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Evidence-based practice in the paediatric respiratory physiotherapy setting

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EVIDENCE-BASED PRACTICE IN THE PAEDIATRIC RESPIRATORY PHYSIOTHERAPY SETTING

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A research report submitted to the Faculty of Health Sciences, University of the Witwatersrand, Johannesburg in partial fulfilment of the requirements for the degree of Master of Science Physiotherapy.

Johannesburg, 2016.

ABSTRACT

INTRODUCTION:

Physiotherapy in the field of paediatrics is a sector of the practice which is often overlooked, especially in the area of respiratory complications. This is a concern as these patients form a vulnerable population. Care should be taken to administer a safe yet effective treatment to ensure optimal health during their developing years. The aim of the study was to determine types of diagnoses being treated and conditions used, as well as the level of literature available and whether these physiotherapists are making use of evidence-based practice.

METHODOLOGY:

This study investigated paediatric physiotherapists treating respiratory patients across South Africa. The literature available was rated and reviewed. A survey was distributed to paediatric respiratory physiotherapists to investigate elements of their work in clinical practice.

RESULTS:

Ninety-eight (27.5%) participants responded to the survey. Pneumonia (35.9%) and bronchiolitis (27.9%) were the conditions most frequently treated with cystic fibrosis being the least common (8.8%) The most common age group treated was six months to one year and percussions and vibrations were the modalities most commonly used. The more supportive evidence was found on physiotherapy for cystic fibrosis and for more active techniques incorporating breathing exercises, cardiovascular exercises and advice and education. However, there was limited evidence on paediatric respiratory physiotherapy as a whole. Half of the participants often used evidence based practice (EBP) in clinical practice whilst the other half seldom did. Those that had received training in EBP had a significantly greater understanding of EBP ($p=0.04$) whilst there was no correlation between EBP knowledge and the number of years a participant had been qualified ($r=0.02$). The majority of the participants had a positive attitude towards EBP and would like to incorporate it more into their practice although most of them felt that clinical reasoning played a larger role.

DISCUSSION:

This study confirms that paediatric physiotherapists who have been trained in EBP have a better understanding of EBP although not all of them are incorporating it into practice. The conditions most commonly treated and the techniques used are not necessarily evidence-based although there is a definite shortage of literature available in this field of practice.

CONCLUSION:

The study highlights the need for more paediatric physiotherapists to become involved in EBP, in turn allowing for further research to be done in this specialised area of health care.

DECLARATION

I, Kim Burelli, declare that this research report is my own unaided work except for the persons listed in my acknowledgements. It is being submitted in partial fulfilment of the requirements of the degree of Master of Science, Physiotherapy, at the University of Witwatersrand. It has not been submitted before for any other degree or examination in any other university.

Signed on the 25th day of May 2016 in Johannesburg.

Signature:



Kim Burelli

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LIST OF ABBREVIATIONS

ACBT	active cycle of breathing technique
BSc	bachelor of science
CAT	critically appraised topic
CF	cyctic fibrosis
CFTR	cystic fibrosis transmembrane conductance regulator
CPD	continuous professional development
CPT	chest physiotherapy
CPRG	cardiopulmonary physiotherapy rehabilitation group
EBP	evidence-based practice
EX	exercise
FEV1	forced expiratory volume in one second
FVC	forced vital capacity
HFCWC	high frequency chest wall compression
HPCSA	Health Professions Council of South Africa
IPPB	intermittent positive pressure breathing
IPV	intrapulmonary percussive ventilation
M, C & S	microscopy, culture and sensitivity
NPA	nasopharyngeal aspirate
NPA: PCR	nasopharyngeal aspirate: polymerase chain reaction
PEP	positive expiratory pressure
PERC	percussions
PD	postural drainage
PNF	peripheral neuromuscular facilitation
PSIG	paediatric special interest group
RCT	randomised controlled trial

RR	respiratory rate
SXN	suctioning
SASP	South African Society of Physiotherapy
VIBES	vibrations
WCPT	World Confederation of Physical Therapy

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CHAPTER 1: INTRODUCTION

Throughout South Africa, the field of paediatrics forms a significant part of the scope of practice of physiotherapy. Paediatric physiotherapists working in this field need to have the required level of experience (Crombie 2004) and sufficient supporting literature to justify their treatment techniques and provide the best service possible to the patient (Scurlock-evans & Upton 2014). This study investigated evidence-based practice within a paediatric respiratory physiotherapy setting and determined physiotherapists' beliefs and opinions on utilising this concept within clinical practice.

