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An evaluation of the paediatric physiotherapy curricula of three South African universities

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Chapter 1: INTRODUCTION

1.1 Background

Undergraduate education plays an instrumental role in determining the future of a particular profession (Higgs *et al*, 1999). Curricula should therefore include a combination of current best practices as well as train students in the diverse client diagnostic groups that will be encountered in practical and academic settings (Brown *et al*, 2006). Three elements need to be taken into account in physiotherapy curricula design, the content aspect, the learning aspect and the socio-cultural context aspect of physiotherapy (Broberg *et al*, 2003).

Paediatric rehabilitation is currently becoming an independent sub-discipline of physiotherapy. Previously paediatric physiotherapy was taught and practiced clinically within an adult module; techniques were merely adjusted to suit the paediatric client group (Helders *et al*, 2003). This approach failed to highlight the specific needs of paediatric clients. The focus of treatment has moved away from impairments to that of function, and from the child alone to the child living in the context of the family, community and peers (Helders *et al*, 2003). It is therefore also time to shift the paediatric physiotherapy module to an independent module within the curriculum.

Since 1994, South Africa's first democratically elected government has yielded varied successes with regards to child health and well-being. Much of the government's efforts have focussed on reversing the marked racial disparities occurring as a result of decades of discriminatory apartheid policies (Saloojee & Pettifor, 2005). Although improvements have been noted with regards to access to health care and access to child social support grants, disability-related health issues have remained neglected. South Africa has a population pyramid resembling other developing countries with one-third of the population being children younger than 14 years (Saloojee & Pettifor, 2005).

Previously, physiotherapy education was designed within a biomedical framework, but has now shifted towards a bio-psychosocial model of health. Globalisation, greater community expectation of accountability, the information technology revolution and an increasing demand for the social ecology model of health has led to significant changes in healthcare (Higgs *et al*, 1999). Physiotherapy education must ensure future graduates receive relevant education to acknowledge changes that are occurring in the movement towards the bio-psychosocial model of health. Education in a South African context hosts a range of new challenges. The income inequality that exists within the population affects the access to health care and produces demographic patterns of social health and disease. Newly qualified graduates need to be equipped to respond to changing healthcare needs and are required to empower their patients to participate actively in assuring their quality of life and well-being (Higgs *et al*, 1999).

Evidence based practice has become a key requirement for entry level practice. New graduates are therefore expected to apply an evidence based approach to practice. Universities should be encouraged to incorporate the principles of evidence based practice into undergraduate curricula (Chipchase, 2008).

Cherry & Knutson (1993) conducted a survey of the paediatric content of physiotherapy entry level programmes in the United States in which three areas of paediatric content were examined; childhood development, paediatric disorders and illnesses, and management of paediatric diagnoses. The quality of the entry level physiotherapy paediatric curricula will determine the ability of undergraduate students to develop the concepts, skills, and attitudes required for entry level practice (Cherry & Knutson, 1993).

A good starting point for curricula revision can begin by determining which paediatric diagnoses are appropriate to include in undergraduate physiotherapy degrees in South Africa. Crucial groundwork is needed in the training of students in appropriate diagnosis, so that universities can produce students that are aware of the unique spectrum of diagnoses treated within a South African setting.

1.2 PROBLEM STATEMENT:

It is not clear whether newly qualified physiotherapists are being adequately equipped with the basic knowledge of the variety of diagnoses of the large South African paediatric population requiring rehabilitation services.

1.3 RESEARCH QUESTION:

Do the paediatric physiotherapy curricula taught at three South African universities equip students with the basic knowledge of the variety of paediatric diagnoses seen by physiotherapists at a large tertiary academic hospital?

1.4 AIMS:

The aims of this study were:

The aim of this study was to determine whether the paediatric physiotherapy curricula of three South African universities equip students with the basic knowledge of the variety of paediatric diagnoses seen by physiotherapists at the Chris Hani Baragwanath hospital.

The study was divided into two phases:
Phase 1: Analysed paediatric diagnoses treated by physiotherapists at the Chris Hani Baragwanath and was termed “Paediatric Statistics”.
Phase 2: Evaluated the content of paediatric physiotherapy curricula of the three universities and was termed “Curricula Content”.

AIM PHASE 1 (PAEDIATRIC STATISTICS):

To determine the range and number of children affected by specific diagnoses, by analysing the statistics of paediatric patients, treated by physiotherapists at the Chris Hani Baragwanath hospital in 2010.

AIM PHASE 2 (CURRICULA CONTENT):

To determine whether there was concordance between diagnoses managed at the Chris Hani Baragwanath hospital and content taught by the universities by analysing the content of the paediatric curricula of the three South African universities.

1.5 OBJECTIVES:

The objectives of this study were:

OBJECTIVES PHASE 1 (PAEDIATRIC STATISTICS):

- To determine the proportion of paediatric patients referred for physiotherapy management and the proportion of time taken to treat paediatric patients.
- To determine the range of paediatric diagnoses referred for physiotherapy management.

OBJECTIVES PHASE 2 (CURRICULA CONTENT):

Section A

- To analyse the paediatric physiotherapy curricula content of three South African universities to ascertain which aspects of paediatric physiotherapy are taught in the curriculum, under the categories:

a – Paediatric patient diagnoses
b - Standardised assessment tools
c - Evidence based practice in paediatric physiotherapy
d - Structure of the paediatric module within the context of the whole curriculum.

Section B

- To analyse the explicit documented paediatric curricula outlines of the three universities.

- To identify if discrepancies exist in the content between the perceived paediatric modules, as documented from the questionnaires completed by university lecturers, and the explicit documented curricula outlines.

1.6 SIGNIFICANCE OF THE STUDY:

- Data obtained from this study can be used to inform curricula development in the future; with regards to paediatric modules within physiotherapy degrees in South Africa.
- The study provides a useful data base of diagnoses that can be included in curricula that may result in the development of more appropriate curricula.

The following chapter will discuss literature which reflects the importance of the inclusion of paediatrics as an independent module within the physiotherapy curriculum.

Chapter 2: LITERATURE REVIEW

2.1 Introduction

Undergraduate education plays an instrumental role in determining the future of a particular profession (Higgs *et al*, 1999). Curricula should therefore include a combination of current best practices as well as train students in the diverse client diagnostic groups that will be encountered in practical and academic settings (Brown *et al*, 2006). This review will firstly focus on the context of paediatric physiotherapy practice in South Africa, the need for the incorporation of a specialised paediatric module in the undergraduate physiotherapy curricula of South African universities, and lastly the content aspect of paediatric physiotherapy. A deeper analysis of the content of physiotherapy curricula will examine the paediatric patient diagnostic groups treated by physiotherapists, standardised tests used in the assessment of paediatric patients requiring physiotherapy services and the role of evidence based learning in undergraduate physiotherapy education (Brown *et al*, 2006).

Key words used to access information for the literature search included: paediatric, physiotherapy, curricula design, curricula content, undergraduate degree and South Africa. Three search engines were used namely; PUBmed, CINAHL and ProQuest. Literature was also gathered via a hand search through two journals concerned with paediatric physiotherapy namely “Pediatric Physical Therapy” and “Physical and Occupational Therapy for Children” from the years 2000-2010.

2.1.1 Research setting

Apartheid left a legacy of racially segregated amenities and discriminatory health care policies. Since 1994, the country’s first democratically elected government has yielded varied successes with regards to child health and well-being. Much of the government’s efforts have focussed on reversing the marked racial disparities occurring as a result of decades of discriminatory apartheid policies. Although improvements have been noted with regards to access to health care and access to child social support grants, disability-related health issues have remained neglected. South Africa has a population pyramid resembling other developing countries with

one-third of the population being children younger than 14 years. South African health care lies between ‘first’ and ‘third’ world services. While the quality of health professionals are internationally recognised and state-of-the-art equipment and skills are readily available in many academic and private health care settings, the profile of illnesses in the majority of the population remains ‘developing world’ and adequate care remains inaccessible to many. The National Plan of Action for Children in South Africa requires all government services to prioritise the needs of children in policies, budget decisions, and delivery of services (Saloojee & Pettifor, 2005).

The Chris Hani Baragwanath hospital is the largest hospital in the world, with more than 3000 beds, 7000 members of staff and over 100 000 admissions per year. It serves Soweto, an urban working class community of approximately one million people. The total paediatric medical admissions to Chris Hani Baragwanath Hospital increased by over 20% in the years 1992-1997, due to the increasing number of children infected with HIV. Children with more advanced diseases are referred to the Chris Hani Baragwanath hospital. The pressure on beds may lead doctors to discharge patients early and this impacts on the time available for rehabilitation, patient education and counselling (Zwi *et al*, 1999).

The care of children in South Africa is embedded in the Constitution of the country. South Africa has signed and acknowledged The United Nations Charter on the Rights of the Child (Levin, 2004). Child social support grants are available to the guardians of all poor children under 14 years of age. The orphan crisis poses the greatest challenge for child health and well-being. A foster –care grant is available for caregivers of orphans (Saloojee & Pettifor, 2005).

HIV has transformed the structure of paediatric practice in South Africa from a sub-speciality that dealt mainly with acute illnesses to that of managing chronically ill and dying patients. Since 2002, the infant mortality rate and the under-5 mortality rate have decreased due to impact of the prevention of mother-child transmission (PMTCT) program. In 2003, the health ministry was forced to supply nevirapine for the PMTCT program. In 2004, highly active antiretroviral therapy (HAART) became available for both adults and children in government institutions. The HIV/AIDS pandemic has placed enormous pressure on existing health services. More than

40% of all deaths of children are attributed to AIDS (Saloojee & Pettifor, 2005). Recent advances in the treatment of HIV and AIDS has resulted in survivors having an increased life expectancy, associated with a decline in physical, functional and psychological parameters. People with AIDS are often referred for physiotherapy to improve function. Adequate knowledge, a positive attitude and willingness to provide services are important factors in providing appropriate care to patients living with HIV/AIDS (Oyeyemi *et al*, 2007).

2.2 Elements in physiotherapy curricula design

The content of undergraduate curricula has expanded substantially as a result of growth in knowledge, research, and information technology. This increase in content has not been accompanied by an increase in the length of undergraduate physiotherapy programmes. Uncertainties arise as to which skills and topics should be included in the undergraduate curriculum. Often, physiotherapy programmes increase content without removing any – resulting in curricula hypertrophy (Chipchase *et al*, 2008).

The content aspect of physiotherapy includes a description of core concepts of physiotherapy: physiotherapy practice, working areas for physiotherapy and the research and development of physiotherapy (Broberg *et al*, 2003). The content aspect involves other disciplines such as anatomy, physiology, behavioural sciences, social sciences, and biomedical subjects and how they are incorporated into physiotherapy (Broberg *et al,* 2003).

The context aspect includes the cultural and societal conditions for the profession including legislation. The learning aspect highlights the individual student's learning process and his/her professional growth during the programme (Broberg *et al*, 2003). The learning aspect of physiotherapy will not be included in this review.

Early graduates interested in training in paediatric physiotherapy have had to rely on postgraduate continuing education courses due to limited time in the curriculum. New graduates have difficulty in administering standardised tests, and have not adequately developed hands on treatment skills (Stuberg & McEwen, 1993).

Curricula consist of three aspects: the explicit curricula, implicit curricula and null curricula. The explicit curricula consist of prerequisite courses, physical therapy courses and clinical education settings. The implicit curriculum includes values and beliefs that are transferred from university lecturers and clinical supervisors to their students. Students regularly receive implicit messages from faculty members about the importance of certain types of knowledge, patients that are interesting to treat, and acceptable and unacceptable professional behaviours. Examples of implicit curricula are: courses weighted according to importance (more important courses receive scheduling priority in time and venue), and faculty members demonstrating and expecting courtesy, initiative, and respect for other health care professionals. The null curriculum refers to what is left out of the curriculum such as courses not offered, or neglected clinical sites (day-care centres and rural health practices) (Shepard & Jenson, 1990). The importance that students place on paediatric physiotherapy can be derived from their experience of the explicit, implicit or null curricula. For example, a paediatric module that is not taught as an independent module or have permanent qualified lecturers organising its structure may result in students not placing as much importance or interest in its practice in comparison with other sub disciplines of physiotherapy.

2.3.1 Curricula development

Institutions have acknowledged the need for curriculum development by university lecturers, as new curricula are constantly required to meet changing educational demands. Curriculum development involves 6 steps namely:

- problem identification via a needs assessment,
- needs assessment of targeted learners,
- measurable objectives,
- educational strategies,
- implementation
- and lastly evaluation and feedback (Windish *et al*, 2007).

Academics responsible for curricula development in Australia ranked current clinical practice and research evidence as the most important factors in formulating curricula content (Chipchase *et al*, 2008). Basing curricular decisions on clinical usage appears to provide a manner of limiting curricula content and producing clinically relevant entry level practitioners. Basing curricula solely on clinical practice, however, presents several risks for the physiotherapy profession. Firstly, this approach to curricula design does not reflect evidence that a modality improves patient outcome. In an evidence based health care climate, the need to justify the inclusion of certain modalities and their inclusion in undergraduate curricula is important. Secondly, clinical practice might adopt new modalities due to successful marketing campaigns resulting in rapid and widespread clinical usage. If curricula only reflected norms in clinical practice, such modalities would be included in undergraduate curricula. Usage patterns may then reflect advertiser input more accurately than evidence based effectiveness (Chipchase *et al*, 2008).

An evidence based approach to curriculum development would be to develop curricula based only on an evidence or research framework. Material for which high quality research exists will only be included in curricula. This method of including only evidence based research in curricula proves problematic as there is currently no universally accepted evidence hierarchy to ascertain the efficacy of different physiotherapeutic interventions and techniques. There is no clear and accepted model for curricular decision making based on best available research evidence (Chipchase *et al*, 2008). The time, expertise, and work required to undertake regular systematic reviews of every physiotherapy assessment and intervention in order to determine what should be retained in undergraduate physiotherapy therapy will require time, as not much evidence is currently available in a South African setting.

A middle ground for determining curricular content should include both clinical practice and research evidence. Contemporary data on clinical practice patterns can provide a guide for entry level curricula. At the same time a method for identifying and evaluating research findings can be developed to aid in the baseline raw curricula outline based on clinical practice. A review process can be undertaken for each modality by interested academics, clinicians or research candidates. This

strategy will highlight where higher level research approaches or clarification of efficacy are required (Chipchase *et al*, 2008).

Windesh *et al* (2007) organised a program to train faculty members in curriculum development. Despite demands for curricular change, most lecturers are not trained in education or curricular development. The goals of the program were to aid participants to develop knowledge and skills to design, implement and evaluate, and disseminate a curriculum. Participants reported improved skills in curricular development, implementation and evaluation after the program. Participants also enjoyed curriculum development more than non-participants. The programme's success was seen in the number of curricula that were implemented at institutions by participants after completion of the program. Eighty four percent of curricula developed were either fully or partly implemented at institutions.

Pinnock & Jones (2008) used a modified Delphi technique to consult experts in New Zealand in an effort to formulate a framework for undergraduate medical paediatric content and improve curricula content. The process began by a listing of common presenting complaints based on personal experience of the author. By sequential surveys, a list was constructed that could serve as a framework for an undergraduate paediatric curriculum in New Zealand. A needs analysis should be done to determine the content of a course, and to ensure it is suitable for the real world. Educators should also be made aware of the needs of their communities and context to ensure they develop the curricula accordingly. Many educators are not experts in curriculum development, therefore training is essential and studies regarding the needs of communities should be disseminated to educators (Pinnock & Jones, 2008).

This review aims to fulfil the first step of the process of curricula development namely, needs assessment. By analysing the literature for the needs of paediatric rehabilitation in a South African context, the spectrum of paediatric diagnose treated by physiotherapists, and current assessment and treatment options available to physiotherapists in the sphere of paediatric practice – the content aspect of physiotherapy practice will be analysed. The next step of targeted student needs assessment can be conducted thereafter.

2.3 Paediatric course structure

The status of paediatric physiotherapy education in the United States was first investigated by Cherry and Knutson in 1993. As a response to the initial survey conducted by Cherry & Knutson- the Section of Pediatrics of the American Physical Therapy Association published a document titled “Pediatric Curriculum content in Professional Physical Therapy Education” to ensure standardisation in paediatric content in professional education curricula. This document was revised in 2009 and called “Pediatric Curriculum content in Professional Physical Therapy Education: A cross reference for content, behavioural objectives and professional sources”. The purpose of this document was to provide a resource for paediatric educators based on contemporary practice and contained recommendations of key paediatric content areas (Schreiber *et al*, 2009).

Schreiber *et al* (2011) conducted a study to examine the status of professional paediatric physiotherapy education in the United States. Eighty three percent of programmes used recommendations published in the above mentioned document to develop and deliver paediatric content in their programmes. A large degree of variability was found regarding necessary elements in paediatric physiotherapy education. While 70 % of institutions reported that paediatrics was taught as an independent module, only 10 universities reported that paediatric physiotherapy was a required course. The number of hours dedicated to paediatrics varied from 35 hours to 210 hours. The authors recommended 90 hours as the appropriate number of hours for paediatric content within the curriculum. The 90 hours should not include clinical rotation hours but lectures, Problem Based Learning (PBL), and hands on exposure to children. Sixty six percent of professional programmes employed a full time faculty member responsible for teaching paediatric content. Institutions provided important feedback to introduce creative learning opportunities to gain experience in paediatrics such as Special Olympics, hippotherapy, and respite care.

Even though efforts have been made in the United States since 1993 to address the variability in curriculum structure and ensure necessary content is covered in all universities, Schreiber *et al* (2011) concluded that further work needs to be done to ensure more consistency in the provision of paediatric professional education.

2.4 The need for paediatric physiotherapy to be taught as an independent sub-discipline of physiotherapy within a South African context

Paediatric rehabilitation is currently becoming an independent sub-discipline of physiotherapy. Previously paediatric physiotherapy was taught and practiced clinically within an adult module; techniques were merely adjusted to suit the paediatric client group (Helders *et al*, 2003). This approach failed to highlight the specific needs of paediatric clients. The skills and knowledge needed to treat paediatric patients are not always an adaptation of skills and knowledge used to treat adult patients. Children's needs are specific to their unique pathologies and are greatly affected by development and maturation (Turner, 1993).

Unlike other aspects of physiotherapy practice where students can practice new skills with adult peers in laboratory settings, it is suboptimal to practice paediatric skills on adults. Opportunities therefore need to be presented whereby students can practice hands on skills with children (Schreiber *et al*, 2011). It is therefore important for universities to include paediatric physiotherapy as an independent sub section within the curriculum to ensure that the specific needs of each diagnoses within the scope of paediatric rehabilitation is appropriately covered in the syllabus.

2.4.1 Paediatric philosophy

The focus of paediatric treatment has moved away from impairments to that of function, and from the child alone to the child living within the context of the family, community and peers. The scope of paediatric physiotherapy diagnoses has therefore shifted away from diagnoses referred only from acute hospital settings to that of school, home and community environments. Advances in paediatric medicine have led to increased survival rates in children with serious physical illnesses and disabilities. Attention has been shifted from dealing with mortality to coping with morbidity (Helders *et al*, 2003). Paediatric palliative care has emerged as a specialised area of practice and involves not only the management of symptoms but also the psychosocial and spiritual needs of the child and family through death and bereavement (Price & McNeilly, 2006). The scope of diagnoses included in

paediatric physiotherapy has therefore evolved to include chronic illnesses and palliative care.

Paediatric physiotherapy is practiced in a wide variety of settings. These include: hospitals, rehabilitation centres, home-based health care, the school system, early intervention centres, developmental intervention centres, outpatient rooms and extended care facilities (Gandy, 1993). Physiotherapists in South Africa are first line practitioners and do not require a referral from a doctor to treat. In the educational team they are therefore seen as medical experts (Stuberg & McEwen, 1993). Physiotherapists require specialised knowledge regarding paediatrics in order to advocate the rights and needs of disabled children in the wide variety of settings in which paediatric physiotherapy is practiced. Families of children with disabilities might be unable to advocate for the rights of their children as they might be unfamiliar with legal aspects regarding disability rights in South Africa (Cherry, 1991).

2.4.2 Paediatric Science

The developmental changes that children undergo require physiotherapists working with this population to be skilled in development science to anticipate future changes that occur during childhood. The presence of disease and disability interferes with growth and development and this decreases the ability of the child to learn and gain function. The physical, social, cognitive and emotional needs of a child change over time. Therapeutic goals and techniques need to be adapted to suit the changing needs of the child. Developmental changes need to be anticipated and therapy should be orientated around facilitating the developmental of appropriate motor skills and behaviours. Progress of some developmental milestones may require direct facilitation by the paediatric physiotherapist (Cherry, 1991). Children with developmental disabilities rarely outgrow their functional impairments – students therefore need to be trained to anticipate small treatment effects (Stuberg & McEwen, 1993).

