performed online															
	Online search		University library		Physiotherapy websites		Online databases		Online journals		Email		Department website	
	n	(%) *	n	(%) *	n	(%) *	n	(%) *	n	(%) *	n	(%) *	n	(%) *
University of Cape Town *(n=73)*	64	(87.7%)	53	(72.7%)	44	(60.3%)	45	(61.6%)	41	(56.2%)	57	(78.1%)	64	(87.7%)
University of KwaZulu-Natal *(n=75)*	56	(74.7%)	23	(30.7%)	32	(42.7%)	15	(20%)	16	(21.3%)	25	(33.3%)	31	(41.3%)
University of Limpopo *(n=68)*	54	(79.4%)	34	(50%)	52	(76.5%)	20	(29.4%)	23	(33.8%)	20	(29.4%)	10	(14.7%)
University of Stellenbosch *(n=103)*	102	(99%)	80	(77.7%)	82	(79.6%)	83	(80.6%)	59	(57.3%)	86	(83.5%)	61	(59.2%)
University of Western Cape *(n=132)*	115	(87.1%)	84	(63.6%)	78	(59.1%)	71	(53.8%)	79	(59.8%)	48	(36.4%)	28	(21.2%)
University of Witwatersrand *(n=78)*	56	(71.8%)	58	(74.4%)	34	(43.6%)	46	(59%)	37	(47.4%)	16	(20.5%)	23	(29.5%)
TOTAL (Mean %)	447	(84.5%)	332	(62.8%)	322	(60.9%)	280	(52.9%)	255	(48.2%)	252	(47.6%)	217	(41%)

** Significant association (p = 0.000)*

Note: Students were able to make multiple selections, which explains why percentages > 100%.

Table 11 shows that online searches are the most common use of the Internet by physiotherapy students at university (84.5%) and that the use of

departmental websites was the least common (41%). There was a significant association (p = 0.000) between the university attended and each of the reasons that students use the Internet.

Table 12: Physiotherapy students reasons for Internet use at university (N=529)

University	Reasons for Internet use at university			
	Preparing assignments ** n (%)	**Personal interest n (%)**	**Academic development * n (%)**	**Advice or guidance ** n (%)**
University of Cape Town *(n=73)*	66 (90.4%)	45 (61.6%)	34 (46.6%)	22 (30.1%)
University of KwaZulu-Natal *(n=75)*	57 (75%)	37 (48.7%)	36 (47.4%)	15 (19.7%)
University of Limpopo *(n=68)*	52 (76.5%)	38 (55.9%)	35 (51.5%)	16 (23.5%)
University of Stellenbosch *(n=103)*	65 (84.2%)	36 (52.2%)	33 (47.8%)	27 (39.1%)
University of Western Cape *(n=132)*	112 (84.8%)	56 (42.4%)	36 (27.3%)	24 (18.2%)
University of the Witwatersrand *(n=78)*	56 (71.8%)	28 (35.9%)	33 (42.3%)	8 (10.3%)

TOTALS	408 (77.1%)	240 (45.4%)	207 (39.1%)	112 (21.2%)

** Significant association (p < 0.005)*

*** Significant association (p = 0.000)*

Note: students were able to make multiple selections, which explains why totals exceed 100% within universities.

Table 12 shows that the main use by physiotherapy students of the Internet at university is for the preparation of assignments (71.8% - 90.4%) and that the least common use is to seek advice or guidance (10.3% - 39.1%). There was a significant association ($p < 0.005$) between the university attended and the use of the Internet for academic development, a significant association ($p = 0.000$) between the university attended and use of the Internet for assignments and a significant association ($p = 0.000$) between the university attended and the use of the Internet for advice and guidance.

4.4 Physiotherapy students' experiences of ICT and their perceptions on its use

Table 13 presents the previous and current experiences of physiotherapy students' access to computers and the Internet.

Table 13: Access to computers and the Internet at various settings (N=529)

Setting	Computer		Internet	
	n	%	n	%
High school	367	71.1	253	47.8
Home	412	77.9	282	53.3
University	512	96.8	509	96.2

Table 13 indicates that the majority of physiotherapy students had access to a computer in all three settings (high school, home and university), with the percentage rising steadily from high school to home to university. This contrasts with the percentage of students who had access to the Internet before enrolling at university (48.6% at high school and 52.2% at home).

Table 14 shows the relationship between computer access at various settings (high school, home and at university) and the universities attended by respondents.