Evidence-based practice (EBP) was derived from evidence-based medicine and is defined as 'integrating clinical expertise with the best available external clinical evidence from systematic research' (Sackett 1997 p3). Evidence-based physiotherapy is defined as 'the practice of physiotherapy guided by relevant, high-quality clinical research'(Campos, Beckenkamp & Moseley, 2013 p252).It is necessary to obtain evidence that is relevant and applicable to the question at hand, and to know how to critique this evidence and incorporate it into clinical practice. To uphold the status of the profession and to ensure that optimal health care is being achieved, the therapist should engage in evidence-based practice whilst considering the preferences of the patient and in this case the parents (Scurlock-Evans, Upton & Upton 2014). There is a need to determine whether paediatric therapists are treating conditions and using modalities for which there is appropriate and relevant literature.

1.1 Databases

One way of conducting EBP is to search the relevant databases providing information on studies done relating to specific fields of interest.

Pedro is a free database specially designed for physiotherapists. A survey of the Pedro database over a two-year period showed America, Australia and Brazil to have the highest amount of users whilst Peru, Chile and Columbia had the highest number of physiotherapists as users specifically, but South Africa did not feature (Campos, Beckencamp & Moseley 2013). There is a need to determine the strategies South African paediatric physiotherapists are using within clinical practice.

1.2 Paediatrics and Education

It is the paediatric physiotherapists duty to assess the individual patient's needs and make an informed decision on the treatment approach, which is patient-specific (De Boeck et al. 2008). The lungs and airways of infants and young children are still in the process of growth and development and therefore they are a lot more vulnerable to harmful effects (Oberwaldner 2000). It is therefore imperative that conditions treated and modalities used should be supported by appropriate research. There are numerous continuous professional development (CPD) courses offered specifically on the topic of paediatric physiotherapy with information on the latest literature regarding respiratory conditions and treatment techniques, usually an average of four per year on respiratory physiotherapy and an additional 11 on other aspects of paediatric physiotherapy These educational sessions are essential to ensure that therapists are equipped to apply techniques effectively, and thus provide the best level of care to their patients.

There are important anatomical and physiological differences between the respiratory systems of adults and children. These must be taken into account when treating children with respiratory problems. Some of these differences include that children have relatively more compliant chest walls, their airways are narrow and have a paucity of smooth muscle in their walls, the diaphragm fatigues easily and has limited potential for downward excursion. In addition children are obligatory nose breathers until approximately three months of age and do not have a mature collateral ventilation system until they are at least six years of age (Schechter, 2007; Oberwaldner, 2000)

There is a lot of controversy on whether physiotherapy treatment for the paediatric patient has a positive influence on the clinical outcome. We need to be sure of our role as physiotherapists and make an accurate judgement as to whether we are having a beneficial effect on the patient presented to us (Walsh, Hood, & Merritt 2011). This knowledge is gained not only through clinical practice and experience, but also by evaluating the literature at hand.

1.3 Problem Statement:

It is unclear whether South African paediatric physiotherapists are making use of the current professional literature and relevant training to ensure that they are administering the best service possible to the patients entrusted to them.

1.4 Aim of Study:

To determine whether physiotherapists are conducting evidence-based practice in the diagnoses they are treating and the techniques they are using in paediatric practice throughout South Africa.