The scientific basis of a paediatric physiotherapy curriculum combines a basis of anatomy, physiology, biomechanics, pathology, motor control, motor learning,

psychology and therapeutic sciences as well as developmental science, paediatric medical pathology, and the assessment of developmental risk factors. To ensure safe and effective intervention in paediatric physiotherapy, a thorough knowledge of the biological characteristics of children and the differences between children and adults needs to be covered. Immature skeletal, muscular, neurological, respiratory and digestive structures guide therapeutic strategies. Curricula based on anatomy and physiology, the process of problem solving, patient education are as important in the formulation of paediatric curricula as in general physiotherapy. Paediatric training needs to pay special attention to the child's physical, psychological, social and emotional characteristics (Cherry, 1991).

Many paediatric health problems have no or a limited equivalent in adult medicine. Genetic origin disorders, chromosomal disorders, and pre/peri-natal disorders diagnosed in infancy affect development of the child. The interaction between development and medical disorders should be anticipated. Deforming forces may cause irreversible changes on an immature skeleton. Risk assessments are carried out to prevent the potential development of problems (Cherry, 1991).

2.4.3 Paediatric Techniques

Technique differences exist between the treatment of adult and paediatric patients. Quantitative differences exist in the intensity, duration and frequency of treatment. For example, percussion techniques, for clearing bronchopulmonary secretions, require less force for infants and small children. Therapy is often integrated into child care giving (feeding, carrying, dressing) which increases the frequency of therapeutic intervention in the child's natural environment. The treatment of patients with a chronic disorder requires prolonged duration. As their bodies change and needs evolve, disabled children need to be treated by the physiotherapist over the course of their childhood. Children have less capability of pursuing therapy independently after instruction; maximum contact with a therapist is therefore required. An adult has acquired memories of abilities to guide recovery – children lack this frame of reference. Children cannot comprehend long term goals of therapy, understanding and motivation exist only for the present. They have little understanding on

preventative care. Goals are accomplished not through conventional exercise, but more through play, toys and functional activities (Cherry, 1991).

The need for physical therapists trained to work with handicapped infants has increased as the number of early intervention programmes have increased and as professionals have realised that specific skills are needed to work with this population (Cochrane *et al*, 1990). In a survey of universities conducted by Cochrane *et al* (1990), 72% of the respondents from entry level and post-professional programs indicated a need for curricula to contain training materials in physical therapy for working with handicapped infants. In the study conducted by Cochrane *et al* (1990) a working conference was conducted to define the primary mission and major roles of physical therapists working with handicapped infants and their families. They defined the primary mission as being "to enhance the sensorimotor development, neurobehavioral organization, and cardiopulmonary status of handicapped infants, at risk infants and pre-school aged children within the family and community context." The conference participants reached a consensus on 13 major functions of physical therapists working with handicapped children and their families:

> "1) Screening for neuro-muscular-skeletal, cardiopulmonary and general developmental dysfunction;
> 2) assessing children's neuro-muscular-skeletal and motor skills for differential diagnosis;
> 3) assessing children's cardiopulmonary status;
> 4) designing, implementing, and monitoring therapeutic interventions;
> 5) evaluating program intervention effectiveness and modifying programs as needed;
> 6) identifying with the family their strengths, priorities and needs;
> 7) developing family recommendations and monitoring their implementation;
> 8)participating in interdisciplinary planning;
> 9) consulting with the family members and caregivers;
> 10) consulting with and referring to other professionals and community agencies;
> 11) serving as case managers;

12)recommending or fabricating adaptive equipment and mobility devices; and

13) recommending or implementing environmental modifications (Cochrane *et al*, 1990)."

Since techniques used on paediatric patients differ to that of adults, physiotherapists need to be trained in the variety of paediatric diagnoses treated by them, to ensure adequate precautions are taken. By respecting the physiological and anatomical differences present in children, physiotherapists will be able to assess whether treatment will be beneficial in certain diagnoses and injuries of paediatric clients during treatment can be prevented.

2.5 The International Classification Of Function (ICF) as a model to guide clinical thinking, practice and education in paediatrics

The ICF encompasses all aspects of health and represents an interactive relationship between health conditions and contextual factors (Personal and Environmental factors) (Rosenbaum & Stewart, 2004). Educators need to promote and apply the ICF model in the training of undergraduate students in order to analyse the complex interaction of elements affecting the function, activity performance and participation of the child. Educators need to inform future health care professionals about the ICF as it allows a common language to describe and classify health and disability issues (Rosenbaum & Stewart, 2004).

Jelsma & Scott (2011) concluded that the ICF is a useful framework which South African physiotherapy students can use to assess paediatric patients and plan suitable treatments. Teaching students to assess paediatric patients in a South African context using the ICF framework encourages clinical reasoning and an improved holistic approach to the patient's problems. This improved holistic and contextual assessment leads to a more appropriate treatment plan for the patient. The authors found that physiotherapy students, who overtly used the ICF framework to gather information, analyse and plan interventions produced assessments of a higher quality than those students who only loosely applied the concepts of the ICF.

Students used clinical reasoning via the ICF framework to determine ways to make daily activities easier through therapy, how to make environmental changes, and to increase awareness of personal factors which might have positive or negative effects on task performance.

The ICF provides a mechanism to make clinical assumptions more transparent and systematic to evaluate. In a survey of physiotherapists and occupational therapists, 52% were not familiar with the ICF and 56% did not know that the ICF could be used in clinical practice (Darrah, 2008).

In 2001, an international work group developed a version of the ICF for children and youth called the ICF-CY (Darrah, 2008). The ICF-CY involved expansion of the content of the traditional ICF framework to capture the growth and development characteristics of infants, toddlers, children and adolescents. It includes mental functions such as attention, memory, and perception; as well as activities of family life, play, learning and education. The ICF-CY provides a standardized classification across disciplines such as health, social welfare, legal systems and education. The benefits of the ICF-CY is that it provides a framework for interdisciplinary practice, is able to clarify diagnoses and co-morbidities, provides a functional basis for intervention and provides a standardised documentation of variables in research (Ibragimova *et al*, 2009).

By using the ICF as a framework, physiotherapists are able to assess various diagnoses holistically and are able to affect change on various aspects affecting the health of a child.

2.6 Paediatric diagnoses treated by physiotherapists

Cherry & Knutson (1993) conducted a survey of the paediatric content of physiotherapy entry level programs in the USA in which three areas of paediatric content were examined; paediatric disorders and illnesses, childhood development, and management of paediatric conditions.

Donahoe-Fillmore (2002) discovered that topics not well included in undergraduate physiotherapy curricula in the United States were orthopaedic and cardiopulmonary conditions, health service delivery issues, behavioural management and cultural

diversity. The study developed a framework to determine priority topics within the paediatric curriculum. The topics of normal development and hands-on experience on paediatric clients were well covered in the curricula of physiotherapy programmes in the United States. Improvements can be still be made in hands on practice and more time dedicated to paediatrics. Overall findings were that programmes adequately incorporated paediatric content in undergraduate curricula. The study developed a framework to determine priority topics within paediatric curricula. The framework was based on guidelines set out by the Section of Pediatrics of the American Physical Therapy Association entitled “Guidelines for Pediatric Content in Entry-Level Physical Therapy Education”. An audit was made of the top 20 content areas covered in paediatrics in physiotherapy programmes across the United States. The majority of the items (14 out of 20) included in paediatric content were related to examination of the paediatric patient; two were related to diagnoses, two evaluation, two normal development and no areas in instruction or family health and service delivery. The largest gap in content was seen in behaviour management, followed by paediatric diagnoses, intervention skills, family health and service delivery and lastly normal development. These results indicate that lecturers responsible for paediatrics rate examination and evaluation skills as most important content areas in paediatric curricula and therefore cover them intensely in the syllabus. Clinical skills are elective – many students do not have the opportunity to participate in a paediatric rotation due to limited placements. Evidence based practice was found to be a common area for improvement (Donahoe-Fillmore, 2002).

In order to determine which diagnoses to include in this literature review; two studies which examined the curricula content of undergraduate physiotherapy programmes in the United States were analysed, the top ten causes of under-5 mortality in South Africa were examined, and paediatric physiotherapy management in specific diagnoses cited in current literature were analysed. A move has been made to look beyond paediatric neurology to include other areas of paediatrics such as rheumatology, orthopaedics, pulmonology, burns and traumatology (Helders *et al*, 2003).

Cherry & Knutson (1993) examined paediatric disorders and illnesses that should be included in undergraduate curricula. These include myelodysplasia, muscular

dystrophy, cerebral palsy, AIDS, congenital heart abnormalities, cocaine-exposed infants, down syndrome/ chromosomal disorders, haemophilia, juvenile rheumatoid arthritis, congenital amputation, mild motor dysfunction / clumsiness, paediatric head injury, cystic fibrosis/ asthma, premature infants, congenital sensory deficits acquired or idiopathic orthopaedic conditions, and congenital orthopaedic conditions (Cherry & Knutson, 1993).

Donahoe-Fillmore (2002) listed the top patient diagnoses included in physiotherapy programmes in the United States:

- Cerebral palsy
- Myodysplasia
- Muscular dystrophy
- Complications of prematurity
- Scoliosis
- Traumatic Brain Injury
- Developmental delay
- Spinal cord injury
- Juvenile rheumatoid arthritis
- Congenital hip dysplasia
- Sensory motor problems
- Brachial Plexus injuries
- Osteogenesis imperfecta
- Contractures
- Torticollis
- Genetic abnormalities
- Cystic Fibrosis
- Burns
- Foetal Alcohol Syndrome
- Asthma
- Congenital foot deformities
- Cognitive
- Bronchopulmonary dysplasia
- Diabetes

- Amputation
- Growth related issues
- Drug exposure
- Congenital heart defects
- Failure to Thrive
- Sports injuries
- Cancer
- Immune deficiency
- Haemophilia
- Lead poisoning.

The top 10 causes of under-5 mortality in South Africa include HIV/AIDS, low birth weight, diarrhoeal diseases, lower respiratory tract infections, protein-energy malnutrition, neonatal infections, birth asphyxia and trauma, congenital heart disease, road traffic accidents, and bacterial meningitis (Saloojee & Pettifor, 2005). The burden of communicable diseases such as respiratory infections and diarrhoea is decreasing due to improvements in the provision of safe water, adequate sanitation, and electricity in poorer communities. Tuberculosis still continues to flourish alongside the HIV pandemic. There have been notable successes in reducing vaccine preventable diseases. Polio was last reported in SA in 1989. Road traffic accidents account for a third of deaths in the 5-9 year age group. Much of this mortality is preventable and result due to environmental hazards including lack of pavements and pedestrian crossings. The lack of neonatal intensive care and high care facilities in rural areas explains the high neonatal mortality rates. Kangaroo mother care units is an intervention aimed at improving the situation. The health department's four priority conditions of birth defects include albinism, Down syndrome, foetal alcohol syndrome and neural tube defects. Adolescent health care has also been highlighted for attention. This includes life skills education (Saloojee & Pettifor, 2005). Physiotherapy students need to be aware of communicable diseases such as TB, and should play an active part in informing the public on preventative measures to reduce the incidence in the population. Patients admitted to hospital for the above mentioned diseases should be screened to determine whether developmental delay exists, the underlying causes of the delay and whether the child

will benefit from intervention from the rehabilitation team. Diseases formerly unknown in childhood are being presented for treatment by the rehabilitation team such as paediatric chronic fatigue and pain syndromes (Helders *et al*, 2003).

A selection of diagnoses cited in the literature above was made to analyse whether evidence exists in the physiotherapy management of paediatric diagnoses. Four categories were formulated to analyse the different diagnoses that paediatric physiotherapists encounter in their management of paediatric patients:

2.6.1 Neurological Conditions

- Developmental Coordination Disorder
- Cerebral Palsy
- Spinal cord injuries
- Traumatic Brain Injuries

2.6.2 Respiratory Conditions

- Bronchiolitis
- Pneumonia
- Acute Severe Asthma
- Atelectasis
- Children treated with mechanical ventilation
- Possible tasks for physiotherapy in acute respiratory disease
- Physiotherapy in the prevention of pulmonary complications in paediatric cardiac surgery
- Cystic Fibrosis

2.6.3 Neuromusculoskeletal

- Haemophilia
- Spinal conditions
- Low Back Pain
- Sports injuries in children

2.6.4 Other

- Burns
- HIV
- Palliative Care

- Pain

2.6.1 Neurological Conditions

Differences between paediatric and adult nervous systems

At birth, the brain of an infant is one fourth the weight of an adult brain. To achieve its adult weight the brain undergoes growth spurts during critical periods. Postnatal experience plays an important role in inducing developmental changes in the pattern of synaptic connections of the nervous system. Within the brain of a newborn, myelination occurs into young adulthood. The first two months after childbirth represents a period of central nervous system (CNS) organisation. The major efferent (motor) tracts begin myelination one month after birth. During the second year of life, the increasing speed and complexity of movement may be related to myelination. The process slows down after two years and is almost complete by ten years. From six to ten years, fundamental skills such as jumping, throwing, catching and balancing become refined as the nervous system continues to increase the speed of conduction of nerve impulses through ongoing myelination, and motor control becomes more automatic. Neural plasticity is the ability of the nervous system to adapt. Plasticity appears to be greatest during the development of the nervous system (Martin, 2002).

Neurological diagnoses managed by physiotherapists

Developmental Coordination Disorder

Developmental Coordination Disorder (DCD) has been described as motor coordination that is significantly below a child's corresponding age and intelligence. Limitations in body structure and function manifest in DCD as: poor visual perception; muscle weakness, especially of the hands; decreased muscle tone; reduced balance and postural control; poor coordination; disorganised oral-motor and sequencing; language and sound in words; and decreased sensory performance. One of the most detrimental effects of late intervention in children with DCD is a decreased participation in sport and leisure activities (Kane & Bell, 2009).

Therapists provide input that prevents secondary impairments such as decreased strength, fitness, endurance and aerobic capacity (Missuana *et al*, 2006; Kane & Bell, 2009).

Cerebral Palsy (CP)

Cerebral palsy is the most common physical disability in childhood (Rosenbaum, 2003). Bax *et al* (2005) describe cerebral palsy, "Cerebral Palsy describes a group of disorders of the development of movement and posture, causing activity limitations that are attributed to non-progressive disturbances that occurred in the developing foetal or infant brain. The motor disorders of cerebral palsy are often accompanied by disturbances of sensation, cognition, communication, perception, and/or behaviour by a seizure disorder."

CP constitutes a large proportion of physiotherapy in paediatrics. Comprehensive rehabilitation involves age appropriate tasks which encompass domains of the child's body structure and function, activity performance, participation as well as the impact of personal and environmental of task performance. Interventions that have been found to have the highest level of evidence for effectiveness include strengthening exercises, functional therapy on mobility and self-care, ankle-foot orthoses on gait and Constraint Induced Therapy on hand function (Saleh *et al*, 2008).

Spinal Cord Injury

The site and level of a spinal cord injury is often related to the cause of the injury and the child's age (Shakhazizian & Massagli, 2006). Physiotherapists play an important role in developing age appropriate range of motion(ROM) and strengthening programmes. Functional skills are addressed including bed mobility, transfers, sitting balance, ambulation and wheelchair skills. Physiotherapists play an important role in the prevention, treatment and management of secondary complications such as pressure ulcers, contractures, oedema, spasticity, pathologic fractures and scoliosis (Shakhazizian & Massagli, 2006).

Traumatic Brain Injuries

Children who have sustained a traumatic brain injury (TBI) in South Africa present with needs and experiences that are very different as compared with experiences in more developed countries. The main aetiologies of TBI include the high rate of violence in the country and the high incidence of motor vehicle accidents. There are however, few places of care following the acute stages of recovery, and there are no specialised paediatric units for children with TBI. There are also no dedicated national support groups for children who have sustained TBI. Physiotherapists need to engage with non-governmental organisations with regard to managing children with TBI. Physiotherapists have an important role to play in raising awareness of prevention of TBI and managing children who have sustained a TBI. Not all undergraduate programs address TBI in children (Levin, 2004). The inclusion of TBI in an undergraduate physiotherapy program will raise awareness of the needs of this diagnostic group in a South African context within the profession; individuals who have a committed interest in TBI can thereafter consider specialisation in this field (Levin, 2004).

Neonatal Physical Therapy

Physiotherapists specialising in neonatal care have the opportunity to treat the musculoskeletal system of infants in the intensive care unit (ICU) and to support parents in optimising infant brain development during their neonatal intensive care unit (NICU) stay. Collaboration with caregivers to participate in rehabilitative programmes can decrease the risk of skull deformities, torticollis, and extremity malalignment. By creating a developmentally supportive environment with modulated sensory input from light, noise and handling, the recovery of the neonate is optimised and the risk of adverse effects is reduced (Sweeney *et al*, 2010).

2.6.2 Respiratory conditions

Differences between paediatric and adult cardiovascular and pulmonary systems

Several changes occur in cardiac muscle fibres (myocytes) during development which allow the mature myocyte to contract with more force. Although there is no increase that occurs in the number of myocytes as the heart grows, the cross sectional area of fibres increase. The heart rate and stroke volume of infants and young children are different to that of adults. The stroke volume of a newborn is only three to four ml; whereas adults have a stroke volume of 40ml. Children compensate for the smaller stroke volume by demonstrating higher heart rates than adults (Martin, 2002).

The ribs of a newborn primarily consist of cartilage and are in a horizontal position, giving the lower thorax a circular dimension. The diaphragm and other ventilatory muscles consist of more type IIa muscle fibres, affecting muscle strength and endurance. The structural immaturity of the thorax combined with the lack of development and control of ventilatory muscles, prevent the infant from stabilising the rib cage and effectively using the diaphragm during respiration. Increased movement of the head and upper limbs enhances muscle use and expansion of the upper chest in breathing. As the infant learns to assume antigravity positions, the force of the developing abdominal musculature pulls the ribs downward into a more angular position. This angular position not only expands the thoracic cavity, but also allows the intercostal muscles to work more efficiently. With growth of the rib cage, the diaphragm is pulled into a dome shape that enhances the length-tension relationship of the muscle and improves function. Only a small percentage of the total number of alveoli to be developed, are present at birth. New alveoli continue to develop until approximately eight years of age (DeCesare & Graybill, (1991) in Martin (2002)). The bronchioles and alveoli of infants and young children are weaker and less efficient than those of adults. Smooth muscle in the walls of bronchioles do not develop until the child is three to four years. As a result, the airways are more susceptible to collapse. There is also an absence of collateral ventilation mechanisms in children which may increase the risk of infection and atelectasis (Martin, 2002).

Cardiopulmonary diagnoses managed by physiotherapists

The majority of acute illnesses in children are due to pulmonary complications. Pulmonary disorders affect all age groups and could be due to infective, neurologic, muscular, skeletal, or cardiac anomalies. An increased survival of premature infants has resulted in an increased incidence of chronic lung disease (Gould, 1991). Physiotherapy is an important part of ensuring airway clearance in respiratory conditions such as cystic fibrosis, bronchiectasis and neuromuscular disease. The role of physiotherapy in acute respiratory diseases in previously healthy children has not been proven to be beneficial (Boeck *et al*, 2008).

There is little evidence that airway clearance techniques play a role in the management of children diagnosed with an acute respiratory problem. The aim of chest physiotherapy during an acute infection is to enhance airway clearance, and therefore improve breathing mechanics and gaseous exchange. A variety of techniques are employed by physiotherapist to clear airways; namely: chest wall clapping, percussion, postural drainage, manual chest compression during expiration, autogenic drainage, active cycle of breathing, manual cough assistance techniques, devices to promote huffing, high frequency chest wall compression, intrapulmonary percussive ventilation, oscillatory devices such as a flutter and a positive expiratory pressure mask (Boeck *et al*, 2008).

Bronchiolitis

Bronchiolitis is a common viral lower respiratory tract infection in young children (Perotta *et al*, 2008). A systematic review conducted by Perotta *et al* (2008) confirmed that physiotherapy was not indicated in the treatment of acute uncomplicated bronchiolitis in children.

Pneumonia

Pneumonia is defined as an inflammation of the lung parenchyma that is most commonly caused by microorganisms. There are currently no studies assessing the role of airway clearance techniques as an adjunctive treatment for pneumonia. From the existing evidence, a positive effect was never shown and one study reported a significantly longer duration of fever in the group treated with vibration, percussion

and postural drainage (Boeck *et al*, 2008). Acute pneumonia in previously healthy children affects peripheral airways in the consolidation phase of pneumonia. Only in the resolution phase do moderate amounts of secretions appear in the airways and would make chest physiotherapy an appropriate intervention (Boeck *et al*, 2008).