Table 14: Access to computers in various settings, and university attended (N=529)

University	Computer access at high school * n (%)		Computer access at home * n (%)		Computer access at university n (%)	
	Yes	No	Yes	No	Yes	No
University of Cape Town *(n=73)*	57 (78.1%)	16 (21.9%)	58 (79.5%)	15 (20.5%)	72 (98.6%)	1 (1.4%)
University of KwaZulu-Natal *(n=75)*	47 (62.7%)	28 (37.3%)	53 (70.7%)	22 (29.3%)	74 (98.7%)	1 (1.3%)
University of Limpopo *(n=68)*	27 (39.7%)	41 (60.3%)	29 (42.6%)	39 (57.4%)	64 (94.1%)	4 (5.9%)
University of Stellenbosch *(n=103)*	76 (73.8%)	27 (26.2%)	91 (88.3%)	12 (11.7%)	103 (100%)	0
University of Western Cape *(n=132)*	108 (81.8%)	24 (18.2%)	110 (83.3%)	22 (16.7%)	126 (95.5%)	6 (4.5%)
University of the Witwatersrand *(n=78)*	61 (78.2%)	17 (21.8%)	71 (91%)	7 (9%)	73 (93.6%)	5 (6.4%)

** p = 0.000*

Table 14 shows how computer access at home and at high school are almost equivalent within each university, but that access across universities is quite varied. The largest variation between computer access at high school and home was at the University of Stellenbosch (14.5%). The largest variation between universities in terms of computer access at high school was between the University of the Western Cape and the University of Limpopo (42.1%). The largest variation between universities in terms of computer access at home was between the University of the Witwatersrand

and the University of Limpopo (48.4%). There is a significant association (p = 0.000) between computer access at high school and computer access at home, and the university attended.

Table 15: Access to the Internet in various settings, and university attended (N=529)

University	Internet access at high school * n (%)		Internet access at home * n (%)		Internet access at university n (%)	
	Yes	No	Yes	No	Yes	No
University of Cape Town *(n=73)*	45 (61.6%)	28 (38.4%)	48 (65.8%)	25 (34.2%)	72 (98.6%)	1 (1.4%)
University of KwaZulu-Natal *(n=75)*	27 (36%)	48 (64%)	32 (42.7%)	43 (57.3%)	73 (97.3%)	2 (2.7%)
University of Limpopo *(n=68)*	9 (13.2%)	59 (86.8%)	12 (17.6%)	56 (82.4%)	64 (94.1%)	4 (5.9%)
University of Stellenbosch *(n=103)*	51 (49.5%)	52 (50.5%)	66 (64.1%)	37 (35.9%)	102 (99%)	1 (1%)
University of Western Cape *(n=132)*	82 (62.1%)	50 (37.9%)	66 (50%)	66 (50%)	126 (95.5%)	6 (4.5%)
University of the Witwatersrand *(n=78)*	39 (50%)	39 (50%)	58 (74.4%)	20 (25.6%)	72 (92.3%)	6 (7.7%)

** p = 0.000*

Table 15 indicates a similar distribution to Table 14, wherein access to the Internet is almost equivalent within each university but which is again more varied across universities. It also demonstrates how, varied as Internet access may be before students begin attending university, on admission it rises

to over 90% for every university. There is a significant association (p = 0.000) between Internet access at high school and at home, and the university attended.

Table 16: Access to a computer in various settings, and race of student (N=529)

Race	Computer access at high school *		Computer access at home *		Computer access at university	
	Yes	No	Yes	No	Yes	No
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Black *(n=117)*	52 (44.4%)	65 (55.6%)	44 (37.6%)	73 (62.4%)	109 (93.2%)	8 (6.8%)
Coloured *(n=126)*	103 (81.7%)	23 (18.3%)	110 (87.3%)	16 (12.7%)	124 (98.4%)	2 (1.6%)
Indian *(n=64)*	42 (65.6%)	22 (34.4%)	51 (79.7%)	13 (20.3%)	63 (98.4%)	1 (1.6%)
White *(n=219)*	177 (80.8%)	42 (19.2%)	204 (93.2%)	15 (6.8%)	213 (97.3%)	6 (2.7%)
Other *(n=3)*	2 (66.7%)	1 (33.3%)	3 (100%)	0	3 (100%)	0

** p = 0.000*

There is a significant association between computer access at high school and computer access at home, and the race of students (p = 0.000).

Table 17: Access to the Internet in various settings, and race of students (N=529)

Race	Internet access at high school *		Internet access at home *		Internet access at university	
	Yes n (%)	No n (%)	Yes n (%)	No n (%)	Yes n (%)	No n (%)
Black *(n=117)*	21 (17.9%)	96 (82.1%)	18 (15.4%)	99 (84.6%)	111 (94.9%)	6 (5.1%)
Coloured *(n=126)*	77 (61.1%)	49 (38.9%)	59 (46.8%)	67 (53.2%)	123 (97.6%)	3 (2.4%)
Indian *(n=64)*	22 (34.4%)	42 (65.6%)	33 (51.6%)	31 (48.4%)	63 (98.4%)	1 (1.6%)
White *(n=219)*	131 (59.8%)	88 (40.2%)	170 (77.6%)	49 (22.4%)	209 (95.4%)	10 (4.6%)
Other *(n=3)*	2 (66.7%)	1 (33.3%)	2 (66.7%)	1 (33.3%)	3 (100%)	0

Table 17 demonstrates a similar distribution as Table 16, in that Internet access in the various settings are varied across race but that on entering university, everyone has equal access to the Internet. There is a significant association ($p = 0.000$) between Internet access at high school and at home, and race. There is no significant association between race and access to the Internet at university.