1.5 Objectives of Study:

- To determine the types of conditions being treated and modalities being used by physiotherapists in paediatric respiratory practice.
- To assess the level of evidence available for the above conditions and treatment modalities and therefore determine whether paediatric physiotherapists are conducting evidence-based practice in the clinical setting.
- To determine whether paediatric physiotherapists are evaluating the literature to provide the best service possible in this specialised field of practice.

1.6 Significance of Study:

In evidence-based practice, health care professionals are encouraged to move away from merely accepting instructions from other authorities to help them in practice, and move toward relevant studies and research to influence their clinical approach (Jette et al. 2003). There is continuous research being done to determine the most effective ways of providing a service in the health care profession as it is a field in which there are constantly new observations being made and theories being tested.

There is also an increasing availability of postgraduate and CPD courses on a variety of different topics, many relating to paediatrics. This study strives to investigate whether paediatric respiratory physiotherapists are making use of the information at hand and applying it in an appropriate setting. It will also aid in creating awareness amongst paediatric physiotherapists to not merely accept the treatments used in the past but to rather dig deeper and investigate more recent literature to constantly improve their skills and treatment approach.

1.7 *Conclusion*

The aim of this study is to determine which conditions are being treated and how, and the extent to which this treatment approach incorporates evidence-based practice in the clinical setting.

CHAPTER 2: LITERATURE REVIEW

This chapter will look at evidence-based practice in paediatric respiratory physiotherapy and the importance thereof. It will discuss the different diagnoses being treated by paediatric physiotherapists followed by a section on the modalities being used and their clinical outcomes. Chest physiotherapy in neonates and paediatrics aged zero to 12 years will be reviewed as a specialized scope of practice with an overall discussion on the necessity of correlating clinical reasoning with the relevant literature available.

Literature was sourced through searches on the following databases: Pubmed, ScienceDirect, PEDro, Scopus. Keywords used: percussions, vibrations, ACBT, postural drainage, suctioning, paediatric physiotherapy, pneumonia, sinusitis, bronchiolitis, asthma, exercise, evidence-based practice.

All of the available literature published to date, in the English language, was used.

2.1 Evidence – based practice

In the practice of physiotherapy, evidence-based practice (EBP) is highly important to ensure optimal care for individual patients based on sound evidence related to the profession and the utilisation of appropriate skills backed up by relevant literature (Kumar, Grimmer-Somers & Hughes 2010). According to physiotherapists worldwide, the most common limitations to conducting evidence-based practice are a lack of knowledge on how to correctly review literature and statistics, a lack of skill in appraisal of the quality of literature and limited time devoted to researching (Iles & Davidson 2006).The health care profession is governed by time spent mostly on patient treatments and there is little opportunity for anything else. It is of great importance that a practice makes a point of setting aside a set time for coming together to review literature and discuss questions arising during practice. The concept of evidence- based practice needs to be correctly understood in order for it to be carried out effectively within clinical practice. Regular and relevant training is also required to enhance the researching skills of professionals to allow them to feel more confident in EBP (Illes & Davidson 2006).
Other obstacles identified were unsupportive colleagues or management regarding EBP and a workplace culture too set in their ways, guided by a protocol and not willing to change their approach and outlook in general practice. Lack of resources to

conduct EBP was also a major factor (Barnard 2001). Professionals feel that it is often difficult to access efficient databases and that the information they have access to is limited. They find it difficult to engage in EBP when their colleagues and alliedstaff feel that it is irrelevant. They feel despondent as often their findings with EBP are not heard and are overruled by those in a higher position in the workplace (Williams, Perillo, & Brown 2015). These issues need to be individually addressed to allow for a better outlook and more opportunity for EBP.

Although there are many controversial beliefs regarding EBP, physiotherapists also identified the advantages. It provides a better working environment and a better service to the patients as well as better relationships with other health care professionals. Ideas and findings can be shared to benefit the profession. EBP helps therapists to think a bit more critically, to be more open-minded to different concepts and to not merely accept what has been taught but rather to continue to question and explore different aspects and insights into the profession (Scurlock-Evans, Upton & Upton 2014). An encouraging work culture, access to resources, along with effective skills training and proactive colleagues are all factors which promote EBP (Barnard 2001).