Acute Severe Asthma

Asthma is a common childhood disease that may result in severe restrictions in childhood activities. The role of the physiotherapist in treating children diagnosed with asthma is to present strategies that allow affected individuals the opportunity to play and compete in age appropriate activities (Massery & Magee, 2006). A well designed randomised control trial concluded that chest physiotherapy techniques to help clear secretions, achieve relaxation, minimise ineffective breathing movements and optimise drug therapy did not improve lung function in children diagnosed with asthma (Asher *et al*, 1990).

Atelectasis

Atelectasis is a partial or total collapse of a lung segment or lobe. Causes of atelectasis include foreign body aspiration, external airway compression, exacerbations of asthma, chest wall deformation, and mucous plugging during artificial ventilation. Recent studies have reported on the use of intrapulmonary percussive ventilation via a face mask to treat atelectasis. A prospective randomised control trial in intubated ventilated patients showed an improvement in atelectasis in the percussive ventilation group but not in the group receiving chest clapping and vibration (Deakins & Chatburn, 2002).

Children treated with mechanical ventilation

Although chest physiotherapy, in children beyond the newborn period, was previously considered to be the standard therapy in mechanically ventilated patients; research has shown that manual chest percussion in ventilated patients is a stressful process causing an increase in oxygen consumption, heart rate, blood pressure and intracranial pressure ((Horiuchi *et al* (1997) & Mackenzie & Shin (1985)).

If physiotherapy is prescribed to clear airways in previously healthy children care must be taken not to inflict harm on the patient. Due to the unstable compliant nature

of an infant's chest wall, infants are prone to atelectasis and respiratory insufficiency. Ventilation perfusion matching of an infant differs to that of an adult. When side lying an infant breathes with the uppermost lung whereas an adult will ventilate the dependant lung (Davies *et al*, 1992). An infant's airway wall is more labile resulting in hyperresponsiveness (Clarke *et al*, 1992). Little research is available on the effect of newer airway clearance techniques. Some case reports on chest physiotherapy in infants feature decreased oxygen saturation, increased oxygen consumption, gastro-oesophageal reflux, fractured ribs, increased intracranial pressure and even brain injury (Hess, 2002).

Physiotherapists need to channel limited resources in order to treat diagnoses that are more likely to benefit from physiotherapeutic intervention. Children with chronic lung disease such as suppurative lung disease (cystic fibrosis, primary ciliary dyskinesia, bronchiectasis) and children with neuromuscular disease who have restrictive lung disease and ineffective cough are more likely to benefit from airway clearance techniques than previously healthy children with acute respiratory disorders. However airway clearance techniques might benefit certain previously healthy children with acute lung disease who have particular problems clearing secretions; and if these secretions contribute to the increased work of breathing and gaseous exchange disturbance. If a positive result is noted in these selected individuals after a trial session, airway clearance techniques can be commenced on an individual basis. Physiotherapists need to be in contact with the referring physician to question the basis of referral of previously healthy children with acute respiratory disease for airway clearance (Boeck *et al*, 2008).

Possible tasks for the physiotherapist in the care for children with acute respiratory disease

Due to the special expertise of physiotherapists working with respiratory care in paediatrics; they can assume specific tasks in the care of general paediatric patients with acute respiratory disease. Teaching and supervising the correct inhalation therapy of asthma drugs via nebulisers, spacers and dry powder inhalers, instructing on the appropriate hygienic use of inhalation material, and principles of oxygen therapy, are important roles for physiotherapists to assume in a South African

context as there are limited numbers of asthma nurses and respiratory specialists (Boeck *et al*, 2008).

Research into the area of the role of physiotherapy in enhancing airway clearance in previously healthy children with acute lung disorders is limited. The reasons for the limited research available are due to difficulty in defining a homogenous patient group, the variety of devices and techniques available, variability that exists in operator expertise and difficulty in defining comparison treatments or blind control groups. Almost all children with normal lung defence mechanisms and normal chest wall function recover completely after an acute respiratory illness (Boeck *et al*, 2008).

Physiotherapy in the prevention of pulmonary complications in paediatric cardiac surgery

The physiotherapist plays a major role in the rehabilitation of children with congenital heart disease. A large part of this role involves parent educating and strategies to enhance parent-child interaction (Howell & Hill, 2006). Pulmonary complications are the most common causes of morbidity and mortality post heart surgery. Physiotherapists are involved with mobilizing secretions, increasing aeration and increasing general mobility. Percussions and vibration can be used to assist in mobilisation of secretions and can be performed in conjunction with postural drainage. Positioning must be used with caution in the post operative patient (Howell & Hill, 2006).

The postoperative cardiac patient should be mobilized as soon as possible to minimise adverse effects of retention of secretions and neuromuscular complications of immobility. Neurologic consequences may occur post surgery and would require long term physiotherapy. In infants with congenital heart disease, poor feeding, poor growth, and developmental delay can lead to impairment and activity limitations. The presence of congenital cardiac defect is significantly associated with mental and motor developmental delay (Howell & Hill, 2006).

Physical activity is important for all children, including children with congenital heart disease. The defect and surgical intervention, as well as any influence that the defect may have on exercise tolerance must be understood before prescribing an exercise programme for a child with a congenital heart defect (Howell & Hill, 2006).

Cystic Fibrosis

Cystic Fibrosis (CF) is an autosomal recessive heredity disease. The primary physiologic abnormalities in CF includes a blocked exocrine gland function due to obstruction by hyperviscous liquid and an increased susceptibility to infection by specific groups of bacteria. Professional intervention in the management of cystic fibrosis is usually concentrated in CF clinics. Physiotherapists play an important role in management programmes for children with cystic fibrosis. Improved self-efficacy care may prove to enhance the effectiveness of treatment and help to prevent or delay the onset of this disorder (Agnew *et al*, 2006).

Gaskin *et al* (1998) in Agnew *et al* (2006) found that Positive Expiratory Pressure (PEP) therapy is a valid alternative to conventional physiotherapy. In acute exacerbations, both PEP mask therapy and conventional chest physiotherapy showed some evidence of improving pulmonary function scores (Agnew *et al*, 2006).

2.6.3 Neuromusculoskeletal

Differences between paediatric and adult neuromusculoskeletal systems

Early childhood represents a period of bone growth, modelling and remodelling. The epiphysis is an active site for new bone development and plays a vital role in skeletal development. Fractures of the epiphyseal plate can interfere in bone growth, resulting in either asymmetric bone growth or the termination of growth. Growing bone is more susceptible to both compressive and tensile stresses. Greenstick fractures and apophyseal avulsion injuries are common in young children. The periosteum is thicker than in adult bone resulting in the occurrence of less displaced fractures (Martin, 2002). Physiotherapists need to be aware of the differences that exist between the neuromusculoskeletal systems of paediatric and adult patients, as this will influence the type of injuries, the process of healing and the expected rate of recovery in the children as compared to adults.

Haemophilia

Haemophilia is the term used to identify several X-linked disorders of blood coagulation. Haemorrhages may occur anywhere in the body but the most common

sites are joints, followed by muscles. Physiotherapy for the child with haemophilia is aimed at maintaining strength and ROM in all joints and at preventing and reducing disability (McGee, 2006). Hilberg *et al* (2003) in McGee (2006) demonstrated that a program of core stabilization and lower extremity proprioceptive training can significantly improve performance on single limb stance tests.

Spinal Conditions

Physiotherapists play a vital role in the detection and treatment of spinal conditions. Spinal deformities are classified according to aetiology, location, magnitude and direction. They may be idiopathic, congenital or neuromuscular in origin (Patrick, 2006).

Scoliosis

Detection of scoliosis is made by identification of trunk, shoulder or pelvic asymmetries. Non surgical interventions for scoliosis include exercise and orthotic treatment. A home exercise program involving trunk and pelvic strength and flexibility is prescribed for children with idiopathic and congenital scoliosis (Patrick, 2006).

Adolescent scoliosis has been shown to cause abnormalities in rib cage configuration that impedes lung function.

Low Back Pain

Recent epidemiological studies indicate that Low Back Pain (LBP) is more common amongst children and adolescents than previously thought. Referral to physiotherapy services in the paediatric population is relatively low. Back pain in this population is usually viewed as a typical experience associated with growth. The clinical presentation of back pain differs to adults with respect to history, physician diagnosis, and physical examination findings. In a study conducted by Clifford & Fritz (2003), all the pathological lesions in children and adolescent with lower back pain were due to spondylolitic lesions. Children and adolescents were also found to have a decreased ROM into extension, unlike the decreased range of flexion as noted in adults. The physical examination findings suggest that spinal stabilization exercises may be beneficial in these patients (Clifford & Fritz, 2003).

Sports Injuries in Children

An increase in sport participation in the paediatric population has increased the risk of sports related injuries in children. The type and location of injuries in children differ to that of adults. Children need to have the appropriate physiologic conditioning, strength and flexibility to participate safely in sport (Bainbridge, 2006).

Several factors pose as risk factors for injury in children. The epiphysis is more susceptible to injury and may shear or fracture e.g. avulsion fractures of the anterior cruciate ligament. Decreased limb length and angular deformity are common sequelae of epiphyseal fractures. Children are also more prone to muscle-tendon injuries. Irritation of the insertion of the musculotendon unit can cause pain and inflammation. Osgood-Schlatter disease results from a longitudinal traction of the quadriceps muscle on the tibial tubercle. Sinding-Larsen Johannson disease occurs at the inferior pole of the patella (Bainbridge, 2006).

The most common lesions in the lumbar spine are spondylolysis and spondylolisthesis (Bainbridge, 2006). Supracondylar fractures are the second most common fracture in the skeletally immature client. They are a result of increased forces into extension.

Keppler *et al* (2005) conducted a study to examine the effectiveness of physiotherapy after operative treatment of supracondylar humeral fractures in children. They concluded that postoperative physiotherapy is unnecessary in children with supracondylar fractures without neurovascular injuries as there was no difference in elbow ROM one year post trauma. The study did not take into account that at 12 and 18 weeks post trauma, the patients who had received physiotherapy achieved significantly greater ROM. The primary goal of physiotherapy is to enable an individual to achieve normal functioning as soon as possible. Therefore, even if ROM scores were the same one year post injury, the group that received physiotherapy improved ROM faster and would therefore be indicative of the effectiveness of physiotherapy.

2.6.4 Other

Burns

Burn injuries are classified according to the depth of tissue damage as either superficial, partial or full thickness. Deeper burns may affect fascia, muscle or bone. The position of comfort for most patients is flexion of the joints. A continued flexed posture permits new collagen fibres in the wound to fuse together resulting in the formation of a contracture (Moore & Robinson, 2006). The adverse effects of scar contractures can be reduced by the following interventions: patient positioning and use of splints, ROM and graded resistive exercises, early ambulation, scar management techniques and patient and family education regarding skin care and rehabilitation programme. Structured exercise programmes are required to prevent secondary complications. Compared to adults, children experience increased pain during exercises. Physiotherapy for children with burns should begin at the time of the injury and may extend for several years after the initial hospitalization (Moore & Robinson, 2006).

HIV

HIV has been a major contributing factor to morbidity and mortality in the paediatric population in South Africa. Three conditions commonly found in HIV infected children are Pneumocystis jerovecii pneumonia (PJP), Lymphoid interstitial pneumonia (LIP) and Developmental Delay and HIV encephalopathy. PJP results in diffuse alveolar damage and pneumonitis. It is a progressive disease; a worsening diagnosis is seen by tachypnoea, dyspnoea and cyanosis which are all indicative of hypoxemia. Death is inevitable in all cases of PJP. The role of physiotherapy in PJP management in South Africa is the collection of induced sputum to assist in diagnosis, education of the caregivers on the progression and home management of the disease, management of acute dyspnoea, preventing secondary infections and optimising functional abilities (Potterton & Van Aswegen, 2006). LIP is a slowly progressive interstitial lung disease (Coovadia & Meyers (2001) in Potterton & Van Aswegen(2006)). The child presents with tachypnoea, a productive cough, wheezing, hypoxemia and right sided heart failure. Signs of chronic respiratory disease become apparent over time. Research is required to investigate the role of physiotherapy in the management of this chronic respiratory condition. Possible roles

of physiotherapy could be optimising bronchial hygiene, improving ventilation, reducing the risk of secondary pulmonary complications and formulating a monitored exercise programme (Potterton & Van Aswegen, 2006).

HIV is known to cause neurological damage through a number of mechanisms. Neurological damage results in HIV encephalopathy which affects gross motor development (Hilburn *et al*, 2010). Developmental delay may be the first sign of HIV infection. It may present as mild delay without neurological signs or overt signs of neurological involvement. A family centred approach that addresses functional impairments in the child may be appropriate in improving the marked developmental delay seen in these individuals (Potterton & Van Aswegen, 2006). HIV encephalopathy presents physiotherapists with an important role in the paediatric HIV setting. Physiotherapists are able to use well-designed standardized neurodevelopmental tests and clinical objective testing to detect the presence of HIV encephalopathy in children. Early identification will assist in the referral of children for intervention and can provide an additional criterion for the initiation of HAART therapy (Hilburn *et al*, 2010).

Paediatric Palliative Care

Advances in paediatric medicine have led to increased survival rates in children with serious physical illnesses and disabilities. Attention has been shifted from dealing with mortality to coping with morbidity (Helders *et al*, 2003). Paediatric palliative care has emerged as a specialized area of practice and involves not only the management of symptoms but also the psychosocial and spiritual needs of the child and family through death and bereavement (Price & McNeilly, 2006). As the profile of illnesses have changed resulting in an increased number of children requiring palliative care, students need to be prepared to cope with the increasing demand of long term patient care. Course content should include ethical issues in paediatric palliative care, communication with children and families, bereavement, support services, symptom control and spiritual care (Price & McNeilly, 2006).

Pain

The pain experience of children involves an interaction of physiologic, psychological, behavioural, developmental and situational factors. Although a large amount of literature describes how to evaluate and treat acute pain in children using low-cost, convenient and safe methods, this information is seldom applied. It is imperative that paediatric specialities address all types of pain: whether it is acute, chronic, recurring, procedure related or palliative in nature. The myths and barriers that hinder effective pain control in children include: the lack of pain assessment measures in the paediatric population, lack of knowledge of pain treatment and the myth that children do not feel pain the way adults do. Effective pain management involves an interdisciplinary approach of a combination of pharmacologic, cognitive-behavioural psychological and physiotherapy. Complementary approaches such as massage and heat can be used to decrease pain in certain situations (American Academy of Pediatrics & American Pain Society, 2001).

Chronic pain is a condition that affects many children and adolescents. Evidence gained via cohort follow up studies, retrospective chart reviews and one randomised control trial support evidence for the use of physiotherapy in interdisciplinary treatment for the management of the paediatric patient diagnosed with chronic pain (Campos *et al*, 2011).

2.7 Levels of evidence supporting physiotherapy intervention

2. 7.1 Evidence Based Practice (EBP)

The physiotherapy profession has been criticised for not using available research to inform clinical decision making. Practice has previously relied heavily on anecdotal evidence. Physiotherapists have a moral, professional and ethical obligation to provide evidence based services. Physiotherapists placed in settings not affiliated with teaching or research institutions face challenges in accessing relevant scientific evidence. Time constraints also hinder the usage of EBP in clinical practice. Evidence based practice needs to be emphasised in training despite constraints as it

would aid in increasing confidence in clinical decision making, improve effectiveness in interventions and enhance the stature of the profession. Evidence based practice should be incorporated into content areas of undergraduate curricula to ensure that new graduates practice from well researched guidelines that they can implement in their daily routine (Schreiber *et al*, 2009).

The knowledge and skills gained through undergraduate physiotherapy education form the basis for lifelong professional practice. Evidence based practice has become a key requirement for entry level practice. New graduates are therefore expected to apply an evidence based approach to practice. Universities are encouraged to incorporate the principles of evidence based practice into undergraduate curricula. Curricular content has to depend on both clinical practice as well as research evidence (Chipchase *et al*, 2008). Research involving physical therapists working with children with disabilities and their families needs to be accessed to validate assessment and intervention procedures. New and existing training materials and curricula should be evaluated to assess their effectiveness in preparing therapists to work with paediatric patients requiring rehabilitation services.

2.7.2 Levels of evidence

The US agency for Healthcare and Research categorised the levels of evidence (LOE) of a particular article of research as follows:

1a - a well done systematic review

1b - at least one randomised control trial

IIa - at least one well designed study without randomisation

IIb - at least one type of quasi – experimental study

III - well designed non-experimental descriptive studies such as comparative studies, correlation studies and case studies

IV - expert committee reports or opinions and/or clinical experiences of respected authorities

The above method of categorisation will be used to assess the current status of the level of evidence available with regards to the physiotherapy interventions available in some of the diagnoses managed by physiotherapists under section 2.6.

The following table aims to highlight the current levels of evidence that exist in the physiotherapeutic interventions available in treating various paediatric diagnoses.

Level III was the lowest level of evidence that existed in the literature that was reviewed. The studies conducted by Kane & Bell (2009), Tepas *et al* (2009) and Bogdan *et al* (2011) all indicated that physiotherapy was effective in treating the diagnoses of DCD, TBI and CF respectively. Since these articles were rated as level III, a higher level of evidence is required to conclusively prove that the interventions mentioned in the above articles are effective in the management of these diagnoses.

Level IIb was the next lowest level of evidence that existed in the literature that was reviewed. Although the study conducted by Dos Santos Alves *et al* (2006) revealed positive results in the physiotherapy management of scoliosis, again, a higher level of evidence is required to support the promotion of utilizing physiotherapy in the treatment of this diagnosis.

The study conducted by Da Silva Santos *et al* (2009) was rated as a IIa level of evidence. As with the level III and IIb levels of evidence mentioned above, even though effectiveness was seen in the physiotherapy management of pneumonia in paediatric patients, a higher level of evidence is required to conclusively prove that physiotherapy intervention is effective in the management of pneumonia.

The majority of articles that were analysed were rated as level Ib level of evidence. One article which described routine physiotherapy post extubation in NICU revealed that physiotherapy was ineffective (Bagley *et al*, 2005). Five articles which conducted randomised controlled trials to investigate; the role of massage on preterm infants in the NICU, the role of exercise in reducing lower back pain in teenagers, preoperative physiotherapy in paediatric cardiac patients, a home stimulation program on the cognitive and motor development of children infected with HIV and the effect of purposeful activity on hand function in paediatric burns; all concluded that physiotherapy was effective in these particular diagnoses (Hernandez-Reif *et al*, 2007; Felcar *et al*, 2008; Fanucchi *et al*, 2009; Potterton *et al*, 2010 & Omar *et al*, 2012). The results of two articles which investigated the role of physiotherapy in CP and the effects of physiotherapy on the motor performance of infants who were very preterm with very low birth weights, concluded that the randomised controlled trials that were conducted were inconclusive in determining whether physiotherapy was effective in these two diagnostic groups (Anttila *et al*, 2008 & Cameron *et al*, 2005).

Systematic reviews are rated as a Level Ia level of evidence; and are considered to be the highest level of evidence. Because systematic reviews locate as many articles as possible relating to a particular topic and thereafter analyse the quality of the articles that were chosen, conclusions that are drawn from good quality systematic reviews can be safely applied to clinical practice. One study that was retrieved which evaluated the effect of chest physiotherapy on acute bronchiolitis concluded that chest physiotherapy was ineffective in this patient group (Perotta *et al*, 2007). Three systematic reviews which investigated; the effect of infant positioning in neonates receiving mechanical ventilation, the efficacy of chest physiotherapy for cystic fibrosis and role of exercise and sport in the treatment of patients with haemophilia; concluded that physiotherapy was effective in the management of these diagnoses (Balageur *et al*, 2009; Van de Schans *et al*, 2009 & Gomis *et al*, 2009). Three studies which investigated the effectiveness of physiotherapy interventions on functioning in children diagnosed with CP; the effectiveness of developmental intervention in the neonatal intensive care unit; and the effectiveness of physiotherapy in treating children with LBP; concluded that due to limitations in methodological quality, variations in population interventions and outcomes, limited evidence existing on the effectiveness of physiotherapy interventions through large, well-designed randomised control trials, and limited research regarding physiotherapy treatment in children and adolescents; more research is needed to conclusively prove the effectiveness of physiotherapy in certain diagnoses in the paediatric population. Systematic reviews that concluded that evidence was inconclusive, concluded that more research of a higher quality needs to be conducted as current evidence is inconclusive regarding the role of physiotherapy in these diagnoses ((Anttila *et al*, 2008; Mahoney & Cohen, 2005 & Kosseim *et al*, 2008).