Table 18 shows respondents reported levels of confidence when using a computer for various activities at university. The activities are listed in descending order from those that respondents feel most confident with to those they feel least confident with. The second last column is for respondents who reported that they don't use a computer for that activity and the final column shows data that was missing from the questionnaires.

Table 18: Physiotherapy students confidence when using a computer at university (N=529)

Activities performed using ICT	Very confident		Confident		Uncertain		Not confident		Don't use a computer for this activity		Missing	
	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
Printing documents	335	(63.3%)	77	(14.6%)	26	(4.9%)	11	(2.1%)	43	(8.1%)	37	(7%)
Email	318	(60.1%)	120	(22.7%)	17	(3.2%)	6	(1.1%)	34	(6.4%)	34	(6.4%)
Internet search	303	(57.3%)	138	(26.1%)	21	(4%)	10	(1.9%)	22	(4.2%)	35	(6.6%)
Writing letters/records	287	(54.3%)	94	(17.8%)	33	(6.2%)	24	(4.5%)	52	(9.8%)	39	(7.4%)
Preparing presentations	235	(44.4%)	145	(27.4%)	60	(11.3%)	15	(2.8%)	38	(7.2%)	36	(6.8%)
Games	166	(31.4%)	59	(11.2%)	44	(8.3%)	14	(2.6%)	205	(38.8%)	41	(7.7%)
Professional development	160	(30.2%)	216	(40.8%)	69	(13%)	18	(3.4%)	28	(5.3%)	38	(7.2%)
Online forum discussion	96	(18.1%)	84	(15.9%)	75	(14.2%)	35	(6.6%)	197	(37.2%)	42	(7.9%)
Research	85	(16.1%)	142	(26.8%)	145	(27.4%)	47	(8.9%)	69	(13%)	41	(7.8%)
Exercise prescription	54	(10.2%)	67	(12.7%)	150	(28.4%)	33	(6.2%)	177	(33.5%)	48	(9.1)

Table 18 (on the previous page) indicates that respondents were most confident printing documents, and least confident using ICT to prescribe

exercises. Although respondents were given the opportunity to indicate that they did not use ICT to perform these activities, an average of 39 respondents did not complete this question.

In Table 19, the relationship between physiotherapy students' ability to type without looking at the keyboard ("touch type") and race of the student, are presented.

Table 19: Ability to touch type by race of student (N=529)

Race	Ability to touch type			
	Yes		No	
	n	(%)	n	(%)
Black *(n=117)*	23	(19.7%)	94	(80.3%)
Coloured *(n=126)*	41	(32.5%)	85	(67.5%)
Indian *(n=64)*	15	(23.4%)	49	(76.6%)
White *(n=219)*	96	(43.8%)	121	(55.3%)
Other *(n=3)*	2	(66.7%)	1	(33.3%)

Table 19 indicates that the majority of students who are not White, are not able to touch type and that the group with the most students unable to touch type were Black students (80.3%). There was a significant association (p = 0.000) between a students' race and their ability to touch type.

In Table 20, the relationship between physiotherapy students' ability to type without looking at the keyboard and the university attended, are presented.

Table 20: Ability to touch type by university (N=529)

University	Ability to touch type			
	Yes		No	
	n	(%)	n	(%)
University of Cape Town *(n=73)*	25	(34.2%)	48	(65.8%)
University of KwaZulu-Natal *(n=75)*	14	(18.7%)	61	(81.3%)
University of Limpopo *(n=68)*	17	(25%)	51	(75%)
University of Stellenbosch *(n=103)*	51	(49.5%)	50	(48.5%)
University of Western Cape *(n=132)*	44	(33.3%)	88	(66.7%)
University of the Witwatersrand *(n=78)*	26	(33.3%)	52	(66.6%)

Table 20 indicates that students at two universities, namely the University of KwaZulu-Natal and the University of Limpopo, have the most students who are unable to touch type (80.3% and 75% respectively). There was a significant association (p = 0.001) between the university a student attends and their ability to touch type.

In Table 21, the findings of physiotherapy students perceptions regarding the use of ICT at university and in practice are presented.

Table 21: Students views of the value of computer use (N=529)

Statement	Agree *		Disagree **		Neither agree nor disagree		Missing	
	n	(%)	n	(%)	n	(%)	n	(%)
ICT can improve the level of support I currently receive	369	(69.8%)	29	(5.5%)	127	(24%)	4	(0.8%)
Access to a computer makes administrative tasks easier	500	(94.5%)	7	(1.3%)	20	(3.8%)	2	(0.4%)
Increased use of ICT makes communication easier	458	(86.6%)	15	(2.8%)	53	(2.8%)	3	(0.6%)
A high level of support would positively influence a decision to work in a community post	411	(77.7%)	23	(4.3%)	92	(17.4%)	3	(0.6%)

** Combination of "Strongly agree" and "Agree".*

*** Combination of "Strongly disagree" and "Disagree".*

Note: statements vary slightly from questionnaire to conform to space limitations.