To give a better idea of EBP, a summary of a five step process of conducting EBP is given as follows:

1: *Ask* an answerable clinical question - Recognize a knowledge-gap and formulate a structured question that defines the problem, the intervention and the outcomes of interest.

2: *Acquire* the best available evidence - Know evidence sources and types, and search databases.

3: *Appraise* the evidence - Critically appraise the evidence to determine the validity and clinical importance.

4: *Apply* the evidence - Integrate the evidence with clinical expertise and patient preferences.

5: *Assess* the process - Reflect on steps on to four and identify ways to improve efficiency

(Sackett 1997).

A randomized controlled trial (RCT) administered an evidence-based practice interactive educational programme to an intervention group of physiotherapists and a standard in –service training package to a control group. The study concluded that physiotherapists see 'courses' and 'in-service training' as their most reliable source of information in clinical practice. There was an overall lack of confidence in literature searching and appraisal. Both groups felt that they would like to change their clinical practice to be more evidence-based but the training methods did not seem to be sufficient enough in changing their attitudes towards conducting more EBP, suggesting that this is a complicated process and more research into this aspect of physiotherapy and the ways in which to encourage EBP is recommended (Stevenson, Lewis, & Hay 2004).

More practitioners are using different methods to make EBP more applicable to their current work as it is often felt that EBP is idealistic and not relevant to their daily tasks in practice (Barnard 2001). One of these methods is Critically Appraised Topics (CAT's). A summary is given consisting of the best evidence available to answer a question which has come up in clinical practice. This guides therapists in a more specific approach of EBP which can then be shared with other practitioners with similar questions. The question is asked, the relevant literature is reviewed and a summarised answer is in turn provided (Foster 2001).

In an article discussing evidence-based physiotherapy in an intensive care unit, a framework of a system for comparing evidence was supplied. The United States Preventive Services Tasks Force designed a rating system (from highest to lowest quality) of evidence. It states as follows:

I: Evidence obtained from a systematic review of all relevant randomized- controlled trials

II: Evidence obtained from at least one properly-designed randomised-controlled trial

III – I: Evidence obtained from well – designed controlled- trials without randomization

III – II: Evidence obtained from well-designed cohort or case –control analytic studies preferably from more than one centre
III – III: Evidence obtained from multiple time series with or without the intervention, with dramatic results in uncontrolled experiments

IV: Opinions of respected authorities, based on clinical experiences, descriptive studies or reports of expert committees (Jones 2000).

This is an appropriate guide to reference whether the quality of evidence being reviewed is of a high standard as it does not help to merely review the literature unless a valid study is used as a resource.

Physiotherapists have different opinions and definitions of EBP, which may cause controversy as to the correct way of applying this in practice. Some feel that valuable and reliable high-quality research should direct the way one conducts clinical practice whilst others feel that this takes away the importance of the individual patients needs. They feel that clinical experience is the key to effective practice, with research forming a much smaller role (Barnard 2001). Some feel EBP is the way forward to enhancing the profession but there are others that feel it may be a waste of time. By creating awareness of the advantages of EBP, it may persuade more physiotherapists to be enthusiastic about this concept of practice and allow them to work together supporting each other and sharing ideas, in turn improving professional practice

2.2 Respiratory diagnoses

Numerous respiratory conditions are being treated by paediatric physiotherapists both in hospital and as out - patients. Some of these conditions have a large amount of literature supporting the use of physiotherapy as a treatment approach whilst others have limited evidence or evidence stating that physiotherapy is ineffective, sometimes having more risk of harm than benefits. An overview of some of the available literature is discussed below.