2.8 The Clinical Practice Improvement (CPI) approach

Although randomised control trials are considered the highest level of evidence to base practice on, these designs are difficult to complete due to small numbers of potential consenting individuals, difficulty in matching control and treatment groups and ethical confines that accompany the use of children with disabilities in clinical research. The proof of effectiveness of therapeutic interventions is still of great value to children with disabilities, their families, healthcare payers, the physiotherapy profession and society. Although the analysis of diagnoses treated by physiotherapists in section 6.1 revealed pathology whose clinical picture can be managed by physiotherapy, there is currently very little evidence of good quality available that supports the role of physiotherapy in the management of these diagnoses. The Clinical Practice Improvement (CPI) approach is being employed to ascertain which aspects in the management of paediatric patients needs to be further investigated via randomised control trials. The CPI approach provides a naturalistic view of management modalities currently being used by examining what is actually happening in clinical practice. An inducted, bottom up approach is used in the CPI model which asks front line practitioners to describe and categorise what they actually do in therapy. This information may then be organised to characterise the management options available in paediatric physiotherapy. The CPI has the ability to uncover best practices which can later be tested in validation studies. Unproductive interventions can be disregarded, so that time is not wasted on further investigation. Using the CPI model, the Pediatric Physical Therapy Intervention Activities (PPTIA) data form was developed to determine which modalities paediatric physiotherapists are actually employing in the management of paediatric patients (Hashimoto & McCoy, 2009).

Certain diagnoses reviewed in the literature, such as cerebral palsy, cystic fibrosis, haemophilia, spinal conditions, clubfoot and burns displayed a strong evidence to support physiotherapy intervention. Research of a higher level of evidence still needs to be conducted in order to support the role of physiotherapy in the management of other conditions such as DCD and oncology. Diagnoses that are discussed in the literature as having a strong evidence base for the efficacy of physiotherapy as well

commonly seen in the statistics of paediatric patients referred to the physiotherapy department should definitely be included in the curricula of the three universities.

2.9 Standardised Assessment tools used by physiotherapists

Paediatric rehabilitation has been transformed into a mature profession with its own scientific framework. There are an increasing number of paediatric measures and instruments developed specifically for the paediatric rehabilitation profession. Standardised measures are conducted as part of the assessment process to identify possible delay or abnormality in development. The purpose of testing, characteristics of the child, reliability and validity of the measure are all factors that need to be taken into account when administering a standardised measure (Tieman *et al*, 2005).

Several factors influence the selection of a particular measure. They include the purpose of conducting the assessment, the characteristics of the child (age and functional capabilities of the child), developmental or functional areas to be assessed (Gross motor, fine motor, cognition, self-care play or functional mobility), setting in which the examination will occur (child's natural environment, rehabilitation clinic or inpatient hospital), and the external constraints of testing (time available to administer the test, examiner training, space and equipment required, and the cost of purchasing the measure). Evidence of reliability and validity are also important factors that influence the selection of a measure. A therapist has to be trained in using the measure in order to administer it correctly and score it accurately (Tieman *et al*, 2005).

Five measures are commonly used to measure motor development and function as they have evidence of reliability and validity. The Bayley Scales of Infant Development II consist of a mental scale (language and perceptual), motor scale (gross and fine motor), and behavioural scale. The purpose of this scale is to identify children between the ages of one month to three and a half years with developmental delay. Normative data has also been collected on high risk children with Down syndrome, prematurity, HIV and prenatal drug exposure. The scale however does not differentiate between gross and fine motor development and does not provide a comprehensive measure of motor development. Items are not scores

for emerging ability. The motor scale of the BSIDII is a valid discriminative measure that is able to identify motor delay in young children. The Peabody Developmental Motor Scales II measures gross and fine motor skills in children younger than six. The PDMS – 2 has excellent reliability and validity as a discriminative measure. Separate scores are obtained for gross and fine motor development. The Pediatric Evaluation of Disability Inventory is a measure designed to identify functional limitations and record progress in children with disabilities. Functions important for daily living are evaluated. The PEDI can be used as both a discriminative or an evaluative measure. The PEDI is administered via structured interview with the parent or observation of the child. The Gross Motor Function Measures an evaluative measure designed to measure change over time in children with cerebral palsy. The GMFM can be used for clinical decision making and intervention planning (Tieman *et al*, 2005).

The purpose of developmental screening is to identify children who appear to have delayed development and hence aid in appropriate referral. Developmental screening tools include several domains and should be relatively short and inexpensive to administer. A child who exhibits delayed motor development can be referred to a physiotherapist for further examination (Tieman *et al*, 2005).

Validated and standardised neurodevelopmental assessments are vital in a South African setting as it can aid in the identification of early warning signs of HIV associated CNS disorders and provide a means of standardised assessment of paediatric HIV care. Standardised neurodevelopmental assessments can assist in the initiation of highly active anti-retroviral therapy(HAART) at the appropriate time as well as aid in the prevention and management of HIV associated neurological impairment. Due to a shortage of staff and a lack of validated assessment tools, neurodevelopmental assessments are rarely performed in developing countries. The development and administration of gross motor assessments in a South African context is more appropriate than tools used to assess than cognitive function. Cognitive function tools require a large range of costly equipment, requires more time to administer, and more skill to identify subtle responses. A difficulty emerges in communication due to the large number of languages spoken and the different cultures that exist in South Africa. Gross Motor function is easy to assess, as no

equipment is required as budgets cannot cater for expensive equipment required for assessments (Hilburn *et al*, 2011).

HIV infected children are at risk for developmental problems from an early age. A screening tool in a South African setting is essential for detecting neurodevelopmental delay and therefore allow for adequate referral. A screening tool also assists in the initiation of certain pharmaceutical therapies; a screening tool that can identify neurodevelopmental delay provides an additional assessment for the initiation of HAART in HIV infected children (Hilburn *et al*, 2011). The Infant Gross Motor Screening Tool (IGMST) is a standardised gross motor developmental screening tool, for use in HIV infected infants between six and 18 months of age, which is suitable for use in developing countries. The statistical properties of the IGMST; the validity, reliability and diagnostic properties; are excellent and are suitable for use within the HIV paediatric setting in South Africa. The IGMST is an easy to administer, short assessment tool that can be administered by doctors or nurses at HIV clinics to make referral to appropriate rehabilitation services possible (Hilburn *et al*, 2011).

2.10 Conclusion

Undergraduate physiotherapy training not only produces students with discipline specific knowledge and skills but also a range of generic skills (e.g. problem solving, research, interpersonal and self-directed learning skills) (Higgs *et al*, 1999). Physiotherapy education needs to equip graduates with four levels of professional competence: technical competence (generic and discipline-specific), interpersonal competence, the ability to interact with and change the context of practice, and the capacity to demonstrate professional responsibility in serving and enhancing society (Higgs *et al*, 1999).

Chapter 3: METHODS

In this chapter, the methodology used in this research paper will be presented.

3.1. LOCATION

This study included feedback from three universities; the University of the Witwatersrand, the University of Limpopo and the University of Pretoria. The Chris Hani Baragwanath hospital was chosen as the institution wherein the statistics of the paediatric diagnoses treated by physiotherapists could be analysed. This institution provides training for newly qualified physiotherapists, during their community service year, from across South Africa and provides exposure to a variety of diagnoses, due to the large number of patients seen by health care professionals at the institution.

3.2 ETHICAL CONSIDERATIONS

Prior to the commencement of data collection, ethical clearance was obtained from the Committee for Research on Human Subjects of the University of the Witwatersrand (Clearance number: M10906) (Appendix I)

Consent was received from the head of physiotherapy from each university to participate in the study as well as the superintendant of the Chris Hani Baragwanath hospital to use the 2010 statistics of paediatric patients seen by physiotherapists. Questionnaires received from the three universities were anonymous.

3.3 SAMPLE SELECTION

A sample of convenience was selected due to the close proximity of the three universities to the Chris Hani Baragwanath hospital. Due to the large number of admissions to the Chris Hani Baragwanath hospital – the patient profile examined via the statistics would represent most of the diagnoses a physiotherapist will encounter in a South African setting.

3.4 METHODOLOGY PHASE 1 (PAEDIATRIC STATISTICS)

3.4.1 Study Design

- A retrospective review of statistics of paediatric patients seen by physiotherapists at the Chris Hani Baragwanath hospital in 2010 was conducted.

3.4.2 Participants

- The paediatric statistics of patients seen by physiotherapists at the Chris Hani Baragwanath hospital in 2010 were analysed.

3.4.3 Procedure

- The superintendant of Chris Hani Baragwanath hospital was contacted for permission to analyse the statistics of paediatric patients seen by physiotherapists in 2010. (Appendix II)
- The statistics of the paediatric diagnoses treated by physiotherapists at the Chris Hani Baragwanath hospital were analysed using a data collection sheet. (Appendix III)
- Data were analysed from the monthly departmental statistics of physiotherapists working in paediatrics.
- The data collection sheet included subsections of:
  - Total number of patients seen by physiotherapists
  - Total number of paediatric patients seen by physiotherapists
  - Total number of each diagnosis treated by physiotherapists
  - Amount of time spent in treating all patients
  - Amount of time spent in treating paediatric patients

3.5 METHODOLOGY PHASE 2 (CURRICULA CONTENT):

3.5.1 Study Design

Section A - Feedback from questionnaires completed by university lecturers

- A descriptive research design was used by means of a questionnaire to obtain the required data of the paediatric physiotherapy curricula of the three South African universities.

Section B - analysis of the recorded explicit curricula outlines of the three universities

- A retrospective analysis of the 2010 curricula outline of the three universities was conducted.

3.5.2 Participants

Section A

- The paediatric curricula of the physiotherapy departments of the University of the Witwatersrand, University of Pretoria and the University of Limpopo were assessed by means of a questionnaire.

Section B

- An analysis of the actual curricula outline of the paediatric physiotherapy module taught at the three universities was conducted.

3.5.3 Procedure

- Informed consent was obtained from the head of physiotherapy in the physiotherapy departments of the University Witwatersrand, the University of Pretoria and the University of Limpopo; to participate in the curricula analysis questionnaire and to provide a copy of the curriculum of the paediatric module taught at their university. (Appendix IV)

Section A

- A questionnaire, based on the literature review, was formulated to analyse the paediatric content of undergraduate physiotherapy programmes in the three South African Universities. (Appendix VI)
- A draft questionnaire was formulated, which included subsections on: paediatric patient diagnoses, standardised assessment tools, evidence based practice in paediatric physiotherapy and structure of the paediatric physiotherapy module at the respective universities.
- An expert panel, consisting of three physiotherapists working in paediatrics from Rahima Moosa Mother and Child Hospital, Charlotte Maxeke Johannesburg Academic Hospital and Chris Hani Baragwanath hospital, was consulted to determine content validity of the questionnaire. Physiotherapists included in the panel were chosen if they had more than two years of experience working in paediatrics.
- The questionnaire was sent per email to the three universities and was completed by the academic staff responsible for coordinating the paediatric modules at the respective universities.

Section B

- The explicit documented paediatric physiotherapy curricula outlines from the University of Witwatersrand, University of Pretoria and University of Limpopo were analysed under the headings: purpose of paediatric module, outcomes of paediatric module, assessment criteria and topics.

3.6 Statistical Analysis-

Phase 1 (PAEDIATRIC STATISTICS):

- Data were recorded on Microsoft Excel and information was converted to graphs and tables.
- Descriptive statistics were used to analyse the statistics of paediatric patients seen by physiotherapists at the Chris Hani Baragwanath hospital in 2010.

Phase 2 (CURRICULAR CONTENT):

Section A

- Data from the questionnaires were analysed quantitatively.

Section B

- Content analysis between the curricula outlines of the universities was done.

- Comparisons were made between the responses of the lecturers via the questionnaires and the explicit documented paediatric curricula outlines of the three universities. Descriptive statistics were used to analyse the relationship between the lecturer's perspective of the paediatric content of the curriculum and the documented university paediatric curriculum in terms of percentage of the combined data obtained from both the survey and explicit university curriculum of University.

The results from this study will be presented in chapter four.

Chapter 4: RESULTS

In Chapter 4, results of this study are presented.

4.1 RESULTS PHASE 1 (PAEDIATRIC STATISTICS)

The following results represent the paediatric diagnoses treated by physiotherapists at the Chris Hani Baragwanath hospital in 2010.

The following table summarises the proportion of paediatric patients seen at the Chris Hani Baragwanath hospital in relation to the total number of patients seen by physiotherapists in 2010.

Table 4.1 Table to represent the proportion of paediatric patients treated by physiotherapists with regard to number and time in 2010

	Total
Total number of patients seen by physiotherapists	36490
Total number of paediatric patients seen by physiotherapists	8093
Percentage of total number of patients seen at the Chris Hani Baragwanath Hospital that are paediatric patients	22,03%
Total amount of time spent in treating patients (Hours)	149331
Total amount of time spent in treating paediatric patients (Hours)	33101
Percentage of total time spent on treating paediatric patients at the Chris Hani Baragwanath Hospital	22,17%

More than a fifth of patients seen at the Chris Hani Baragwanath hospital were paediatric patients. The time spent treating paediatric patients also comprised more than a fifth of the total time spent on treating patients at the hospital.

The following figure illustrates the most frequently seen diagnoses by physiotherapists in 2010. Exact numbers of each of the top fifteen conditions are included in Appendix XI.

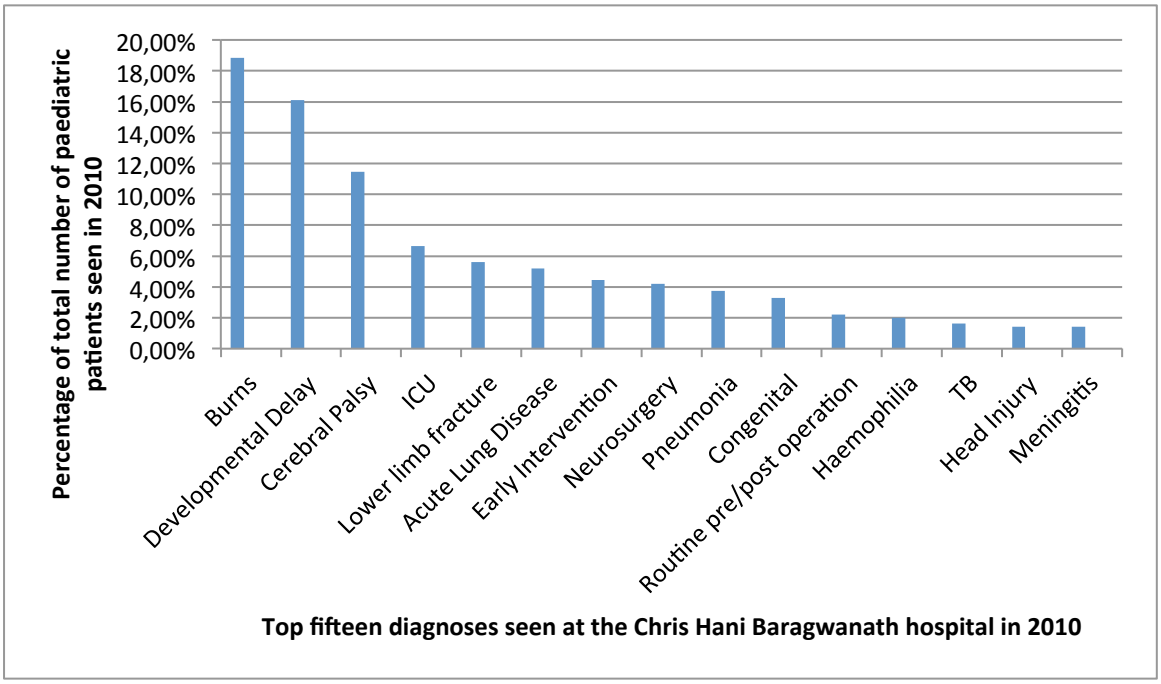

Figure 4.1 Diagram to represent the fifteen paediatric conditions most frequently seen by physiotherapists at the Chris Hani Baragwanath hospital

The above figure clearly illustrates that burns was the most frequently seen diagnosis in 2010.

Note I: The analysis of all paediatric diagnoses seen by physiotherapists in 2010 is included in Appendix X

Note II: Although ICU is not a diagnosis, the category includes all acute chest complications, early mobilisation, acute neurology and acute orthopaedic physiotherapy treatment in an ICU environment

Note III: The term 'congenital' refers to all congenital genetic syndromes resulting in developmental delay and referred for physiotherapy

4.2 RESULTS PHASE 2 (CURRICULAR CONTENT)

SECTION A – Feedback from questionnaires completed by university lecturers

An evaluation of the paediatric physiotherapy curricula content of three South African universities was undertaken by means of a questionnaire to ascertain which aspects of paediatric physiotherapy modules are taught in the curriculum, under the categories:

a - Paediatric patient diagnostic groups
b - Standardised assessment tools
c - Evidence based practice in paediatric physiotherapy
d - Structure of paediatric module in the university curriculum

The paediatric component of the undergraduate physiotherapy degree is coordinated by one lecturer at both University A and University C. The paediatric component of the physiotherapy degree at University B is currently taught as sub-sections of adult modules. The responses of six lecturers were thus analysed for a combined response for University B.
Appendix VII represents the completed questionnaire responses from the three universities.

a – Paediatric patient diagnostic groups

The table below shows the five most important patient diagnostic groups covered at each university as documented from the questionnaires completed by the university lecturers.

Table 4.2 Five most important patient diagnostic groups taught (n=3)

University A	University B	University C
1. HIV 2. Cerebral palsy 3. Developmental delay 4. Acute respiratory conditions i.e. bronchopneumonia 5. Paediatric trauma	1. Fractures 2. Cerebral Palsy 3. Paediatric amputation Arthrogryposis 4. Juvenile Arthritis 5. Paediatric burns	1. Cerebral Palsy 2. HIV/ Aids babies 3. Spina Bifida (Neuromuscular Disorders) 4. Muscular Dystrophies 5. General Paediatrics

All three universities noted cerebral palsy as one of the five most important diagnostic groups taught.

b - Standardised assessment tools

The following graph shows the standardised assessment tools taught at the three universities; as documented from the questionnaires completed by university lecturers.

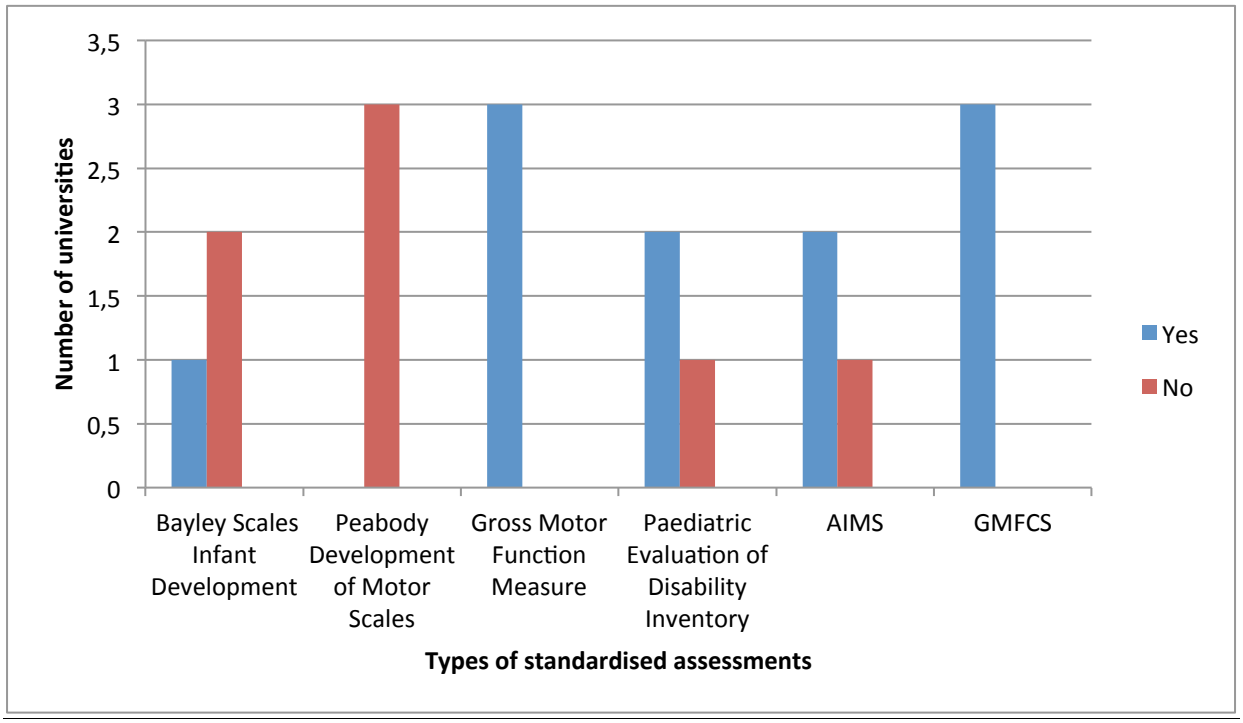

Figure 4.2 Graph to represent the different types of standardised assessments covered at the three universities(n=3)

Only two of the standardised assessments (Gross Motor Function Measure and GMFCS) were covered at all three universities.

The following table documents the five most important standardised assessment tools taught at each of the three universities.