Table 21 indicates that most students responded positively with respect to the statements that ICT makes administrative and communication tasks easier (94.5% and 86.6% respectively). Very few students left these questions out.

Table 22 presents the people that students received support from. Note that respondents were able to make multiple selections.

Table 22: Providers of types of support to physiotherapy students (N=529)

Types of support	Providers of support							
	Students		Lecturers		Supervisors		Friends/family	
	n	(%)	n	(%)	n	(%)	n	(%)
Clinical	34	(6.4%)	162	(30.6%)	215	(40.6%)		
Educational	47	(8.9%)	343	(64.8%)	29	(5.5%)		
Emotional	79	(14.9%)	9	(1.7%)			324	(61.2%)
Social	83	(15.7%)					333	(62.9%)

Table 22 indicates that students receive clinical support mainly from their supervisors and lecturers (71.3%), educational support from lecturers (64.8%) and emotional and social support from friends and family (61.2% and 62.9% respectively).

Table 23 presents different methods by which physiotherapy students currently receive support.

Table 23: Methods of support used by physiotherapy students (N=529)

Method of support	Frequency	
	n	(%)
Face-to-face contact	501	(94.7%)
Telephone	209	(39.5%)
Email	135	(25.5%)

Note: students were able to make multiple selections for this question.

Table 23 indicates that face-to-face contact is the most common form of support experienced by physiotherapy students (94.7%).

Table 24 presents the relationship between methods of support used by physiotherapy students and the universities they attend.

Table 24: Methods of support used by physiotherapy students at each university (N=529)

University	**Face-to-face contact ***		**Email**		**Telephone**	
	n	**(%)**	**n**	**(%)**	**n**	**(%)**
University of Cape Town *(n=73)*	73	(100%)	24	(32.9%)	34	(46.6%)
University of KwaZulu-Natal *(n=75)*	71	(94.7%)	18	(24%)	24	(32%)
University of Limpopo *(n=68)*	56	(82.4%)	20	(29.4%)	29	(42.6%)
University of Stellenbosch *(n=103)*	100	(97.1%)	31	(30.1%)	46	(44.7%)
University of Western Cape *(n=132)*	126	(93.5%)	29	(22%)	48	(36.4%)
University of the Witwatersrand *(n=78)*	75	(96.2%)	13	(16.7%)	28	(35.9%)
TOTALS	501	(94.7%)	135	(25.5%)	209	(39.5%)

** p = 0.000*

In Table 24, there was found to be a significant association ($p < 0.001$) between the university attended and the preference for face-to-face contact as a means of support.

Table 25 presents physiotherapy students' satisfaction with the level of support they had received with regards their various needs.

Table 25: Physiotherapy students' satisfaction with support of different needs (N=529)

Needs of students	Satisfied		Unsatisfied		Missing	
	n	(%)	n	(%)	n	(%)
Educational	494	(93.4%)	34	(6.4%)	1	(0.2%)
Social	487	(92.1%)	41	(7.8%)	1	(0.2%)
Emotional	471	(89%)	57	(10.8%)	1	(0.2%)
Clinical	444	(83.9%)	83	(15.7%)	2	(0.4%)

Table 25 indicates that the majority of physiotherapy students feel that the support they had received was successful in addressing their educational, social, emotional and clinical needs (more than 80% of students were satisfied that the support they had received to address each need was satisfactory).

4.5 Areas in which support is needed

This section will present the results of the open-ended question regarding the areas in which students felt they needed more support. The free text

answers were coded and then sorted into ten themes, which emerged from the data and are presented here, along with examples from each theme.[4]

4.5.1 Support needed in clinical practice

This theme was the most common, with 15.7% (n=83) of respondents making comments that addressed the lack of support they felt was evident in their clinical practice. The following examples are some of the responses that students made.

- *"I don't think we get enough tutorials, especially during clinical blocks"*
- *"Clinical areas, educational - help with cause related information, assignments, venues, where one can carry out investigations e.g. CP patients/children"*
- *"I would like more help in exercise prescription"*
- *"The 'gap' between being a student and the professional world"*
- *"Language translation necessary at times"*
- *"Performance of treatment techniques correctly"*
- *"Clinical support is sometimes lacking at hospital placements"*

[4] Note: spelling and grammatical errors have been left unchanged

- *"Dealing with difficult clinical situations"*
- *"Dealing with tricky clinical scenarios on placements where supervision is poor or minimal"*

4.5.2 Support lacking in theoretical training and education

Seventy nine respondents (14.9%) commented in some way on how they felt that support was lacking in the theoretical and educational training that they received.