2.2.1 Bronchiolitis

Bronchiolitis is an extremely common lower respiratory tract infection in children under one year. It is usually caused by a virus, most often the respiratory syncytial virus (RSV) which is associated with roughly 75 % of cases of bronchiolitis

(Budhiraja, Verma & Shields 2013). It is characterized by inflammation of the airways, especially the bronchioles, and is the main cause for hospitalization in children. Recent statistics show that annually 17 per 1000 children under six months are admitted due to this disease (Castro-Rodriguez, Rodriguez-Martinez & Sossa-Briceno 2015) and it is speculated that one third of all babies will be diagnosed with bronchiolitis before they reach the age of one year (Budhiraja, Verma & Shields 2013).

There are varying degrees of severity and bronchiolitis may be accompanied by bronchopneumonia. It causes an excess of mucous production as well as bronchospasm and may result in signs of respiratory distress such as dyspnoea with increased respiratory rate, nasal flaring and chest recessions with accessory muscle use. There may be wheezing and crepitations on auscultation along with nasal congestion due to thick secretions. This is a concern, especially in infants, as they are predominantly 'nasal-breathers' (Budhiraja, Verma & Shields 2013).

Respiratory physiotherapy is thought to play a role in clearing secretions and enhancing lung function, in turn decreasing respiratory distress. The literature however, is not very supportive. A recent Cochrane systematic review (Perotta, Oritz & Roque 2007) of level I evidence is the most extensive research done on chest physiotherapy in bronchiolitis to date. Three randomised control trials were reviewed but showed no benefits of physiotherapy. The trials looked at percussion and vibration therapy as well as forced expiratory techniques compared with no physiotherapy intervention. There was no improvement in disease severity, respiratory parameters, length of hospital stay or oxygen requirements in the intervention group and some adverse effects of vomiting and respiratory instability were noted in one of the trials that administered the forced expiration technique (Perrotta et al. 2012).

A second study of level IV evidence, done on the management of bronchiolitis, states that airway clearance techniques in terms of physiotherapy may be more harmful than beneficial, although nasal suctioning allows for temporary relief (Village, 2006). Chest physiotherapy consisting of percussions and vibrations with suctioning showed no long-term beneficial effect when compared with suctioning alone, although there was some improvement in oxygen saturation (Nicholas et al, 1999).

This was a RCT of level II evidence with a small sample size of 50 participants and a mean age of two point eight months. The physiotherapy technique used in the experimental group was vaguely explained and not very consistent. This study, although very out-dated, changed the approach of many physiotherapists. They felt it no longer necessary to treat bronchiolitis and focused more attention on other paediatric respiratory complications (Nicholas et al. 1999).

One of the only supportive studies on bronchiolitis physiotherapy treatment is a RCT, of level II evidence, in which a newer physiotherapy technique, along with nebulisation of hypertonic saline, showed short-term benefits directly after treatment when compared with a control group who only received nebulisation. The sample size had a similar age group to the other studies looked at with a mean of four point two months but an extremely small population of only 20 participants. The new technique consisted of fifteen slow expiration facilitations followed by five cough stimulations, although it was poorly explained. It allowed for decreased wheezing and an improvement in the Wang Clinical Severity Score. There was also an improvement of the Wang Clinical severity score noted 120 minutes after the sessions but this was the same for both groups (Postiaux et al. 2011).

Therefore the effects were definitely short-term. The Wang Clinical Severity Score showed good reliability and validity when assessed in 54 children with acute bronchiolitis aged six to 18 months (Chin & Seng 2004).

2.2.2 Pneumonia

Pneumonia is an inflammatory disease of the lungs usually caused in response to infective pathogens, most commonly a virus or bacteria. As a result the body produces an increased amount of mucus to help to fight the infection and lung function may be compromised (Chaves et al. 2013). Therefore, the disease is often treated with chest physiotherapy, although there is also limited supporting evidence regarding this approach. An RCT by Paludo and colleagues, (2008), of level II evidence, looked at two groups of children aged 29 days to twelve years. One group of 51 children received physiotherapy consisting of percussions, vibrations and cough stimulations along with standard pneumonia treatment whilst the control group of 47 children received only standard treatment but no physiotherapy. The standard pneumonia treatment consisited of medical treatment of antibiotics, fluid replacement and oxygen therapy as needed. There was no difference in length of

hospital stay or clinical resolution time but the intervention group showed to have more added chest sounds and a longer cough duration (Paludo et al. 2008). Another systematic review of three RCTs showed improvement in respiratory rate (RR) and oxygen saturation in two of the studies. The third study showed no change in the intervention group. Although it is of level I evidence, a downfall of this review was that the studies differed a lot in characteristics and provided different outcomes. Meta-analyis could not be done (Chaves et al. 2013).