Table 4.3 Five most important assessment tools(n=3)

University A	University B	University C
1. GMFCS 2. GMFM 3. Denver II 4. Infant Gross motor screening test 5. Respiratory assessment	1. GMFM/GMFCS 2. FIM/FAM 3. Barthel Index 4. Ashworth, Berg Scale 5. ICF (especially neurology patients)	1. GMFM 2. GMFCS 3. MACS 4. PEDI 5. WeeFIM

Only University B mentioned including the ICF in its curriculum.

c – Research Orientation

The following table compares the status of the research component of each university as documented from the questionnaires completed by the university lecturers(n=3):

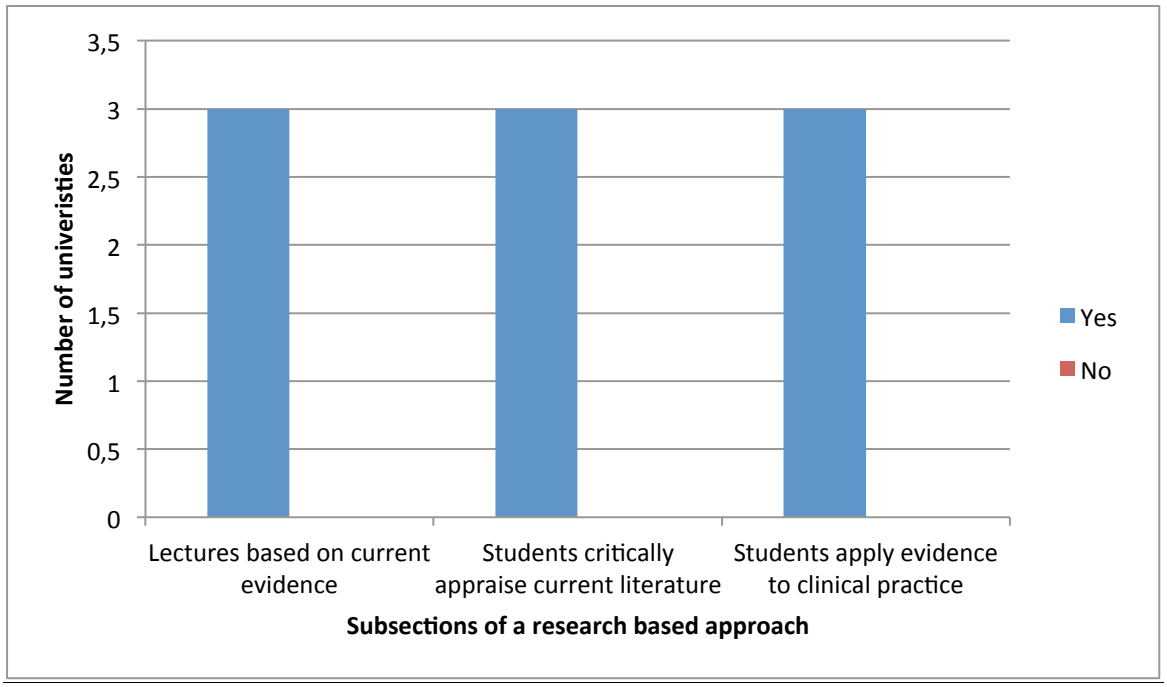

Figure 4.3 Graph to illustrate the extent of incorporation of research based approach in university curricula

All three universities include a research based approach in their curricula.

d - Structure of paediatric module in the university curriculum

University A and C have independent paediatric modules. Paediatrics at University B is incorporated into other adult modules. Six lecturers are involved in the teaching of various components of paediatrics within adult modules at University B.

The following table summarises the structure of the paediatric modules taught at the universities:

Table 4.4 Summary of the structure of the paediatric modules taught at the universities(n=3)

	Percentage
Percentage of the three universities that teach paediatrics as an independent module	66%
Percentage of the three universities that teach the paediatrics within adult modules	33%
Percentage of the three universities that include paediatrics as a required course	66%

Only 66% of the universities teach paediatrics as an independent module.

SECTION B – analysis of the explicit documented curricula outlines of the three universities

The following graph compares the actual curricula outlines of the three universities:

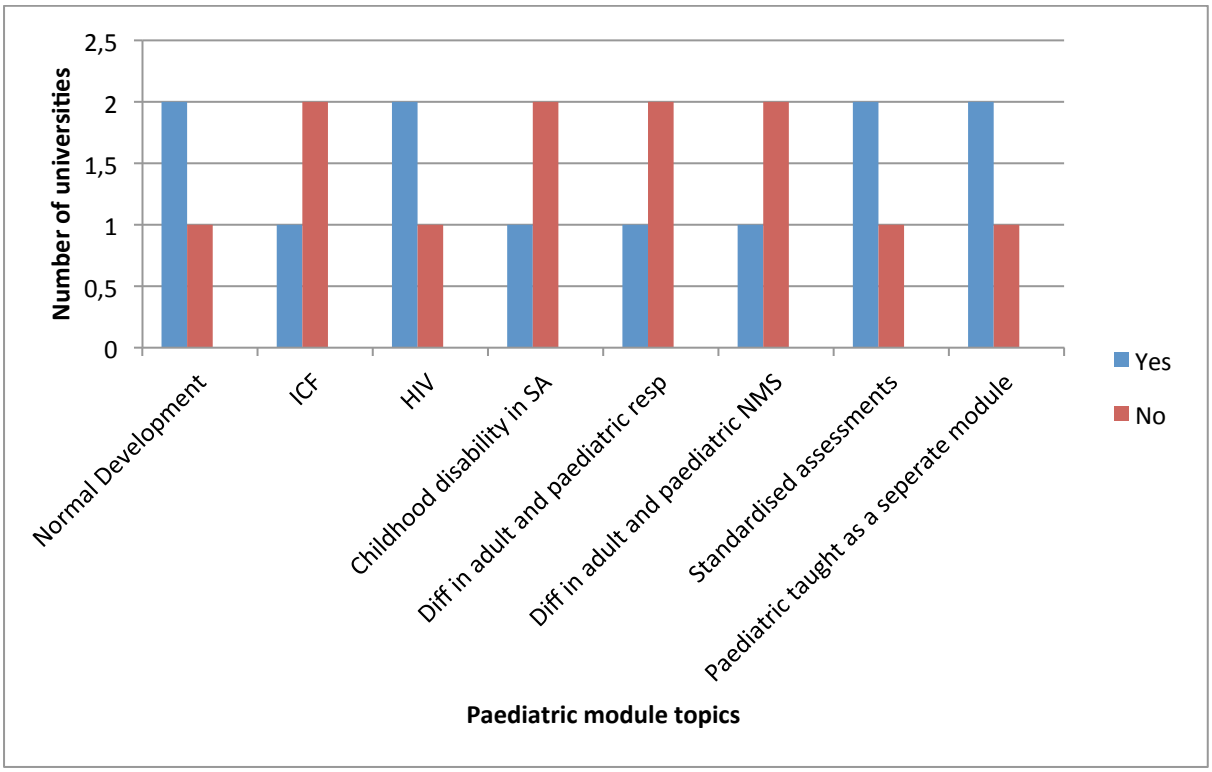

Figure 4.4 Graph to represent whether various paediatric topics were included in the paediatric modules of the three universities (n=3)

There is no topic that is consistently covered at all three universities as recorded in the explicit curricula.

(Note: the complete retrospective analysis of the curricula content of the three universities in included in Appendix VIII)

The following graph illustrates whether the fifteen most common diagnoses seen by physiotherapists at the Chris Hani Baragwanath hospital in 2010 were included in the explicit recorded curricula of the three universities:

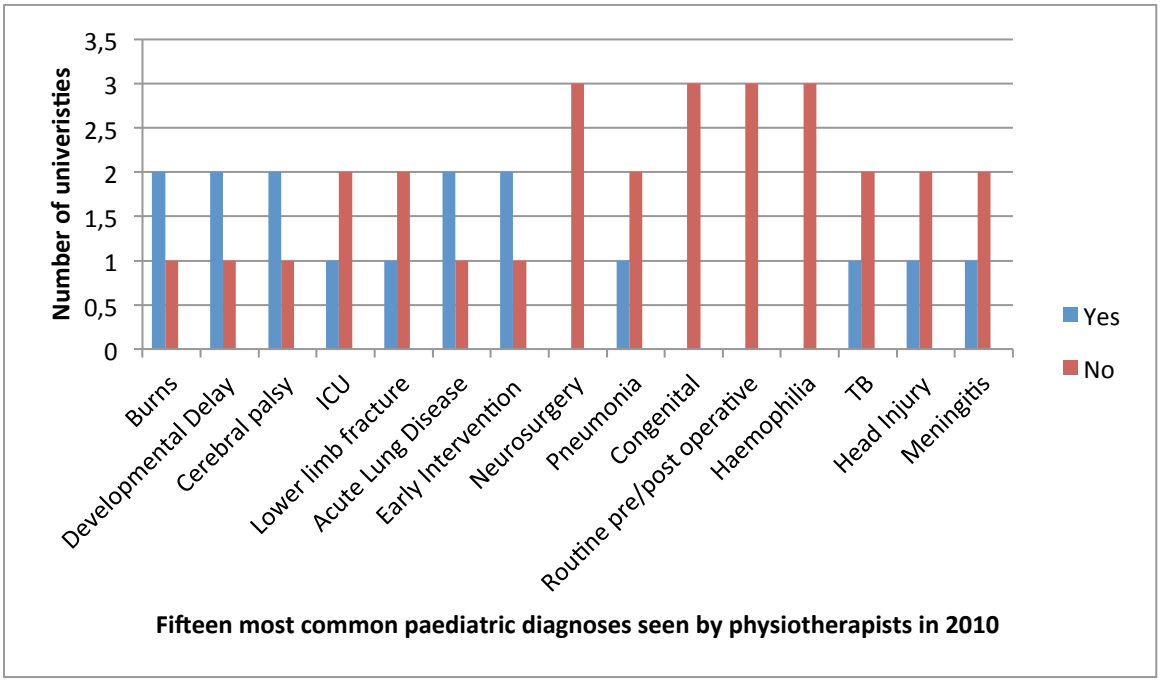

Figure 4.5 Graph to illustrate whether the fifteen most common paediatric diagnoses seen by physiotherapists in 2010 were recorded in the explicit curricula of the three universities (n=3)

Not one of the 15 most frequently seen diagnoses, seen by physiotherapists in 2010, were simultaneously covered by all three universities as recorded by the explicit documented curriculum.

Summary of the explicit documented university curricula outlines

- **University A**

The curricula outline of University A illustrates an independent paediatric module that has appropriate outcomes, topics and assessment criteria for paediatric physiotherapy practice in a South African context. Eleven of the most frequently seen diagnoses at the Chris Hani Baragwanath hospital in 2010 were included in the explicit documented curricula outline of University A.

- **University B**

The curricula outline of University B does not show depth of content in outcomes, assessment criteria or topics with regards to paediatric physiotherapy. Although paediatric topics are meant to be covered within adult modules, no mention of paediatric practice were mentioned in other modules except with regards to burns.

- **University C**

University C had an extensive curricula outline that explained in detail the outcomes, assessment criteria and topics of paediatric physiotherapy within a South African context. Although 30 diagnoses were mentioned in the curricula outline, only three of those diagnoses were included in the 15 most frequently seen diagnoses at the Chris Hani Baragwanath hospital.

The following table analyses the relationship between the lecturer's perspective of the paediatric content of the curriculum and the documented explicit university paediatric curriculum.

Note: A breakdown of the actual content breakdown of the relationship between the lecturer's perspective of the paediatric content of the curriculum and the documented University curriculum paediatric curriculum is included in Appendix IX.

Table 4.5 An analysis of the relationship between the responses recorded via the questionnaires and the documented explicit university curricula outline of the paediatric diagnoses included in the curricula of the three universities (n=3)

	Paediatric diagnoses mentioned in both the questionnaire and university curriculum	**Paediatric diagnoses mentioned in curriculum but not in questionnaire**	**Paediatric diagnoses mentioned in questionnaire but not in explicit curriculum**
Percentage	36,28%	4,94%	58,78%

An analysis of table 4.5 reveals that a difference exists in the paediatric physiotherapy curriculum content that lecturers have reported by means of the questionnaire and the explicit documented curriculum outline. Only 36,28% of diagnoses were concurrently mentioned in both the questionnaire and the explicit documented curricula outlines. Although 4,94% of diagnoses were mentioned in the explicit documented curricula outlines, these were not recorded in the responses received from the questionnaires. The majority of diagnoses (58,78%) were recorded in the responses received from the questionnaire; these diagnoses however were not included in the explicit documented curricula outlines of the universities.

All data concerning curricula content from this point in the data analysis will be extracted from information gained from the questionnaires completed by the paediatric lecturers from the universities and not the actual documented explicit curricula outlines of the respective universities.

Note: HIV will not be included in the analysis; as statistics of HIV were not included in the data obtained from Chris Hani Baragwanath hospital.

The following table compares the five most common diagnoses seen at the Chris Hani Baragwanath hospital by physiotherapists with the five most important diagnoses taught at the universities:

Table 4.6 A comparison between the five most frequent diagnoses seen at the Chris Hani Baragwanath hospital and the five important diagnoses taught at the universities

	Chris Hani Baragwanath hospital	**University A**	**University B**	**University C**
1	**Burns**	HIV	**Fractures**	**Cerebral Palsy**
2	**Developmental Delay**	**Cerebral palsy**	**Cerebral palsy**	HIV/ Aids babies
3	**Cerebral Palsy**	**Developmental delay**	Paediatric amputations Arthrogryposis	Spina Bifida (Neuromuscular Disorders)
4	**ICU**	Acute respiratory conditions i.e. bronchopneumonia	Juvenile Arthritis	Muscular Dystrophies
5	**Lower limb fracture**	**Paediatric trauma**	**Burns**	General Paediatrics

Sixty percent of the five important diagnoses taught at University A and University B were also included in the five most frequently seen diagnoses at the Chris Hani Baragwanath hospital.

The following table illustrates the five most important patient client groups taught at the universities that were not included in the top 15 conditions seen at the Chris Hani Baragwanath hospital.

Table 4.7 The five most important patient diagnoses taught at the universities that were not included in the top 15 diagnoses seen at the Chris Hani Baragwanath hospital

University A	University B	University C
Top five patient client groups taught at the university were amongst top six most frequently seen conditions seen at the Chris Hani Baragwanath hospital	Paediatric amputations Juvenile Arthritis Arthrogryposis	Spina Bifida (Neuromuscular Disorders) Muscular Dystrophies

All of the five most important diagnoses taught at University A were included in the top fifteen most common diagnoses seen at the Chris Hani Baragwanath hospital.

The results presented above will be discussed further in chapter five.

Chapter 5: DISCUSSION

In this chapter the results of the study will be discussed. Combining information gathered from the questionnaires completed by the paediatric lecturers, statistics obtained from the Chris Hani Baragwanath hospital, and current literature available on paediatric curricula content development, themes were highlighted indicating areas that are well covered within the curricula of the three universities, areas which require more focus and methods that would prove beneficial in ensuring adequate coverage of paediatric diagnoses encountered by physiotherapists within the undergraduate physiotherapy degree in South Africa.

The status of paediatric physiotherapy education in the United States was first investigated by Cherry and Knutson in 1993. As a response to the initial survey conducted by Cherry & Knutson- the Section of Pediatrics of the American Physical Therapy Association published a document to ensure standardisation in paediatric content in professional education curricula. By 2009, 83% of physiotherapy programmes used recommendations published in the above mentioned document to develop and deliver paediatric content in their programmes (Schreiber *et al*, 2011). South Africa should aim to produce a document similar to that of the American Physical Therapy Association so that some standardisation of content between South African universities can be achieved.

5.1 Location

The reason underlying the choice of using the statistics of the Chris Hani Baragwanath hospital was that due to the large number of admissions to the hospital – the patient profile examined via the statistics would represent most of the diagnoses that a physiotherapist will encounter in an acute hospital South African setting.

5.2 The inclusion of a separate paediatric module within undergraduate physiotherapy curricula:

The specific needs of paediatric patients mean that therapeutic interventions are often not an adaptation of skills used to treat adults. Schreiber *et al* (2011) states that physiotherapy students require hands-on paediatric opportunities in their training in order to gain confidence in working with this population group. The differences that exist between the respiratory, neuromusculoskeletal and neurological systems in children and adults, highlights the importance of including paediatrics as an independent module within undergraduate physiotherapy curricula in South Africa. More than a fifth of patients seen at the Chris Hani Baragwanath hospital in 2010 were paediatric patients (22,03%). The time spent to treat paediatric patients also comprised more than a fifth of the total time spent on treating patients at the hospital (22,17%)(See Table 4.1). A large number of paediatric patients are therefore treated by physiotherapists at the Chris Hani Baragwanath hospital, highlighting the need to include paediatrics as an independent discipline within the physiotherapy curriculum.

The audit of physiotherapy programmes in the United States revealed that improvements can still be made in hands on practice and more time dedicated to paediatrics. Clinical skills are elective in most programmes in the United States – many students do not have the opportunity to participate in a paediatric rotation due to limited placements (Donahoe-Fillmore (2002).

Two out of three universities that were assessed, taught paediatrics as an independent module. University A had an independent paediatric module as well as an appointed lecturer dedicated to paediatrics. University C indicated the importance of an independent paediatric clinical module that would improve students' awareness and performance in paediatrics. Paediatrics should therefore not be an elective block. Paediatric physiotherapy content at University B is covered by number of lecturers – paediatric modules are taught within adult modules.

The structure of the paediatric module in physiotherapy curricula should be well organised over the four years of undergraduate study. Paediatric training can start in the second year of study and include aspects of normal development in healthy children and an introduction of diseases and disability to provide students more time to assimilate what is taught.

Due to limitations in curricula time, not all paediatric diagnoses need to be included in the paediatric module. However curriculum mapping between different sub-disciplines in the physiotherapy department needs to be undertaken to ensure all aspects are adequately covered. Schreiber *et al* (2011) recommended 90 hours as the appropriate number of hours for paediatric content within the curriculum. The 90 hours should not include clinical rotation hours but lectures, PBL, and hands on exposure to children.

Better communication between lecturers from different universities is required to ensure a baseline of certain aspects within the curriculum that should be present in all universities in South Africa (Appendix VII). South African lecturers need to communicate with lecturers from other developing countries to share experiences and brain storm methods to ensure optimal curricula design within available resources (Appendix VII).

5.3 Comparison of data extracted from questionnaire and curricula outline:

The curricula outlines of the three universities were not included in the discussion as a difference was discovered when comparing the respective lecturer's perception of curricula content that was extracted from the questionnaires and the explicit documented curricula outline of the university (See Table 4.5). Possible explanations of the disparity could be that:

- Lecturers realise the need for improved paediatric content and include it in their theoretical and clinical education modules; this inclusion however is not documented in curricula outlines.
- Curricula are currently being updated.

Curricula outlines should be updated regularly as this provides a framework of what students are expected to know, provides a basis for communication between universities, ensures continuity of teaching if staff are replaced and is the starting point for curriculum development.

5.4 Diagnoses that may be included in undergraduate physiotherapy curricula:

Donahoe-Fillmore (2002) listed the most frequently covered paediatric diagnoses included in physiotherapy programmes in the United States. Only three of the top 15 diagnoses seen in their list were seen in the top 15 diagnoses at the Chris Hani Baragwanath hospital. Caution must therefore be taken when using information of curricula content of universities outside the South African context as the prevalence and spectrum of diagnoses treated by physiotherapists, may be different as each country has unique health needs.

The top 10 causes of under-5 mortality in South Africa include HIV/AIDS, low birth weight, diarrhoeal diseases, lower respiratory tract infections, protein-energy malnutrition, neonatal infections, birth asphyxia and trauma, congenital heart disease, road traffic accidents, and bacterial meningitis. Physiotherapy students need to be aware of the above communicable diseases and should play an active role in informing the public on preventative measures to reduce the incidence in the population. Patients admitted to hospital for the above mentioned diseases should be screened to determine whether developmental delay exists, the underlying causes of the delay and whether the child will benefit from intervention from the rehabilitation team (Saloojee & Pettifor, 2005).

Due to limited time available in undergraduate physiotherapy programmes, the researcher has acknowledged that not all diagnoses recorded from the statistics gathered from the Chris Hani Baragwanath hospital can be introduced in a paediatric module taught at an undergraduate level. A minimum of the fifteen most common diagnoses seen at the Chris Hani Baragwanath hospital could be included in the curricula of universities in South Africa to ensure newly qualified graduates are exposed to diagnoses that they will experience in their clinical placements (See Figure 4.2). Universities should pay more attention to the top five diagnoses seen at the hospital when allocating time distribution to the teaching of the different diagnoses.

Physiotherapists play an important role in the identification of developmental delay. Developmental delay was the second most frequent diagnosis seen in 2010. One of the most important roles of physiotherapy in the management of children with

developmental delay is the early diagnosis of HIV encephalopathy, by means of neurodevelopmental tests. Early identification of HIV encephalopathy provides a criteria for early initiation of HAART (Hilburn, 2011).