- *"Finding/accessing/keeping up to date with new research"*
- *"More notes the better, one on one time with lecturers"*
- *"Anatomy relating to certain injuries or illnesses"*
- *"Visual guides for assessment and treatment techniques that are covered in class"*
- *"Currently as an undergrad student I feel in academics/educational needs. Getting through the vast volume of work."*
- *"Questions that people that doesn't study physio always asks and I cannot explain the physiology and basic consept to them although I actually know the answer"*

4.5.3 Support needed during studying and exams

Twenty seven students (5.1%) felt that they needed more support in terms of their studying and exams.

- *"Ways to study better"*
- *"Getting notes on time"*
- *"Pre-exam stress"*

4.5.4 Support needed for time management

Seventeen respondents (3.2%) reported that they needed more support in terms of time management. The general response in this theme was simply "Time management", although the following two respondents were more specific:

- *"Time management and more effective planning of studying, etc."*
- *"Time management with all subjects"*

These results indicate that students need assistance in determining how best to allocate their time, particularly in relation to their studies.

4.5.5 Emotional support needed

There were 13 respondents (2.5%) who suggested that emotional support was lacking and within this theme, two subthemes emerged. One of these subthemes relates to students experiencing difficulty in managing their emotions regarding patients' suffering. The following quotations illustrate this:

- *"Debriefing for some of the things we experience in the hospitals"*
- *"emotional support re. treating HIV positive patients"*
- *"Emotional support in ICU, neurology in hospitals"*

The other subtheme relates to students finding it difficult to stay motivated during their studies. Some comments included the following:

- *"More enthusiasm and guidance from clinicians and supervisors per block. We need to be encouraged, not put off physio!"*
- *"Motivation to complete degree"*
- *"Emotional - dealing with the intensive clinical programme and fitting studies and clinicals into your life"*

One respondent felt that they were the target of "*Victimisation by staff and lecturers"*, which is clearly an issue for someone trying to complete their

studies. Whether or not this was an isolated incident is unclear.

4.5.6 Use of ICT for support

Seven respondents (1.32%) felt that they needed more support in terms of how they were able to make better use of computers and the Internet. Two subthemes emerged from their responses. Firstly, the use of ICT in itself:

- *"Access to the internet and email"*
- *"Computer literacy"*
- *"More tuition to technology"*

The second subtheme was the use of ICT in the context of students' studies, illustrated with the following quotes:

- *"Getting lecture notes online and easy contact with lecturers"*
- *"Access to online textbooks"*
- *"Receiving marks on the net and tut answers"*
- *"Using internet to search topics that is sometimes unclear"*

4.5.7 Social support needed

Six respondents (1.1%) reported that social support was an area in which they were lacking, with the following two quotes the only responses other than *"Social support"*.

- *"I feel I need help with concentration when studying and I also haven't adapted to the university environment"*
- *"Finding time to go out and relax for a change"*

4.5.8 Needing general support

Two respondents felt that they needed more support in all spheres of their studies. One of the responses was: *"Everywhere, always room for improvement"*.

4.5.9 Need for financial support

One respondent indicated the need for help with *"financial support"* but did not provide any additional information.

4.5.10 Need for spiritual support

The idea of spiritual support was raised by one respondent, who said, *"I need spiritual and more educational support"*. It is unclear whether or not the student felt that there was some way in which ICT could contribute to receiving spiritual support.

4.6 Summary

This chapter presented the results of the study in the form of tables, each with a brief description of those results. The first section described the response rate and the demographic details of the sample. The University of the Western Cape had the highest response rate (82%) of the six universities. The majority of the respondents were female (81.7%), White (41.4%) and aged between 16 and 25 years old (97.1%).

The second section presented the results of respondents' use of ICT at university. The majority of respondents (91.5%) reported using a computer at university and 73.6% reported using it at least weekly. These results were then further broken down into more detailed tables. The main reason given for not using a computer at university was that they had one at home. A large majority of respondents (84.5%) reported using online search to find course-related material and that 83.4% were confident in doing so. The main reason that respondents made use of ICT was to prepare class assignments

(82.8%). A detailed breakdown of the activities and reasons relating to the use of ICT at university were also presented.

The third section presented the results of physiotherapy students' past experience and perceptions of ICT use as a means of providing support. Many respondents did not have access to ICT at home or at high school, and for these students, university was the first place they have regular ICT access. White students had the greatest access to ICT prior to attending university. Black and Indian students were the groups least likely to be able to touch type. Students generally had a favourable perception of how ICT could enhance their working lives. Students reported receiving support from appropriate providers in the majority of cases. Lecturers and supervisors provided 71.2% of students with clinical support and a similar percentage with educational support. Friends and family provided 61.2% of students with emotional support and 62.9% with social support. Most respondents (94.7%) reported that face-to-face contact was the most commonly utilised method by which support was received. The majority of students felt that all of their various needs were successfully being addressed by current forms of support.

The final section of this chapter presented the results of the open-ended question, which addressed the areas in which respondents felt that they needed more support. Ten themes emerged from analysis of the data.