One supportive study done in Egypt found that a group of infants with pneumonia treated with percussions and postural drainage showed a decrease in frequency of suctioning and oxygen use with improvement on auscultation when compared to a control group. However, this article was poorly written and the intervention plan was not well structured and the improvement in oxygen saturation was short-term. (Hussein & Elsamman 2011). It was an RCT and therefore technically of level II evidence although randomization technique was not explained. Although chest physiotherapy seems to have some positive effects in treating pneumonia, there is still a large gap in the literature and more studies need to be done on this disease, especially concerning paediatric patients so that we have more current literature available rather than literature that is often obsolete

2.2.3 Asthma

Asthma is a complicated lung condition and many paediatricians are reluctant to refer children with asthma for physiotherapy in fear of this worsening the symptoms. The approach to managing an asthmatic patient should always be patient specific and often the most important component is education (Garbutt et al. 2015). A survey-based study stated that there is a large need for more education regarding environmental triggers and overall asthma management, for parents and caregivers (Washington et al. 2012).

Diagnosing paediatric asthma is often a challenge (Motal et al. 2009). Literature shows the most common risk factors to be atopy, environmental allergens and infections with the disease features being wheezing, coughing and chest tightness (Green 1996).

Asthma can be classified as being controlled (stable) with symptoms experienced less than twice a week, no nocturnal symptoms and no activity limitations. This may be managed medically by use of a controller inhaler and a reliever inhaler for

emergencies. A child's asthma may be partially controlled having symptoms occurring more than twice per week with some nocturnal symtoms and activity limitation (Motal et al. 2009). It may further be uncontrolled with three or more partially controlled feautures per week and exacerbations may occur. These are also known as acute asthma attacks in which there is extreme shortness of breath and possible need for admission to the emergency department (Kling, Goussard & Gie 2011).

The medical management for an acute attack would be to administer oxygen if necessary, to give a short-acting beta two agonist via a spacer or nebulization and additional systemic corticosteroids (Kling, Goussard & Gie 2011). Respiratory physiotherapy would not be indicated in an acute asthma attack as an RCT on the effects of respiratory physiotherapy in acute severe asthma in children aged six to 13 years showed no improvement in lung function (Asher et al. 1990). Although medical management is necessary for uncontrolled asthma and acute exacerbations, physiotherapy can play a long-term role in management and maintenance of stable asthma (Garbutt et al. 2015; Ducharme et al. 2015). and, as stated below, this is more in the form of exercise, education and facilitation rather than hands-on manual techniques.

With the correct information, the disease can be managed appropriately, minimising asthma attacks and hospitalisations. A cluster – randomised trial, of level II evidence, done on telephonic peer coaching for parents or caregivers with asthmatic children allowed for these children to have more symptom-free days and fewer emergency department visits (Garbutt et al. 2015). Hand-outs for parents explaining symptoms to look out for, when and how to take the different reliever and controller pumps and when to take the child to the hospital are a good idea, as well as encouraging them to keep an asthma diary (Ducharme et al. 2015). This way they can keep track of their symptoms to ensure that their asthma is under control.

Two reviews, of level IV evidence, done on manual chest physiotherapy techniques found no improvement in children with asthma (Schetcher 2007; De Boeck et al. 2008) and an intervention done on children with stable asthma treated with percussions, vibrations, postural drainage and huffing found no change in spirometry. (Barnabe et al. 2003). This study was of level III-I evidence.