CP was the third most frequently seen diagnosis at the Chris Hani Baragwanath hospital in 2010. Further research is still needed regarding which interventions are most effective in the management of CP by physiotherapists in order to ensure optimum care of this patient client group (Anttila *et al*, 2008).

Since ICU was the fourth most frequently seen diagnosis at the Chris Hani Baragwanath hospital in 2010, physiotherapists need to be aware of areas of intervention that are well researched and found to be effective, in order to optimise limited resources and prevent inflicting harm to patients. Kangaroo Mother Care (KMC) has been found to be an effective means of care in under-resourced NICUs. Physiotherapists need to advocate the setting up of KMC units and aid mothers in the handling of their babies during their NICU stay (Saloojee & Pettifor, 2005).

Although the diagnoses that fall under the category of paediatric and neonatal ICU are considered to be speciality fields, students require exposure to these diagnoses as they might be expected to manage these diagnoses if placed in community service settings that are understaffed or do not have senior more qualified superiors working with them. The importance of including these two aspects in the curriculum is highlighted by the concern that these aspects were not adequately covered by University A as well as the large number of patients seen in the ICU setting in the data obtained from the 2010 statistics of Chris Hani Baragwanath hospital. University A suggested that more clinical time in fourth year should be assigned to paediatric and neonatal ICU.

The efficacy of physiotherapy in acute lung infections in previously healthy children has not yet been proven. Little evidence exists that airway clearance techniques play a beneficial role in children with acute lung disease (Boeck *et al*, 2008). Since differences exist in the respiratory systems of adult and paediatric patients, certain complications, such as atelectasis and respiratory insufficiency, are more common in the paediatric patient client group due to their compliant chest wall. Acute lung

disease was rated as the sixth most common referral to physiotherapy in 2010. A further investigation needs to be conducted into the reason for referral of patients with acute lung disease to physiotherapy. Individual patients need to be assessed on the need for the application of airway clearance techniques, as benefit might exist in previously healthy individuals who are unable to clear secretions due to weakness caused by malnutrition or HIV. If physiotherapy is applied in previously healthy children with acute lung disease care must be taken not to inflict harm on the patient. Physiotherapists need to be aware of areas where their input is beneficial such as teaching children the proper method of inhalation of asthma drugs, advising families regarding oxygen therapy and collecting induced sputum for the diagnoses of conditions such as PJP (Boeck *et al*, 2008; Potterton *et al*, 2006). Instead of channelling limited resources on acute lung disease diagnoses that have limited evidence to support the efficacy of physiotherapy, physiotherapists should play an active role in chronic lung diagnoses such as CF, bronchiectasis and neuromuscular disease where strong evidence exists regarding the benefit of physiotherapy.

Haemophilia is a diagnosis where the efficacy of physiotherapy has been well researched. In the systematic review conducted by Gomis *et al* (2009), the study concluded that physiotherapy, physical activity and sport are basic elements to improve quality of life, improve strength, decrease musculoskeletal lesions and prevent haemophiliac atrophy. The authors also concluded that regular exercise and rehabilitation with physiotherapy is fundamental in the management of haemophilia; particularly in countries where replacement therapy is not readily available. Haemophilia was the twelfth most common condition seen at the Chris Hani Baragwanath hospital. Physiotherapists should continue treating this diagnostic group and promote the role of physiotherapy in the management of haemophilia, since research has found physiotherapeutic intervention to be an essential part of the management of this diagnosis.

Children who have sustained a TBI present with needs that are different to other more developed countries. Currently there are no specialised paediatric units for children who have sustained a TBI in South Africa (Levin, 2004). Since TBI was rated as the thirteenth most frequently seen diagnosis in 2010; physiotherapists who have an interest in paediatric TBI, should specialise in this field, and advocate for the

development of institutions to manage paediatric patients post the acute stage of injury.

Physiotherapists need to inform the multidisciplinary team on the role of physiotherapy in diagnoses such as paediatric chronic fatigue, pain and DCD among other diagnoses, in order to ensure adequate referral of these diagnoses to the physiotherapy department. Since these diagnoses were not present in the top fifteen diagnoses seen at the Chris Hani Baragwanath hospital, a question arises whether the multidisciplinary team is aware of the role of physiotherapy in these client groups. A role of the physiotherapists is to increase awareness in the health environment of the role of physiotherapy in the different diagnoses that physiotherapists treat. Often patients are not referred to physiotherapy services due to a lack of knowledge of the role of physiotherapy in the multidisciplinary team. It is important for physiotherapists to update themselves with current literature in order to inform the extended health fraternity of their role in managing various diagnoses.

There is no restriction of what can be included in the curricula of universities in South Africa, but diagnoses that are not seen often should not be included in the top five most important diagnoses taught in undergraduate programmes (See Table 4.7). This however, can only be determined with certainty once an audit of paediatric patient diagnoses has been undertaken at a variety of settings in which South African physiotherapists treat paediatric clients; such as schools catering for children with special needs, private practice, and rural and urban primary health care facilities; in order to ascertain if other diagnoses are also commonly treated that are not referred to tertiary institutions such as the Chris Hani Baragwanath hospital. For example, University C included Spina Bifida and Muscular Dystrophies as one of the top five most important diagnoses. Even though these diagnoses were not seen at the hospital in 2010, they cannot be regarded as unimportant as they might be frequently seen in other settings in which paediatric physiotherapy is practiced, such as schools that cater for children with special needs.

Paediatric palliative care has emerged as a specialized area of practice and involves not only the management of symptoms but also the psychosocial and spiritual needs

of the child and family through death and bereavement (Price and McNeilly, 2006). HIV has transformed the structure of paediatric practice in South Africa from a sub-speciality that dealt mainly with acute illnesses to that of managing chronically ill and dying patients (Oyeyemi *et al*, 2007). As the profile of illnesses have resulting in an increased number of children requiring palliative care, students need to be prepared to cope with the increasing demand of long term patient care. Course content should include ethical issues in paediatric palliative care, communication with children and families, bereavement, support services, symptom control and spiritual care (Price and McNeilly, 2006).

5.5 Standardised Assessment Tools

Educators need to promote and apply the ICF model in the training of undergraduate students in order to analyse the complex interaction of elements affecting the function, activity performance and participation of the child (Rosenbaum& Stewart, 2004). Jelsma & Scott (2011) concluded that the ICF is a useful framework which South African physiotherapy students can use to assess paediatric patients and plan suitable treatments. Despite the importance of the ICF as a framework for rehabilitation – only University B mentioned its use as an assessment tool.

Selecting an appropriate standardised assessment tool is a crucial part of the examination of a child affected with a delay or disorder. Several factors influence the selection of a particular measure. A therapist has to be trained in using the measure in order to administer it correctly and score it accurately (Tieman *et al*, 2005). Figure 4.2 illustrates that besides the GMFM and GMFCS, which were covered at all three universities, there was no consensus regarding other standardised assessment tools. Universities also reported that standardised tools are expensive and not available for student use (Appendix VII). Physiotherapists with an interest in paediatric practice need to reach a consensus regarding which standardised tests are most applicable in this country and areas which require the development of standardised tests applicable to the South African context.

The Infant Gross Motor Screening Tool (IGMST) is a standardised gross motor developmental screening tool, for use in HIV infected infants between six and 18

months of age, which is suitable for use in developing countries. The IGMST is an easy to administer, short assessment tool that can be administered by doctors or nurses at HIV clinics to make referral to appropriate rehabilitation services possible (Hilburn *et al*, 2011). Universities should consider introducing students to tools such as the IGMST as they are designed for use in South African setting.

5.6 Evidence Based Practice (EBP)

The physiotherapy profession has been criticized for not using available research to inform clinical decision making. Practice has previously relied heavily on anecdotal evidence. Physiotherapists placed in settings not affiliated with teaching or research institutions face challenges in accessing relevant scientific evidence (Schreiber *et al*, 2009). Time constraints also hinder the usage of EBP in clinical practice. EBP needs to be emphasised in training despite constraints as it would aid in increasing confidence in clinical decision making, improve effectiveness in interventions and enhance the stature of the profession (Schreiber *et al*, 2009).

A research based approach was well incorporated in all three universities (Figure 4.3). Research was incorporated into curricula via lectures being based on current evidence, students being required to research and comment on current evidence, and patient presentations being supported by current evidence. Universities suggested that EBP can be encouraged further by promoting post graduate research, the publication of high quality articles and less expensive textbooks being made available (Appendix VII).

5.7 Recommendations for further research

- Paediatric physiotherapy is practiced in a wide variety of settings. These include: hospitals, rehabilitation centres, home-based health care, the school system, early intervention centres, developmental intervention centres, outpatient rooms and extended care facilities (Gandy, 1993). An audit of paediatric patient diagnoses needs to be undertaken at a variety of settings in which South African physiotherapists treat paediatric clients; such as schools catering for children with special needs, private practice, rural and urban

primary health care facilities and early developmental centres; in order to ascertain if other conditions are also commonly treated that are not referred to tertiary institutions such as the Chris Hani Baragwanath hospital.

- Further research needs to be conducted on the variety of assessment tools that are applicable to the South African context. Research can also be conducted to ascertain intervention strategies that are supported by the literature that have been found to be effective in treating paediatric patients. A review process can be undertaken for each modality by interested academics, clinicians or research candidates. This strategy will highlight where higher level research approaches or clarification of efficacy are required.

- A national sample of curricula needs to be analysed to determine prevalent trends of paediatric physiotherapy modules in a South African context.

- Once an audit of the content of paediatric programmes is completed, an investigation into the manner in which the content is conveyed to students needs to be assessed.

Chapter 6: CONCLUSION

The aim of this study was to determine whether the paediatric physiotherapy curricula of three South African universities equip students with the basic knowledge of the variety of paediatric diagnoses seen by physiotherapists at the Chris Hani Baragwanath hospital.

- Since the statistics of paediatric patients treated by physiotherapists in 2010 revealed that almost a fifth of total patients were paediatric patients; it is vital for universities to realise the importance of including paediatric physiotherapy training in their undergraduate physiotherapy course structure.
- In view of the fact that universities have limited time available in undergraduate physiotherapy programmes, the fifteen most common paediatric diagnoses can be used by universities as a baseline of which diagnoses are most important to include in the syllabus.
- As variation currently exists in the curricula content of the universities; improved communication between universities in South Africa may enhance standardisation of training in programmes across the country.
- Lecturers responsible for coordinating paediatric modules at universities need to ensure that the paediatric content covered each year is appropriately documented in explicit documented curricula outlines to prevent discrepancies occurring between what is perceived to have been covered by individual lecturers and what is recorded as having been covered.
- To date, no national audit of paediatric content of physiotherapy programmes in South Africa has been conducted. The United States has spent almost 18 years on methods to ensure adequate content of paediatric physiotherapy and standardisation of training in programmes across the country. This study aims to highlight the need for an independent paediatric module within physiotherapy curricula, provide a preliminary framework for paediatric content within physiotherapy undergraduate degrees and finally make suggestions to universities on methods that can be employed to ensure that curricula expose new graduates to the most frequent diagnoses of paediatric patients seen within a South African context.

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Appendix I Ethical Clearance

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG
Division of the Deputy Registrar (Research)

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)
R14/49 Ms Aamena I Vachiat

CLEARANCE CERTIFICATE	M10906
PROJECT	An Evaluation of the Physiotherapy Carricula of Three South African Universities in Preparing Students for the Management of Paediatric Patients
INVESTIGATORS	Ms Aamena I Vachiat.
DEPARTMENT	Department of Physiotherapy
DATE CONSIDERED	01/10/2010
DECISION OF THE COMMITTEE*	Approved unconditionally

Unless otherwise specified this ethical clearance is valid for 5 years and may be renewed upon application.

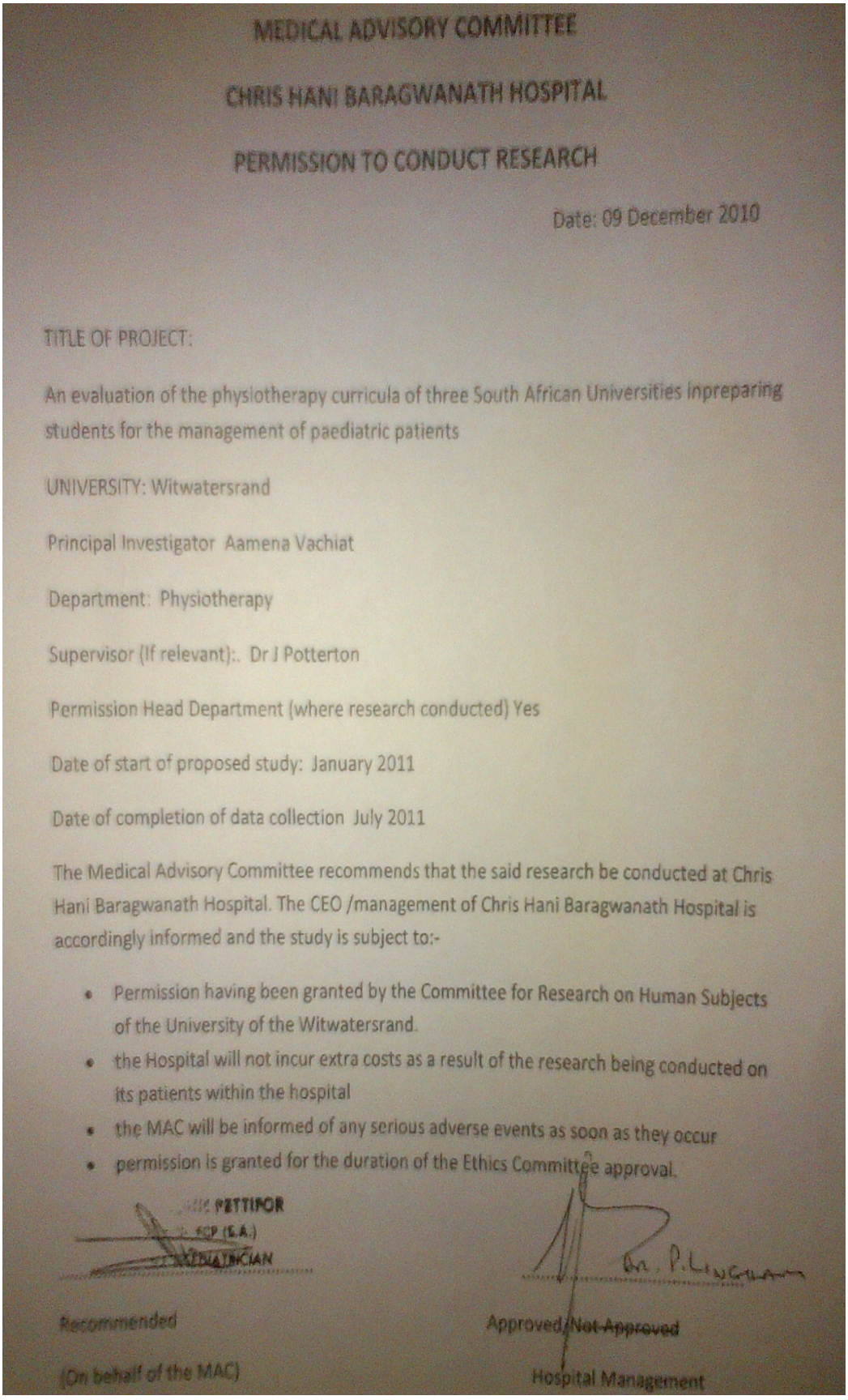
DATE 03/11/2010 CHAIRPERSON .....
(Professor PE Cleaton-Jones)

*Guidelines for written 'informed consent' attached where applicable
cc: Supervisor : Dr Joanne Potterton

DECLARATION OF INVESTIGATOR(S)

To be completed in duplicate and ONE COPY returned to the Secretary at Room 10004, 10th Floor, Senate House, University.
I/We fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and I/we guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the Committee. I agree to a completion of a yearly progress report.
PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES

Appendix II Consent from the superintendent of Chris Hani Baragwanath hospital



MEDICAL ADVISORY COMMITTEE

CHRIS HANI BARAGWANATH HOSPITAL

PERMISSION TO CONDUCT RESEARCH

Date: 09 December 2010

TITLE OF PROJECT:

An evaluation of the physiotherapy curricula of three South African Universities inpreparing students for the management of paediatric patients

UNIVERSITY: Witwatersrand

Principal Investigator Aamena Vachiat

Department: Physiotherapy

Supervisor (If relevant):. Dr J Potterton

Permission Head Department (where research conducted) Yes

Date of start of proposed study: January 2011

Date of completion of data collection July 2011

The Medical Advisory Committee recommends that the said research be conducted at Chris Hani Baragwanath Hospital. The CEO /management of Chris Hani Baragwanath Hospital is accordingly informed and the study is subject to:-

- Permission having been granted by the Committee for Research on Human Subjects of the University of the Witwatersrand.
- the Hospital will not incur extra costs as a result of the research being conducted on its patients within the hospital
- the MAC will be informed of any serious adverse events as soon as they occur
- permission is granted for the duration of the Ethics Committee approval.

PETTIFOR

FCP (S.A.)

PAEDIATRICIAN

Recommended

(On behalf of the MAC)

Approved/~~Not Approved~~

Hospital Management

Appendix III

Data Collection Sheet

Total number of patients seen by physiotherapists	
Total number of paediatric patients seen by physiotherapists	
Amount of time spent in treating all patients	
Amount of time spent in treating paediatric patients	
Total number of each type of paediatric condition treated by physiotherapists	
Number of adaptive mobility aids issued in 2009	

Appendix IV Consent from the head of the physiotherapy department of the three universities

25 January 2011

To: The Head of the Physiotherapy Department

Re: Consent for paediatric lecturers to complete a questionnaire regarding paediatric curricula content

My name is Aamena Vachiat and I am currently registered for a masters degree in paediatric physiotherapy at the University of the Witwatersrand. The aim of my study is to determine whether the paediatric physiotherapy curricula of three South African universities equip students with the basic skills in the assessment and treatment of the variety of paediatric conditions seen by physiotherapists at the Chris Hani Baragwanath hospital. A retrospective review of statistics of paediatric patients seen by physiotherapists at the Chris Hani Baragwanath hospital in 2010 will be conducted. A questionnaire research design will be used to obtain the required data of the paediatric physiotherapy curricula of the three South African universities.

Attached is a questionnaire, based on an extensive literature review, aiming to analyse the paediatric content of the undergraduate physiotherapy program at your university. An expert panel consisting of physiotherapists specializing in paediatrics were consulted to determine content validity of the questionnaire. The questionnaire includes: various conditions covered in the curriculum, and assessment tools and intervention strategies used to assess and treat these various conditions.

Consent is being sought from you to allow the paediatric lecturers working in the physiotherapy department at the University of Witwatersrand to complete the above mentioned questionnaire, and to provide a copy of the curricula outline of the paediatric component taught at the University. Participation is voluntary and they may choose to leave out any answers which they do not wish to complete.

Thanking You

Aamena Vachiat BSc Physio
072 340 2949
aamenav@gmail.com

– – – –

I _____ (name of Head of Physiotherapy Department) of the University of _____, hereby consent to allow the paediatric lecturers working in my department to complete the above mentioned questionnaire and to provide the curricula outline of the paediatric physiotherapy component taught at the University.

_____

_____

Signature Date

(Completed forms can be faxed to (011) 834 – 5699)

Appendix V Information Sheet for Questionnaire

To: Paediatric lecturers at the physiotherapy departments of the University of Witwatersrand, the University of Limpopo and the University of Pretoria

Study title: An evaluation of the physiotherapy curricula of three South African universities in preparing students for the management of paediatric patients.

Introduction: Hello, My name is Aamena Vachiat and I am a student currently registered for a masters degree in paediatric physiotherapy at the University of the Witwatersrand. The aim of my study is to determine whether the paediatric physiotherapy curricula of three South African universities equip students with the basic skills in the assessment and treatment of the variety of paediatric conditions seen by physiotherapists at the Chris Hani Baragwanath hospital. A retrospective review of statistics of paediatric patients seen by physiotherapists at the Chris Hani Baragwanath Hospital in 2009 will be conducted. A questionnaire research design will be used to obtain the required data of the paediatric physiotherapy curricula of the three South African universities. Attached is a questionnaire, based on an extensive literature review, aiming to analyze the paediatric content of the undergraduate physiotherapy program at your university. An expert panel, consisting of physiotherapists specializing in paediatrics, were consulted to determine content validity of the questionnaire.

Invitation to participate: I would like to invite you participate in this study by please completing the questionnaire analysing the paediatric content of the undergraduate physiotherapy curriculum at your university. Participation is voluntary and you may choose to leave out any answers which you do not wish to complete. The questionnaire will take approximately 30 minutes to compete. Your consent to participate will be acknowledged by your completion of the questionnaire.