CHAPTER FIVE

DISCUSSION

5.1 Introduction

This chapter presents a discussion of the results that were presented in Chapter Four. The first section presents the demographics of the respondents and discusses response rate, gender, age and race. The second section relates to physiotherapy students' use of ICT at university. The third section discusses physiotherapy students' experiences and perceptions of the use of ICT for support. The fourth section discusses the results of the open-ended question regarding the areas in which physiotherapy students felt that they needed more support. The chapter is concluded with a summary.

5.2 Demographics of respondents

The response rate of 47.8% is not as high as is considered good by some authors (Bowling, 1995) but is higher than 20%, which Burgess (2001) suggests is common. Babbie and Mouton (2006) state that a response rate of 50% is adequate for analysis and reporting. The rate of non-response was 52.1% and no reasons were given, although lack of interest in the study or poor understanding of the topic may have been responsible. The universities that questionnaires were hand delivered to (the University of Cape Town, the University of Stellenbosch and the University of the Western Cape) had the highest response rates of the six universities (48%, 57.5% and 82% respectively). This may have implications for questionnaire distribution in

future studies. The high response rate of 82% from students at the University of the Western Cape was almost double that of the other universities (excepting the University of Stellenbosch, with a response rate of 57.5%) and may have been a result of it being the university attended by the researcher. Distribution of the questionnaires by post to the three universities not situated in Cape Town (i.e. the University of KwaZulu-Natal, the University of Limpopo and the University of the Witwatersrand) was more difficult than had initially been thought. The contact details obtained from some departmental websites were incorrect and telephone numbers had to then be sourced from the phone book. Ensuring the correct departmental contact details are available online is a simple but effective use of ICT to provide relevant information to both current and potential students. Yet it was in this most basic of uses that some universities were found wanting. A lack of useful information may be one of the reasons that only 41% of respondents made use of their departmental websites. One exception was at the University of Cape Town (UCT), where 87.7% of students make use of this facility. However, perusal of the UCT physiotherapy department website showed a static display of only rudimentary information, which begs the question, "What were almost 90% of UCT physiotherapy students doing on their departmental website"? It seems more likely that respondents meant that they had visited it at some point.

The difference between genders was quite high at most universities, showing that the field of physiotherapy is still very much the domain of females (81.7% of respondents were female, compared to 18.3% male). This is in keeping with the history of the profession (Washington University, 2004). The only university where this was not the case was the University of Limpopo, which had a more even distribution of female to male students (58.8% and 41.2% respectively).

The ages of the respondents fell into what might be a normal expectation for students attending university, with 86.5% of respondents being between the ages of 18 and 22. Outliers of this range were one 16 year old respondent, which is a very young age to be attending university and four respondents who were over 30 years old.

In terms of race distribution at each university, there were some results worth noting. Just as the field of physiotherapy is dominated by females, at university it also seems to be occupied mainly by White students (41.4%), with Black and Coloured students (22.1% and 23.8% respectively) making up about half the percentage of White students. The racial distribution at each university was, in general, quite stereotypical. The university with the highest percentage of one racial group was the University of Limpopo (89.7% Black), followed closely by the University of the Witwatersrand (80.8% White) and the University of Stellenbosch (77.7% White). The University of the Western Cape had the highest percentage of Coloured students (61.4%) and the University of KwaZulu-Natal was made up mostly of Indian students (50.7%). The University of Cape Town had the most equal distribution of race, although White students were still in the majority (46.6%). The issue of race and ICT use is discussed in more detail in the following section.

5.3 The use of ICT at university

All universities included in the survey provided computer and Internet access to their students, although not all of the students surveyed were aware of this access. The majority of respondents (91.5%) reported using a computer at university, of which 73.6% report using it at least weekly. The majority of Black physiotherapy students (90.6%) use a computer at university at least weekly, compared to 15.1% of White students who don't use a computer at university at all. All universities had more than 80% of physiotherapy students using a computer on campus. At the University of Stellenbosch, 100% of respondents reported using a computer at university.

In terms of the frequency of computer use while at university, 100% of students at the University of Stellenbosch use a computer on a daily basis when on campus. It should be noted however, that third and fourth year physiotherapy students at the University of Stellenbosch return to university every day, while, for example, students at the University of the Western Cape only attend campus once a week while on their clinical placements. This could account for the difference in frequency of computer use among universities. Another possible factor that may influence students' decisions to work in computer labs at the University of the Western Cape, was the finding by Rohleder et al. (2007) that the labs were frequently busy and loud, making working there difficult.

While it is clear that the majority of students are capable of using ICT at university for some activities (e.g. 82.8% of respondents reported using ICT to

prepare assignments), only 23.4% used it to seek advice or guidance. Although, the University of Stellenbosch and the University of Cape Town showed a higher percentage of students who used ICT for this reason (39.1% and 30.1% respectively). This may indicate that students see the use of ICT more as a means of accessing information than as a means of seeking support. Respondents from the University of Stellenbosch scored consistently higher than all other universities when it came to the use of ICT for various activities at university. The use of email was consistently low across four of the universities (20.5% - 36.4%), with the exception of respondents from the University of Stellenbosch (83.5% used email at university) and the University of Cape Town (78.2% used email at university). In terms of the reasons for ICT use, the University of the Western Cape scored the lowest (27.3%) for respondents' use of ICT for academic development, whereas all other universities were above 40%.