An article of level IV evidence on studies done on exercise training as an approach to treatment, showed very promising results. Some of the most common beneficial

exercises mentioned were swimming, cycling and walking. Thirty-two articles were reviewed and mostly showed that exercise increased overall fitness, in turn improving lung function with minimal effects of worsening exercise-induced asthma. In fact it was more beneficial than harmful (Welsh, Kemp, & Roberts 2005). An RCT of level II evidence in children presenting with partially controlled asthma, aged eight to 12 years, found inspiratory muscle training along with respiratory exercises to improve peak expiratory flow (PEF) and severity symptoms when compared to a control group (Lima et al. 2008). From the literature one can conclude that education and cardiothoracic training are more beneficial than merely performing manual techniques on children affected by asthma. An innovative, more active approach with extensive advice to caregivers and parents is the way forward.

In summary, when used appropriately, there is a place for respiratory physiotherapy in asthma care. It provides guidance for the patient and family on the correct management of the disease and allows for a better understanding with improved health outcomes.

2.2.4 Sinusitis

Sinusitis in the paediatric population is of growing concern but recent evidence has shown that antibiotics are not significantly more effective than using nasal irrigation alone, which will be discussed later on (Ragab et al. 2015).

Paediatric physiotherapists are playing a role in the management of sinusitis with a variety of treatment modalities. Chronic rhinosinusitis is due to an inflammatory condition of the nose and paranasal sinuses, in which the resultant symptoms continue for twelve weeks. The symptoms (similar to those of acute rhinosinusitis) are generally nasal congestion, mouth-breathing, post nasal drainage and coughing with headaches and anosmia (Naghdi et al. 2013).

The paranasal sinuses are air-filled spaces which are formed by the excavation of bone around the nasal cavity. The process begins prenatally and continues on through the course of life. They form within some of the cranial bones, namely the frontal, ethmoid, sphenoid and maxilla and are named accordingly. Evidence shows that there are three phases of pneumatisation of the paranasal sinuses. The first phase occurs at a rapid growth rate during the first year, the second between the ages of one to six years and the third phase being the slowest, up

until puberty (Lee, Shin, & Lee 2012). Evidence also shows that the ethmoid and maxillary sinuses are present, however small, from birth (Duerinckx et al. 1991), the sphenoid sinuses from roughly 10 months old (Tan et al. 2003) and the frontal sinuses usually only from 10 years onwards (Adibelli, Songu, & Adibelli 2015).

In paediatric private practice physiotherapy treatment for sinusitis is usually a regime of ultrasound and laser therapy followed by a saline nasal irrigation and / or suctioning to clear mucous depending on the individual patient presentation. The physiological mechanism of action behind ultrasound is supported by a study undertaken in a laboratory that showed the killing of bacterial biofilms using this intervention. Biofilms are communities of bacteria which are thought to exist in sinusitis infections and are highly resistant to antibiotic treatment (Bartley & Young 2009). An additional study was done on 10 patients undergoing endoscopic sinus surgery, with a diagnosis of chronic rhinosinusitis and nasal polyps. Low-frequency ultrasound was found to decrease the inflammatory cell count and bacterial biofilms were removed from the epithelial layer of the nasal polyps (Karosi, Szikali & Csomor 2016). Therefore ultrasound is thought to be an effective modality in the treatment of sinusitis but no studies were found investigating the effect of ultrasound treatment on sinusitis in children. Low level laser therapy is said to have analgesic and anti-inflammatory effects and helps to enhance the immune system by stimulating T and B lymphocytes, lysozymes and the process of phagocytosis (Hacarova 2000).

A study compared sinus treatment in three groups consisting of children and adults. The first group of 30 participants had laser alone, the second group of 91 had laser and antihistamines and the third of 73 had laser, antihistamines and antibiotics. The results state that all groups improved especially with an analgesic effect. This study was of level III-III and poorly explained with vague results. It did not explain how they got to the results and there was no clarification of how many children compared to adults were included in the sample sizes (Hacarova 2000). A pilot study found that laser treatment allowed for a significant improvement in symptoms however this was investigated in adult patients only (Naghdi et al. 2013).