Benefits: There will be no direct benefit for participation in this questionnaire but the research may be beneficial in the future. The future benefit of participating in this questionnaire include formulating curricula that include a combination of current best practices as well as training students in managing the various client diagnostic groups that will be encounter. Information obtained from the study will be made available to the Head of your physiotherapy department after the results and conclusion of the study are formulated.

Risks: There will be no risks associated with your participation in the study.

Confidentiality: Confidentiality will be ensured as all responses will remain anonymous. Each university will be assigned a code and all responses will be forwarded to a separate email address especially set up for this study. The data will be stored for five years and then destroyed.

Thanking you for taking the time to read this information sheet.

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Appendix VI - Questionnaire

Questionnaire – An analysis of paediatric physiotherapy curricula content

This questionnaire is designed to obtain information regarding the curricula content of undergraduate paediatric physiotherapy programs at a University level.

This questionnaire will take approximately 30 minutes to complete.

Should you have any queries, please contact: Aamena Vachiat at 072 340 2949

Completed Questionnaires can be emailed to: paediatric.curricula@gmail.com , by ***the 28 February 2011***

Content Aspect of the Paediatric Physiotherapy Curriculum

1) Paediatric Patient Client Groups treated by physiotherapists

The following conditions are included as part of the curriculum that I teach:	**Yes**	**No**	**Unsure**
Cerebral Palsy			
Head Injury			
Meningitis			
Hydrocephalus			
Muscular Dystrophy			
Down-Syndrome/Chromosomal Disorders			
Mild motor dysfunction/clumsiness			
Paediatric chronic fatigue and general weakness			
Paediatric pain syndromes			
Spinal Muscular Atrophy			
Neural tube defects			
Spina Bifida			
Brachial Plexus Injury i.e. Erbs Palsy			
Bell's Palsy			
Torticollis			
Congenital Heart Abnormalities			
Haemophilia			
Juvenile Rheumatoid Arthritis			
Congenital Amputation			
Idiopathic orthopaedic conditions			
Congenital orthopaedic conditions			
Paediatric trauma and associated orthopaedics			
Sports injuries			
Burns			
Protein Energy malnutrition			
Foetal Alcohol Syndrome			
HIV/AIDS			
Cystic Fibrosis			
TB			
Bronchiectasis			

The following conditions are included as part of the curriculum that I teach:	Yes	No	Unsure
Asthma			
Pneumonia			
Bronchiolitis			
Premature infants			
Other			
List the 5 most important patient client groups included in your curriculum in order of importance (1=most important) 1 - 2 - 3 - 4 - 5 -			

2) Assessment

I teach the following foundation developmental milestones:	Yes	No	Unsure
Family centred intervention			
Parental involvement			
Participation in community			
Environment - home, school, recreation			
Peculiarities involving paediatric anatomy, physiology			
Gross Motor Development			
Fine Motor Development			
Cognitive development Oral Development			
Psycho social development of infants, children, adolescents			
Nutrition			
Physical Growth Characteristics			
Skeletal Development			
Muscle strength/function development			
Foetal Movement and Development			
Sensory Development			
Analysis of Movement			
Developmental Reflexes			
Students become competent in the following theoretical approaches:			

I teach the following foundation developmental milestones:	Yes	No	Unsure
2.1) Theoretical Approaches to Learning			
• Neuro-developmental treatment			
Students become competent in the following assessment tools:			
2.2) Standardized Assessment tools			
• Bayley Scales Infant Development			
• Peabody Development of Motor Scales			
• Gesell Developmental Schedule			
• Miller Assessment of Preschoolers			
• Gross Motor Function Measure			
• Paediatric Evaluation of Disability Inventory			
• Movement ABC			
• Alberta Infant Motor Scale			
• GMFCS			
2.3) Other Assessment			
Respiratory Assessment			
Orthopaedic Assessment			
Paediatric ICU			
Other (if possible, please specify why certain assessment modules are not incorporated into curricula)			
List the 5 most important assessment tools included in your curriculum in order of importance (1=most important) 1- 2 - 3- 4- 5-			

3) Intervention

I teach the following intervention modalities as part of the paediatric component of the physiotherapy curriculum:	Yes	No	Unsure
Family Centred intervention			
Neonatal intensive care			
Kangaroo mother care			
Prescribing orthotics and prosthetics			
Positioning and handling disabled children			
Functional skills and outcomes			
Feeding			
Collaboration NGO's (awareness)			
Provide education			
Group intervention			
Planning			
Individualised education plan			
Individualised family service plan			
Adaptive seating			
Wheelchairs/powered mobility			
Behaviour management			
Rehabilitation technology			
Roles of other professionals (referral)			
Prevention (screening)			
Neuro developmental therapy			
Respiratory treatment			
Paediatric ICU			
Other (if possible, please specify why certain intervention modules are not incorporated into curricula)			
Rank the 5 most important intervention modalities included in your curriculum in order of importance (1=most important) 1 - 2 - 3 - 4 - 5 -			

4) Research

Provide a short description of how you incorporate evidence based practice in the paediatric physiotherapy module in the curriculum taught at your university

5) Multi-professional education

Which professionals will the students be trained to refer patients to	**Yes**	**No**
Orthopaedic Surgeon		
Neurodevelopmental Specialist		
Dietician		
Orthotist		
Podiatrist		
Occupational Therapist		
Speech Therapist and Audiologist		
Social Worker		
Psychologist		
Dentist		
Psychiatrist		

6) Paediatric Module in Curriculum

	Yes	**No**
Independent Module		
Subsection of adult course		
Elective		
Required		
Amount of Clinical time spent in paediatrics		
Total time spent in paediatric physiotherapy module		
Estimated percentage of paediatric teaching as part of whole curriculum		

7) Socio cultural context of the Paediatric Physiotherapy Curriculum

	Yes	**No**
Paediatric issues in South African context		
Grants		

	Yes	No
Primary Health Care Issues		
Legislation		
Bio psychosocial Model		

General

1) What aspects are not taught enough to prepare students for clinical practice?

2) From the stated problem above, what would you change to better equip students to assess and treat paediatric patients?

3. Please provide any suggestions that you have that can improve the content of paediatric physiotherapy curricula in South Africa



Thank you very much for taking the time to complete this questionnaire

Appendix VII – Combination of completed questionnaires of the three universities

The table below represents the responses from the three universities concerning the paediatric diagnoses included in the curricula of the three universities.

1 Paediatric patient client groups treated by physiotherapists

	University A		University B		University C	
	Yes	**No**	**Yes**	**No**	**Yes**	**No**
Cerebral Palsy	√		√		√	
Head Injury	√			√	√	
Meningitis	√		√		√	
Hydrocephalus	√		√		√	
Muscular Dystrophy	√		√		√	
Down Syndrome/ Chromosomal Disorders		√	√		√	
Mild motor dysfunction/clumsiness	√			√	√	
Paediatric chronic fatigue and general weakness		√		√		√
Paediatric pain syndromes		√		√		√
Spinal Muscular Atrophy	√		√		√	
Neural tube defects	√		√		√	
Spina Bifida	√		√		√	
Brachial Plexus Injury i.e. Erbs Palsy		√		√	√	
Bell's Palsy		√	√			√
Torticollis		√	√		√	
Congenital Heart Abnormalities	√		√		√	
Haemophilia	√			√	√	
Juvenile Rheumatoid Arthritis	√		√		√	
Congenital Amputation	√		√		√	
Idiopathic orthopaedic conditions		√		√	√	
Congenital orthopaedic conditions		√	√		√	
Paediatric trauma and associated orthopaedics	√		√		√	
Sports injuries	√			√	√	√
Burns	√		√		√	

Protein Energy malnutrition	√			√	√	
Foetal Alcohol Syndrome		√		√		√
HIV/AIDS	√		√		√	
Cystic Fibrosis	√		√			√
TB	√		√			√
Bronchiectasis	√		√			√
Asthma	√		√			√
Pneumonia	√		√			√
Bronchiolitis	√		√			√
Premature infants	√		√		√	

University A	University B	University C
Other • Differences between adults and paediatrics in terms of anatomy and physiology – respiratory, orthopaedics and neurology systems. • Overview paediatric pain • Paediatrics in a South African context	**Other** • Developmental Delay • Arthrogryposis • Oncology	

All three universities had similar numbers of diagnoses that were not covered (A=9, B=10,C=10). A difference exists between the types of diagnoses that were not covered between the three universities.

The table below shows the five most important patient diagnostic groups covered at each university.

Table 2 Five most important patient diagnostic groups

University A	University B	University C
1. HIV 2. Cerebral palsy 3. Developmental delay 4. Acute respiratory conditions i.e. bronchopneumonia 5. Paediatric trauma	1. Fractures 2. Cerebral Palsy 3. Paediatric amputation Arthrogryposis 4. Juvenile Arthritis 5. Paediatric burns	1 – Cerebral Palsy 2 – HIV/ Aids babies 3 - Spina Bifida (Neuromuscular Disorders) 4 - Muscular Dystrophies 5 – General Paediatrics

University A and B covered similar topics as their five most important patient diagnostic groups. University C included topics of Spina Bifida, Muscular Dystrophies and General paediatrics that were not mentioned in the other two universities.

The table below illustrates which developmental milestones students are taught at the

three universities.

3 Assessment: Developmental Milestones

	Yes	No	Yes	No	Yes	No
Family centred intervention	√			√	√	
Parental involvement	√		√		√	
Participation in community	√		√		√	
Environment - home, school, recreation	√			√	√	
Peculiarities involving paediatric anatomy, physiology	√		√		√	
Gross Motor Development	√		√		√	
Fine Motor Development	√		√		√	
Cognitive development Oral Development	√			√		√
Psycho social development of infants, children, adolescents	√			√	√	
Nutrition	√			√	√	
Physical Growth Characteristics	√		√		√	
Skeletal Development	√			√	√	
Muscle strength/function development	√		√		√	
Foetal Movement and Development	√			√		√
Sensory Development		√		√	√	
Analysis of Movement	√			√	√	
Developmental Reflexes	√		√		√	

University A included all developmental milestones besides sensory development in its curriculum. University B did not include eight milestones in its curriculum. Gaps are being noticed in the paediatric content of University B even though lecturers say that that aspects of paediatrics are included in adult modules.

The following table shows the standardised assessment tools taught at the three universities.

3Assessment:

Standardised Assessment Tools

	Yes	No	Yes	No	Yes	No
Bayley Scales Infant Development	√ Demo only			√		√
Peabody Development of Motor Scales		√		√		√
Gesell Developmental Schedule		√		√		√
Miller Assessment of Preschoolers		√		√		√
Gross Motor Function Measure	√		√		√	
Paediatric Evaluation of Disability Inventory	√			√	√	
Movement ABC	√		√			√
Alberta Infant Motor Scale	√		√			√
GMFCS	√		√		√	

Assessment:

Additional Assessment

	Yes	No	Yes	No	Yes	No
Respiratory Assessment	√		√		√	
Orthopaedic Assessment	√		√		√	
Paediatric ICU	√		√		√	

Five most important assessment tools

University A	University B	University C
1- GMFCS 2 -GMFM 3- Denver II 4- Infant Gross motor screening test 5-Respiratory assessment	1. GMFM/GMFCS 2. FIM/FAM 3. Barthel Index 4. Ashworth, Berg Scale 5. ICF (especially neurology patients)	1- GMFM 2 – GMFCS 3- MACS 4- PEDI 5- WeeFIM

University A	University B	University C
Other They are expensive and not available for student use 1. We also use the Denver II 2. The Infant Gross Motor Screening Test		

Certain standardised tests cited above, such as the Peabody Development of Motor Scales, the Gesell Developmental Schedule and the Miller Assessment of Preschoolers are not commonly used in a South African setting and it is therefore understandable that they are not taught at the three universities. University A displayed a good coverage of standardised assessment tools in their syllabus. Only University B mentioned including the ICF in its curriculum.

The following table represents the intervention modalities included in the paediatric curricula of the three universities.

3. Intervention

	Yes	No	Yes	No	Yes	No
Family Centred intervention	√		√		√	
Neonatal intensive care	√		√		√	
Kangaroo mother care	√		√		√	
Prescribing orthotics and prosthetics	√			√		√
Positioning and handling disabled children	√		√		√	
Functional skills and outcomes	√		√		√	
Feeding	√			√		√
Collaboration NGO's (awareness)	√		√			√
Provide education	√		√		√	
Group intervention	√		√		√	
Planning	√		√		√	
Individualised education plan		√		√	√	
Individualised family service plan	√		√		√	
Adaptive seating	√		√		√	
Wheelchairs/powered mobility	√			√		√
Behaviour management		√		√	√	
Rehabilitation technology	√		√		√	
Roles of other professionals (referral)	√		√		√	
Prevention (screening)	√		√		√	
Neuro developmental therapy	√		√		√	
Respiratory treatment	√		√		√	
Paediatric ICU	√		√			√

Five most important intervention modalities		
University A	**University B**	**University C**
1 - Functional skills and outcomes 2 –Respiratory treatment 3 – NDT 4 – Positioning and handling disabled children 5 –Referral	1- Positioning and handling disabled children 2- Provide education, family centred intervention 3- NDT 4- Respiratory Treatment, Paediatric ICU	1 – Neurodevelopmental therapy approach 2 – Prevention (Screening) 3 – Functional Skills and Outcomes 4 – Positioning and Handling Children with disabilities 5 - Modified constraint induced

	5- Behaviour management	therapy approach

University A reported most intervention modalities in its paediatric curriculum. All three universities cited neuro-developmental training and positioning and handling as the five most important intervention modalities.

The following table compares the status of the research component of each university:

5 Research

University A	University B	University C
• Lectures are based on current evidence • Students have to read recent articles and comment on their relevance to clinical practice every week • Some students do a paediatric proposal and literature review for their research project. • Patient presentations have to be supported by recent literature	• Include relevant recent articles (peer reviewed journals) - discussion as part of prepared patient, part of notes, bring article on unknown condition while doing practicals, presentation of articles (journal club) • Incorporating recent course work • Read evidence based articles, critically appraise them and include latest evidence in notes, lectures and discussions with students	• Clinical Practice: during blocks students present an article that appraise the current evidence of their choice of treatment • During small group discussions – students share/ discuss specific topics given to them on adjuncts or other approaches to managing the condition of their patients

All three universities include evidence based practice in their curricula.

The following table represents whether universities teach referral of paediatric patients to the various disciplines:

6Multi – professional education

	Yes	No	Yes	No	Yes	No
Orthopaedic Surgeon	√		√		√	
Neurodevelopmental Specialist	√		√		√	
Dietician	√		√		√	
Orthotist	√		√		√	
Podiatrist		√	√			√
Occupational	√		√		√	

Therapist						
Speech Therapist and Audiologist	√		√		√	
Social Worker	√		√		√	
Psychologist	√		√		√	
Dentist		√	√		√	
Psychiatrist	√		√		√	

University B teaches referral to all disciplines cited above. The other two universities taught majority of discipline referral.

The following table analyses the structure of the paediatric module in the three universities:

7 Structure of Paediatric Module in the university curriculum

University A	**University B**	**University C**
• Paediatrics is taught as an independent module • It is a required course • Amount of Clinical time spent in paediatrics = 240 hours • Total time spent in paediatric physiotherapy module = 300 hours • Estimated percentage of paediatric teaching as part of whole curriculum = 8 -10%	• The Paediatric physiotherapy module is integrated with other blocks such as adult respiratory, orthopaedics, ICU, biomechanics and community health • six lecturers are involved in teaching paediatrics: ➢ five lecturers teach paediatrics as part of their adult modules (integrated) ➢ one lecturer teaches child's health and paediatrics (the main emphasis is on neurology) Lecturer 3 •20 hours clinical time spent per block in paediatrics •35% of total curriculum spent on paediatrics Lecturer 5 •150 hours clinical time spent in paediatrics •300 hours total time spent in paediatrics	• Paediatrics is taught as an independent course • Some aspects are integrated into adult modules • It is a required course • Clinical time: Fourth year: 160 hours for all students Third year: 128 hours for half of the class

University A and C have independent paediatric modules. Paediatrics at University B is incorporated into other adult modules. Six lecturers are involved in the teaching of various components of paediatrics within adult modules at University B. The differences in the responses of the various lecturers in University B illustrates the need for a designated paediatric lecturer who can ensure that all staff involved in paediatrics

have consensus as to the structure of the paediatric module within the curriculum.

The following table depicts whether socio-cultural aspects of physiotherapy within a South African context are included in the curricula of the three universities:

8 Socio-cultural context of the paediatric physiotherapy curriculum

	Yes	No	Yes	No	Yes	No
Paediatric issues in South African context	√		√		√	
Grants	√		√			√
Primary Health Care Issues	√		√		√	
Legislation		√	√		√	
Bio psychosocial Model	√		√		√	

The table illustrates that socio-cultural aspects are well-covered in all three universities.

Aspects not adequately covered at the three universities included:

- Not enough time spent on paediatric and neonatal ICU
- Management of children with severe CP
- Handling of the paediatric patients especially with pain
- How to engage a child in an effective program (child play)
- Aspects on language, emotional development, feeding etc. (ST and OT specialist fields)

Changes that can be made to better equip students to assess and treat paediatric patients:

- More clinical time in 4th year to spend on paediatric/neonatal ICU
- Emphasize incorporating outcome measures (assessment tools)
- Students do not always apply what was taught in class into clinical practice
- Liaise with other health care professionals (speech, language, emotional development) OT, ST, PT departments should work together (emphasise multi disciplinary team approach)
- More time to allow students to assimilate and synthesise what they are taught.

Suggestions to improve the paediatric physiotherapy curricula in South Africa:

- Better communication between university lecturers

- More paediatric continuing education lectures
- Opportunities for lecturers to visit other countries to learn from their programmes
- Encourage post graduate research in the area
- Publication of high quality articles
- Less expensive textbooks
- Interaction with lecturers from other developing countries
- Incorporate more hands on in paediatric trauma
- Collaboration between groups, organisations and institutions
- Looking to introduce a separate paediatric clinical block for third years – this should improve student awareness and performance in paediatrics
- Start hands on from the second year, normal development on ordinary children
- Introduce disease /disabilities towards the end of the second year
- We should expose all students to a Paediatric Block and not make it an elective block. All students should have an opportunity to have a Paediatric block at undergraduate and not have to choose something else in the place of having exposure to paediatrics.
- Ensure that there is clear Curriculum Mapping to ensure that we do not assume that students have learned something that relates to paediatrics, taught by a colleague, only to find that there was no depth or substance but only concepts introduced.
- Allow for creativity from each university in as far as needs assessments of their communities and render more service learning for students. Have opportunities of multidisciplinary training/ learning outside of the ‘academic’ hospital.

Appendix VIII – Curricula outline of the three universities

Retrospective analysis of the curricula content of the three universities

The following tables analyse the actual paediatric curricula outlines of the three universities.