The least common use (10.3% - 39.1%) of ICT by physiotherapy students at university (See Table 4.13) was to seek advice or guidance. In situations where physiotherapists find themselves without the established support networks they came to rely on as students, either because of geographical or professional isolation, the use of email is a cost-effective, efficient method by which they could access the clinical expertise of more experienced physiotherapists. It is for this reason that the Healthlink programme (Day, 1999) is seeking to develop the use of email as a tool for improving the management of health services. As well as using email to enhance their professional practice, it could also be used to maintain contact with family and friends, which would offer at least a partial solution to the social isolation sometimes experienced by rural healthcare professionals. However, even though 82.8% of respondents felt “Very confident” or “Confident” using email at university, only an average of 25.5% reported using it as a means of obtaining support of any kind. Again, respondents from the University of Cape Town and the University of Stellenbosch had the highest percentages of

students who use this facility (32.9% and 30.1% respectively). Contrast this with Rohleder et al. (2007), who reported that in students' evaluation of an e-learning system at the University of the Western Cape, they found that one of the main advantages of using ICT was an improvement in communication between students and facilitators through the use of email and online forum discussion, another activity that the students in this survey did not feel confident performing (34%).

The results of this study indicate that the students at two universities, namely the University of KwaZulu-Natal and the University of Limpopo, have the most students who are unable to touch type (80.3% and 75% respectively). The University of Stellenbosch had the highest percentage of students who possess this skill (49.5%), which is expected considering the high level of ICT access and previous exposure found among its students (e.g. at home and high school). The University of Stellenbosch also had the highest percentages of students who engaged in ICT activities, with the exception of accessing online journals, which was consistently low across universities. There was a significant association between the university a student attends and the ability to touch type, which may have implications for the computer literacy programmes offered by individual universities and for future enrolment. If students were to make decisions about which university to attend based, at least in some part, on the perceived level of ICT proficiency required or supported at that university, universities may have to reconsider the importance of focusing on ICT literacy. There was also a significant association between a students' race and their ability to touch type, with White students (44.7%) being the most likely to have this skill and Black students (19.7%), the least likely to have this skill. This may indicate that an increased exposure to ICT at high school level leads to improved ICT skills at a later stage. This is bad news for those students who are unfortunate enough to attend one of the more than 19 000 schools without

computers for teaching and learning in South Africa (See Appendix VII for details). This, despite the governments commitment to the use of ICT in teaching and learning (South African Department of Education, 2004). Rohleder et al. (2007) found that Coloured and Black students from the University of the Western Cape were not computer literate when they began their studies, which may also account for the discrepancy in the use of ICT at university.

5.4 Experiences and perceptions of using ICT for support

In terms of computer access, 77.9% of students had had access to a computer either at home or at high school. This however, means that 22.1% of students only had access to a computer for the first time when they began attending university. Most Black students (55.6%) did not have access to a computer at high school, while a higher percentage of White and Coloured students did (93.2% and 87.3% respectively). This inequity in ICT access at high school is in direct contrast to the position of the South African government in their draft white paper on e-education (South African Department of Education, 2004), which states that "...Government has been quick to seize the opportunity presented by the practical benefits of ICTs to support teaching and learning in the twenty-first century" (p. 8). Yet in terms of real practical solutions, the Department of Education has been slow to provide resources to high schools, in particular those attended by Black students, even though it has claimed that it will "...invest in national initiatives to increase access, boost the capacity of managers, teachers and learners, and provide electronic resources of the highest quality " (p. 11).

For many physiotherapy students (47.7%), the Internet only became accessible once they began attending university. Students attending the University of Limpopo had the lowest percentage of students who had Internet access prior to attending university (13.2% at home and 17.6% at high school). Compare this to the percentage of students from the University of the Witwatersrand who had Internet access prior to attending (74.4% at home and 50% at high school) and it would be considered quite low. In terms of race, the divide between past ICT access is even more pronounced, with 84.6% of Black students not having had access to the Internet at home and 82.1% not having had Internet access at high school. The fact that the University of Limpopo has predominantly Black physiotherapy students may indicate a relationship between university attended, race and prior exposure to ICT that could affect a students ability to work effectively in a growing digital healthcare environment. These results are similar to (but more pronounced than) those found by Ajuwon (2003) among first year medical and nursing students in Nigeria, where 29.3% of those surveyed had never used the Internet before attending university. This may have implications for the way that ICT is taught to first year physiotherapy students, although no literature could be found that discussed this.