Curricula outline of University A

	University A
Year of Study in which paediatrics is included	Paediatrics is included under the Rehabilitation component of the curriculum in the second, third and fourth years of the degree.
Clinical exposure to paediatrics	Third year: 80 hours Fourth year: 128 hours
Purpose of paediatric module	Second year: To introduce the principles of normal development and an overview of developmental milestones 0-3months Third year: The purpose of paediatric module is to enable students to identify and understand the causes of childhood disability in South Africa and their impact on the family. Fourth year: The purpose of this module is to equip students to safely and effectively manage children with a variety of acute and chronic conditions
Outcomes	Second year: 1. Differentiate between normal and abnormal development Third year: 1. Demonstrate knowledge of conditions 2. Assess and manage children with a variety of chronic conditions 3. Fourth year: 4. Understand the theory behind a variety of paediatric conditions 5. Assess and manage a variety of paediatric conditions
Assessment Criteria	Third year: 1. Demonstrate knowledge of the normal developmental process 2. Demonstrate competency according to the Clinical Physiotherapy Assessment Criteria with specific emphasise on children 3. Perform a holistic, functional assessment of a child with cerebral palsy, Duchene's Muscular Dystrophy, Spinal Muscular Atrophy or spina bifida 4. Demonstrate an understanding of the underlying pathology and its implications in cerebral palsy, Duchene's Muscular Dystrophy, Spinal Muscular Atrophy, spina bifida and Downs Syndrome 5. Identify the main problems of the child in terms of the ICF 6. Plan an appropriate treatment program which addresses the main functional problems of the child

	7. Carry out an appropriate, functional and effective treatment 8. Discuss the impact of the child's disability on their family. Demonstrate an awareness of Family Centred intervention 9. Have a thorough knowledge of the causes and types of CP as well as the pathophysiology of the condition 10. Carry out a standardised developmental assessment 11. Discuss the impact of nutrition and HIV infection on normal development 12. Differentiate between SMA and DMD 13. Discuss the role of orthotics, splinting, surgery and medication in the management of children with cerebral palsy Fourth Year 1. Demonstrate an understanding of pathology and clinical presentations of paediatric conditions 2. Demonstrate an ability to integrate theoretical knowledge and practice – clinical reasoning 3. Demonstrate competency according to the Clinical Physiotherapy Assessment Criteria 4. Demonstrate holistic management of children with acute and chronic conditions
Topic	Second year 1. Normal development - Developmental theories and principles - Normal Development: 0-3 (major milestones) - factors influencing the development - Development of Gait Third year 1. Childhood Disability in South Africa - Policy and legislation - Barriers to access - Available grants 2. Cerebral Palsy - Definition, pathology and classification - Types of Cerebral Palsy - Assessment and management of Cerebral palsy 3. Normal Development - Practical evaluation 0-7 4. Developmental Screening 5. Nutrition and Development - Impact of nutrition on development 6. HIV and its impact on children's development 7. SMA, DMD, and Spina Bifida – demonstration 8. Aids, Orthotics and splinting Fourth Year: 1. Introduction to paediatrics - Common health challenges facing children in South Africa 2. Development of the lungs - Review of the embryology of the cardio-respiratory system 3. Differences between adult and paediatric respiratory systems - Clinical implications of anatomical and physiological differences 4. Assessment of respiratory patient

	- Subjective and Objective assessment including X-Rays 5. Common neonatal respiratory conditions - Problems related to prematurity - Respiratory Distress Syndrome - Bronchopulmonary Dysplasia - The role of the physiotherapist in NICU 6. Neurological complications of prematurity - Pathophysiology - Clinical Presentation - Role of the Physiotherapist 7. Suctioning - Suctioning Techniques - Indications, dangers and precautions 8. Musculoskeletal Development throughout childhood - Differences between adults and children - Assessment in orthopaedics 9. Paediatric trauma - Fractures in children - Aetiology and pathophysiology - Clinical presentation and holistic management 10. Juvenile Rheumatoid Arthritis - Diagnosis and classification - Pathophysiology - Medical Management - Physiotherapy assessment and management 11. Paediatric Burns - Causes - Pathology - Management 12. Paediatric Pain - Physiological basis of pain - Pharmacology - Physiotherapy management 13. HIV - Epidemiology, transmission and testing - TB, encephalopathy, Developmental Delay, PCP and LIP - The role of the physiotherapist 14. Causes of post- natal brain injury TBI, meningitis - Causes - Pathophysiology - Assessment, Outcome Measures - Management 15. Sports injuries in children - Epidemiology - Causes - Prevention - Physiotherapy Management 16. Nutritional disorders - Revision of protein energy malnutrition and how it impacts on child health and development - Interpretation of growth charts

	17. Paediatric Outcomes measures - Assessment of motor development in the pre-school child - Bayley Scales of Infant development - AIMS - Evaluate uses and pros and cons of each

Curricula outline of University B

	University B
Year of Study in which paediatrics is included	Paediatrics is not taught as a separate module in University B – it is taught as a sub-section within adult modules
Clinical exposure to paediatrics	
Purpose of paediatric module	No specific paediatric module.
Outcomes	1. Burns Differences between management of adult and paediatric burns 2. No mention of paediatric outcomes in orthopaedic, ICU, sports and NMS modules of the syllabus.
Assessment Criteria	
Topic	1. Management of children with respiratory dysfunction. 2. Congenital heart diseases 3. Valvular disorders 4. Differences in the management of adult and paediatric burn patients.

Curricula outline of University C

	University C
Year of Study in which paediatrics is included	III, IV
Purpose of paediatric module	1) Learn the terminology commonly used in paediatric literature and perinatal statistics. 2) Learn the importance of history taking, physical examination and record keeping as required for child health surveillance. 3) Learn the principles of evaluating newborn babies and 4) Learn the role of physiotherapy in the assessment of childhood disability

	5) Identify children who may need further diagnostic assessment and referral 6) Determine the existence of developmental delay or disability and to propose possible intervention strategies 7) Learn treatment and management principles involved in their rehabilitation. 8) Effectively apply and adapt the treatment techniques using various treatment tools during intervention according to the patient's level of function. 9) Acknowledge the role of caregivers and their involvement in the treatment and management of children with disabilities
Outcomes	1) The student will demonstrate an understanding perinatal statistics terminology by being able to compare and contrast them. 2) Differentiate the stages of childhood development and know important aspects that need to be considered by health professionals during examination as preparation for treatment. 3) Know the aspects that are important for assessing and screening normal development in new born babies. 4) Know aspects of child health surveillance during the first two years of life. 5) The student will demonstrate an understanding of various paediatric neurology conditions with through presentation of case studies and case reports 6) Prepare short lectures and present clinical conditions to their colleagues 7) Demonstrate competency in executing treatment strategies 8) Be able to integrate the various models of care and practice family centred care with caregivers as equal partners. 9) Know current treatment options for CP and neurological disorders in children
Assessment Criteria	This will be done by means of a tests and exams. Assignments may be done to consolidate and facilitate learning. Additional Information The students will visit the antenatal clinic and observe the basic assessment of the newborn. The physiotherapy aspects of caring for the preterm and the child at risk will be discussed in class.
Topic	1) Perinatal statistics terminology - Pregnancy and gestation period - Abortion, Liveborn infant, Stillborn infant - Perinatal and Neonatal periods - Low birth weight infants - Foetal deaths, Perinatal death, Neonatal death. 2) Introduction to child surveillance - Basic embryology and pregnancy - History taking and Physical examination - Age periods of childhood - Fundamentals of examination of the newborn - Common errors in examination of the newborn -Clinical examination during Surveillance - The Road to Health Chart - Problem-oriented Medical Record 3) Normal developmental Screening - General appearance of new born - Vital signs, (Temp, HR, RR, BP) - General measurements (head circumference, chest circumference, weight range, height/ length range) - Skin inspection - Head inspection - Mouth and Throat - Chest and Abdomen - Back and rectum - Extremities (UL and LL) evaluation

	- Musculoskeletal system evaluation 4) Child Surveillance during the first 2 years - Screening procedure and tests - 0 – 2months, 2 – 6months, 6 – 12months, 13 – 24months. Cerebral Palsy: 5) Spastic Quadriplegia (Moderate and Severe SQ) - Associated disabilities in Spastic Quadriplegia 6) Athetosis: - Overview lecture - Movement disorders i.e. hyperkinesias and dyskinesia Pure Athetosis Choreo Athetosis Spastic Athetosis Dystonic Athetosis 7) Associated Reactions and Associated Movements 8) Voluntary & Automatic Movements 9) Balance Development 10) Ataxia 11) Neural Tube disorders - Myelomeningocoele - Myelocoele - Hydrocephalus and its Management 12) Protein Energy Malnutrition Disorders - Kwashiorkor - Marasmus - Pellagra 13) Childhood HIV/ AIDS 14) Neuromuscular disorders 15) Hypotonia & Down's Syndrome 16) Osteogenesis Imperfecta 17) Multiple Disability 18) Facilitation Skills (Part 2) and Movement guiding 19) Speech Therapy Aspects of NDT (AAC) 20) Occupational Therapy Aspects of NDT 21) Adjuncts to Physiotherapy and other Treatment Approaches to children with disabilities 22) Introduction to Paediatric Outcome Measurement Tools (GMFM, GMFCS, PEDI, HRQoL) Orthopaedic Issues in Children: 23) Developmental Hip Dysplasia/ Congenital Hip Dysplasia 24) Foot Deformities – Talipes Calcaneovalgus, Congenital Talipes Equinovarus (CTEV) & the Ponseti Approach, Metatarsus Adductus (varus), Pes Planus, Pes Cavus, Transient Synovitis, Septic Arthritis, Legg-Calvé Perthes Disease, Slipped Capital Femoral Epiphysis (SCFE), 25) Torticollis & Plagiocephaly 26) Osteogenesis Imperfecta 27) Neural Tube Disorders: Rachischisis, Cranioschisis, Myelocoele, Meningocoele, Myelomeningocoele

Appendix IX

An analysis of the relationship between the lecturer's perspective of the paediatric content of the curriculum and the documented University curriculum paediatric curriculum

University A

	Mentioned in both the survey and university curriculum	**Mentioned in curriculum but not in survey**	**Mentioned in survey but not in curriculum**
Paediatric patient client groups	Cerebral Palsy Head Injury Meningitis Muscular Dystrophy Spinal Muscular Atrophy Neural tube defects Spina Bifida Juvenile Rheumatoid Arthritis Paediatric trauma and associated orthopaedics Sports injuries Burns Protein Energy malnutrition HIV/AIDS TB Premature infants	Down Syndrome/ Chromosomal Disorders Paediatric pain syndromes	Hydrocephalus Mild motor dysfunction/clumsiness Congenital Heart Abnormalities Haemophilia Congenital Amputation Cystic Fibrosis Bronchiectasis Asthma Pneumonia Bronchiolitis
Assessment	Family centred intervention Standardised developmental assessment Normal development 0-7 years (type of development not specified in curriculum i.e. fine motor/ speech) Respiratory assessment	Clinical Physiotherapy Assessment Criteria	GMFM PEDI Movement ABC GMFCS Paediatric ICU Denver II Infant Gross Motor Screening Test

	Orthopaedic assessment Bayley Scales of development AIMS Development of the lungs Differences between the adult and paediatric respiratory systems Differences between adult and paediatric musculoskeletal systems Fractures in children		
Treatment	Respiratory Treatment Screening Functional Treatment Family Centred Intervention Planning The role of splinting, orthotics, surgery and medication		Referral to other health care professionals Although the treatment of various disabilities is mentioned in the curriculum, Neurodevelopmental theory, Feeding, Adaptive Seating, Wheelchairs and powered mobility are not specifically mentioned Paediatric ICU
Public Health	Paediatrics in a South African context Legislation Grants Primary Health Care Bio psychosocial		
Multi-professional Referral			Orthopaedic Surgeon Neurodevelopmental Specialist

			Dietician Orthotist Occupational Therapist Speech Therapist and Audiologist Social Worker Psychologist Psychiatrist
Clinical Time		• 208 hours	• 240 hours

University B

	Mentioned in both the survey and university curriculum	**Mentioned in curriculum but not in survey**	**Mentioned in survey but not in curriculum**
Paediatric patient client groups	• Burns • Children Respiratory dysfunction (not classified into different diagnoses in curriculum) • Congenital Heart Disease	• Palliative Care	• Cerebral Palsy • Meningitis • Hydrocephalus • Muscular Dystrophy • Down Syndrome/ Chromosomal Disorders • Spinal Muscular Atrophy • Neural tube defects • Spina Bifida • Bell's Palsy • Torticollis

			• Juvenile Rheumatoid Arthritis • Congenital Amputation • Congenital orthopaedic conditi • Paediatric trauma and associated orthopaedics • HIV/AIDS • Cystic Fibrosis • TB • Bronchiectasis • Asthma • Pneumonia • Bronchiolitis • Premature infants • Developmental Delay • Arthrogryposis • Oncology

Assessment			• Parental involvement • Participation in community • Peculiarities involving paediatric anatomy, physiology • Gross Motor Development • Fine Motor Development • Nutrition • Physical Growth Characteristics • Muscle strength/ function development • Developmental Reflexes • Neuro-developmental treatment • Gross Motor Function Measure • Movement ABC • AIMS • GMFCS • Barthel Index • Ashworth, Berg Scale • ICF • Respiratory Assessment • Orthopaedic Assessment • Paediatric ICU • NICU • FIM
Treatment			• Family Centred intervention • Neonatal intensive care • Kangaroo mother care • Positioning and handling disab • Functional skills and outcomes • Collaboration NGO's (awareness)

			• Provide education • Group intervention • Planning • Individualised family service plan • Adaptive seating • Rehabilitation technology • Roles of other professionals (referral) • Prevention (screening) • Neuro developmental therapy • Respiratory treatment • Paediatric ICU
Public Health	• Grants • Primary Health Care Issues		• Paediatric issues in South African context • Legislation • Bio psychosocial Model
Multi professional			• Orthopaedic Surgeon

			• Neurodevelopmental • Specialist • Dietician • Orthotist • Podiatrist • Occupational Therapist • Speech Therapist and Audiologist • Social Worker • Psychologist • Dentist • Psychiatrist

University C

	Mentioned in both the survey and university curriculum	**Mentioned in curriculum but not in survey**	**Mentioned in survey but not in curriculum**
Paediatric patient client groups	• Cerebral Palsy • Hydrocephalus • Down Syndrome/ Chromosomal Disorders • Neural tube defects • Spina Bifida • Torticollis • Juvenile Rheumatoid Arthritis • Idiopathic orthopaedic conditions • Congenital orthopaedic conditions • Sports injuries • Protein Energy malnutrition	• Osteogenesis Imperfecta	• Head Injury • Meningitis • Muscular Dystrophy • Mild motor dysfunction/clumsiness • Paediatric chronic fatigue and general weakness • Paediatric pain syndromes • Spinal Muscular Atrophy • Brachial Plexus Injury i.e. Erbs Palsy • Congenital Heart Abnormalities • Haemophilia • Congenital Amputation

	• HIV/AIDS		• Paediatric trauma and associated orthopaedics • Burns
Assessment	• Family centred intervention • Parental involvement • Participation in community • Environment - home, school, recreation • Normal Childhood Development (type of development not specified in curriculum i.e. fine motor/ speech) • Neuro-developmental treatment • Gross Motor Function Measure • Paediatric Evaluation of Disability Inventory • GMFCS • Respiratory Assessment • Orthopaedic Assessment • GMFM • GMFCS • PEDI	• HRQoL • Perinatal statistic terminology • Road to Health Chart	• MACS • WeeFIM • Paediatric ICU • Peculiarities involving paediatric anatomy, physiology
Treatment	• Roles of other		• Neonatal intensive

	professionals (referral) • Prevention (screening) • Neuro developmental therapy • Family Centred intervention • Functional skills and outcomes • Provide education • Individualised family service plan • Planning		care • Kangaroo mother care • Positioning and handling disabled children • Group intervention • Individualised education plan • Adaptive seating • Behaviour management • Rehabilitation technology • Respiratory treatment • Strapping • Kinesiotaping • Hippotherapy • Hyperbaric Oxygen • Botox • Constraint Induced Therapy
Public Health			• Paediatric issues in South African context • Primary Health Care Issues • Legislation • Bio psychosocial Model

Multi-professional Referral	• Occupational Therapist • Speech Therapist and Audiologist		• Orthopaedic Surgeon • Neurodevelopmental Specialist • Dietician • Orthotist • Social Worker • Psychologist • Dentist • Psychiatrist

Appendix X Analysis of all paediatric diagnoses seen by physiotherapists in 2010

Condition	Total Number	Condition	Total Number
NEUROLOGY		**ORTHOPEDICS**	
Cerebral Palsy	929	Soft Tissue Injury	65
Developmental Delay	1304	Soft Tissue Reconstruction	12
CVI	33	Osteoarthritis	15
Spinal (Traumatic)	20	Rheumatoid Arthritis	54
Spinal (Non-Traumatic)	64	Spinal surgery	30
Head Injury	116	Vertebral Fracture	1
Neuro Surgery	342	Amputation (traumatic)	16
Central Neuro Lesion	53	Amputation (vascular)	25
Peripheral Neuro Lesion	27	Hands	25
Meningitis	114	Brachial Plexus Injury	17
Bell's palsy	13	Upper Limb Fracture	44
		Lower Limb Fracture	453
		Congenital	266
		Facial Fracture	3
		Pelvic Fracture	18
		Dislocation	7
		Joint Replacement	1
RESPIRATORY		**MED + SURG**	
TB	133	Routine Pre/Post Surgery	180
COPD	3	Burns	1526
Bronchiectasis	14	Nephrology	19
ICU	538	Oncology	93
High care	22	General weakness	78
Acute Lung Disease	419	Haemophilia	163

Sinusitis	17	Pre/Post natal	42
Sputum		Extensive General Surgery	4
Pneumonia	302	Cardio Thoracic Surgery	9
Chronic Lung Disease	66	Cardiac Rehab	2
ICD	33	Dermatology	4
Laringectomy	1	Circulatory Disorder	13
Lung Abscess	35	Vascular	1
Asthma	6	Diabetes	1
CF	1	Urology	12
		Head and Neck	2
		Chronic Pain	2
		Malaria	7
		Early Intervention	361
		Wound Care	10

Appendix XI The fifteen paediatric diagnoses most frequently seen by physiotherapists at the Chris Hani Baragwanath hospital

Condition	Total number of patients seen in 2010	Percentage of total number of paediatric patients seen by physiotherapists
Burns	1526	18,86%
Developmental Delay	1304	16,12%
Cerebral Palsy	929	11,48%
ICU	538	6,65%
Lower limb fracture	453	5,6%
Acute Lung Disease	419	5,18%
Early Intervention	361	4,46%
Neurosurgery	342	4,22%
Pneumonia	302	3,73%
Congenital	266	3,29%
Routine pre/post operation	180	2,22%
Haemophilia	163	2,01%
TB	133	1,64%
Head Injury	116	1,43%
Meningitis	114	1,41%

Appendix XII **Paediatric conditions seen by physiotherapists at the Chris Hani Baragwanath hospital in 2010 that were not included in the syllabus of the three universities (percentage of total number of patients seen provided in brackets)**

University A	University B	University C
• Neurosurgery (4,23%) • Down syndrome/ chromosomal disorders (congenital) (3,29%) • Routine pre/post op (2,22%) • Oncology (1,15%) • Chronic Lung Disease (0,86%) • Spinal Injury - non traumatic (0,79%) • Central nerve lesion (0,65%) • Amputation (0,51%) • Lung abscess (0,43%) • CVI (0,41%) • ICD (0,41%) • Spinal Surgery (0,37%) • Peripheral nerve lesion (0,33%) • Hands (0,31%) • Spinal Injury – traumatic(0,24%) • Nephrology (0,23%) • Pelvic Fractures (0,22%) • Brachial Plexus injuries (0,21%) • Sinusitis (0,21%) • OA (0,18%) • Bell's palsy (0,16%)	• Neurosurgery (4,23%) • Routine pre/post op (2,22%) • Haemophilia (2,01%) • Head Injury (1,43%) • Chronic Lung Disease (0,86%) • Spinal Injury - non traumatic (0,79%) • Central nerve lesion (0,65%) • Lung Abscess (0,43%) • CVI (0,41%) • ICD (0,41%) • Spinal Surgery (0,37%) • Peripheral nerve lesion (0,33%) • Hands (0,31%) • Spinal Injury – traumatic (0,24%) • Nephrology (0,23%) • Pelvic Fractures (0,22%) • Brachial Plexus Injuries (0,21%) • Sinusitis (0,21%) • OA (0,18%) • Circulatory Disorder (0,16%) • Wound care (0,12%) • Cardiothoracic	• Neurosurgery (4,23%) • Routine pre/post op (2,22%) • Oncology (1,15%) • Chronic Lung Disease (0,86%) • Spinal Injury - non traumatic (0,79%) • Central nerve lesion (0,65%) • Amputation (0,51%) • Lung abscess (0,43%) • CVI (0,41%) • ICD (0,41%) • Spinal Surgery (0,37%) • Peripheral nerve lesion (0,33%) • Hands (0,31%) • Spinal Injury – traumatic(0,24%) • Nephrology (0,23%) • Pelvic Fractures (0,22%) • Sinusitis (0,21%) • OA (0,18%) • Bell's palsy (0,16%) • Circulatory Disorder (0,16%) • Urology (0,15%) • Wound care (0,12%) • Cardiothoracic surgery (0,11%)

• Circulatory Disorder (0,16%) • Urology (0,15%) • Wound care (0,12%) • Cardiothoracic surgery (0,11%) • Dislocation (0,09%) • Malaria (0,09%) • Dermatology (0,05%) • Facial fractures (0,04%) • Cardiac Rehab (0,02%) • Head and Neck (0,02%) • Diabetes (0,01%) • Joint replacement (0,01%) • Laryngectomy (0,01%) • Vascular (0,01%) • Vertebral Fracture (0,01%)	surgery (0,11%) • Dislocation (0,09%) • Malaria(0,09%) • Dermatology (0,05%) • Facial fractures (0,04%) • Cardiac Rehab (0,02%) • Chronic Pain (0,02%) • Head and Neck (0,02%) • Diabetes (0,01%) • Joint replacement (0,01%) • Laryngectomy (0,01%) • Vascular (0,01%) • Vertebral Fracture (0.01%) • Urology ((0,15%)	• Dislocation (0,09%) • Malaria (0,09%) • Dermatology (0,05%) • Facial fractures (0,04%) • Cardiac Rehab (0,02%) • Head and Neck (0,02%) • Diabetes (0,01%) • Joint replacement (0,01%) • Laryngectomy (0,01%) • Vascular (0,01%) • Vertebral Fracture (0,01%)