Respondents reported being most confident with the use of email (82.8%) and least confident (22.9%) with using ICT to prescribe exercise, although this is not unusual considering that most of the respondents would not be expected to be prescribing exercises yet. What was more concerning was the fact that the use of ICT to conduct research was the activity in which 36.3% of respondents were least confident (27.4% were "Uncertain" and 8.9% were "Not confident"). With the movement in healthcare toward EBP, it is a concern that only 42.9% (n=227) of respondents indicated that they were "Very confident" or "Confident" when it came to using ICT for research. However, 83.4% of respondents reported that they felt "Very confident" or

"Confident" performing online searches. Students did not make the connection between using the Internet for searching and for using the same strategy to inform practice through research. Other areas where students were not making full use of the potential of ICT to inform their practice and studies, were the use of online journals (48.2%) and online physiotherapy databases (52.9%). Another point of concern regarding the use of ICT for research is that 13% of those surveyed reported not using a computer at all to perform research for any reason. This, in addition to the 36.3% who are either "Uncertain" or "Not confident" using ICT for research, means that almost 50% (i.e. 13% + 36%) of physiotherapy students either do not use, or are not confident using a computer for research. This ties in with the suggestion by Grimmer-Somers et al. (2007) that greater emphasis should be placed on research during education. It is also worth noting that Devitt and Murphy (2004) found that 95% of doctors at a UK NHS hospital used computers to conduct searches of the literature, 80% for writing clinical reports and a similar number for preparing presentations. Finally, it should be noted that only one student mentioned needing more support in accessing and keeping up to date with new research, indicating that research may not be a priority for physiotherapy students in South Africa.

Most respondents agreed with the statements regarding the use of ICT as a positive factor in enhancing support of some kind. Graves and Reddy (1999) and Heywood and Wilson (2001) suggested that use of ICT could play a positive role in making administrative tasks easier, and 94.5% of respondents agreed. In terms of communication, 86.6% of respondents agreed that ICT would make it easier, which is in agreement with the results of Rohleder et al. (2007) who reported that students felt that email and online discussion enhanced the communication process. Most respondents (77.7%) agreed that a high level of support would positively influence their decision to work in a community post, which ties in with the findings of

Hill and Alexander (1996), Mitchell (1996) and Taylor and Lee (2005), who all reported that low levels of support are disincentives to work in rural areas. Almost 70% of respondents agreed with the statement that ICT can improve the level of support that students currently receive. This will be of interest to those practising in rural areas, who reported that the current levels of support they receive is insufficient (Steyn, 2005). These reviews on the use of ICT as a means of providing support is encouraging, considering that these students will soon be expected to take on the responsibilities of a community service physiotherapist (SASP, n.d.) and that ICT has been shown to play a positive role in. Another strategy to encourage employment in community posts is to highlight the positive role of community work. Some of the benefits include job flexibility, the opportunity for independent practice, practice variety and community recognition (D'Amore et al., 2007).

In this study, it was also found that students tended to seek support from those most suited to provide it. In other words, clinical and educational support was received from lecturers and clinicians, while emotional and social support came from family and friends. This may partly explain why some physiotherapists working on community placement struggle with issues of support once their usual support networks are removed. They may struggle to seek support in other ways and from other sources.

The fact that not many respondents (23.4%) reported using ICT for support may be because 83.5% - 92.4% of students indicated that they are satisfied with the level of support they currently receive and therefore they do not feel a need to seek more support. However, while this may be the case while they are students, where clinical supervisors, lecturers, family and friends are close at hand to offer the support that they need, it may not adequately

prepare them for future practice. When working in compulsory community service, the means of support that new graduates relied on when they were students, may not be present. This is certainly the case in remote parts of Australia, where about one-third of rural therapists were dissatisfied with the level of support they received (Taylor & Lee, 2005) and the vacancy and attrition rates in rural areas were rising, despite an increase in the number of health professionals being trained (Struber, 2004). Steyn (2005) found that physiotherapists working on their community service placements complained of poor support, lack of access to resources (e.g. books and the Internet) and no opportunities for CPD, all of which have been shown to be improved through the use of ICT. These factors may have been responsible for the fact that only 5.8% of those surveyed indicated that they would like to remain in their community posts.

Even though 80% of respondents were satisfied with each of the different types of support that they were receiving, 94.7% of respondents reported that this support is face-to-face, a concern in that students are relying on a method of support that may be the least suited to be of any benefit once they are working in their community service placements. This may be an indication that in the relatively protected environment of university, where support networks are well established and support providers are close at hand, students feel that they are well supported. However, once they move out into more geographically, culturally and socially variable areas, they may lack the ability to seek and receive support in different formats, for example, email. Having said this, the current system of support being used by the SASP in KZN in 2006 encouraged mentors and supervisors ("buddies") to conduct face-to-face visits if possible and if not, then to make contact via telephone. While this may be a reflection of new graduates wishes, Mostert (2005) found that many physiotherapists working in the community were unhappy with the support they received and that their buddies did not contact