There is limited and out-dated evidence on physiotherapy treatment in children with sinusitis and also great difficulty in conducting a study to investigate the effect on paediatrics, mostly due to ethical concern as we are unsure of the actual affect of these modalities on the growing and vulnerable paediatric patient. Ultrasound is

thought to be a contraindication over developing growth plates and when used for sinus treatment in children it is being applied over the skull and facial bone area (Batavia 2004). Children's bones are usually still developing at least up until puberty years and therefore we need to be aware of the possible harmful effects. It is irresponsible to continue to treat them with these modalities based on clinical evidence alone.

2.2.5 Cystic Fibrosis

Cystic fibrosis (CF) is a genetic disorder which mostly affects the lungs. This is due to mutations in the gene for a specific protein called the cystic fibrosis transmembrane conductance regulator (CFTR). CFTR helps in producing sweat, digestive fluids and mucus and with this mutation secretions become more viscous and difficult to clear, resulting in breathing and lung complications (Reeves et al. 2012). There is resultant defective mucocilairy airway clearance which may cause further obstruction, inflammation and infection which progressively damages the tissues of the airways. This can lead to respiratory failure and further lung abnormalities and breathing patterns. This may include lung hyperinflation, barrel-chest deformity and the use of accessory muscles to assist with breathing (Lubamba et al. 2012).

A systematic review on chest physiotherapy in children concluded that it is effective in CF but this was based primarily on the quantity of sputum expectorated (Schechter 2007). Modified postural drainage (PD) positions along with manual chest physiotherapy techniques have shown to be beneficial in treating infants with CF, when compared with standard PD in a level II RCT. Forced vital capacity (FVC) and forced expiratory volume (FEV1) improved, especially at five to six years of age (Button et al. 2003). A pilot study, of level IV evidence, showed physiotherapy, in the form of exercise, to significantly increase exercise capacity and decrease the use of intravenous antibiotics in 16 children with CF aged four to 15 years. Unexpectedly, no improvement in quality of life was noted, nor any significant physiological changes, although this was a pilot study with an extremely small sample size. It may be beneficial to conduct a more extensive trial (Ledger et al. 2013).

When respiratory physiotherapy is administered regularly in a home environment by parents or caregivers, it has showed positive long term effects in lung function

(Desmond et al. 1983). A study done on 10 children aged seven to 16 years showed a decrease in FVC when respiratory physiotherapy was no longer administered for three weeks, as opposed to those parents that continued with home treatment.

It is important that the approach in treating children with CF must be patient-specific and also address patient and family satisfaction. Patients are much more compliant, especially children, when approached with treatment techniques that are beneficial to them and their lifestyles, fun to do and can be incorporated easily into daily living for a more long-term effect (Rand, Hill, & Prasad 2013).Parents see physiotherapists as a part of their social support. They often feel overwhelmed with the stresses of raising a child with CF and the physiotherapist should realise their role in not only treating the child, but helping the family as a whole (Tipping, Scholes, & Cox 2010). Of all the respiratory conditions treated by physiotherapists, CF seems to have the most supportive evidence.

2.2.6 Pre and Post Operative respiratory therapy

Although these are not specific respiratory diagnoses, children undergoing surgery are often referred for chest physiotherapy pre and post operatively. The majority of the evidence found on post-operative physiotherapy, although minimal and out-dated, was unsupportive. Routine post-operative physiotherapy is not justified (PasquinA et al. 2006). A group of children ranging from nine months to three years received chest physiotherapy post cardiac surgery whilst another group of the same age range did not. This was an RCT of level II evidence although randomization process was not explained. The group receiving the therapy showed increased atelectasis on chest x-rays when compared with the non-intervention group (Reines et al. 1982). Although this was a very old study, the physiotherapy seemed to worsen the child's condition which is more reason for future research into this field. On a more positive note, one article of level IV evidence found that chest physiotherapy incorporating positive expiratory pressure (PEP) exercises as well as inspiratory resistance exercises showed a decrease in post operative complications but this was in adult patients alone (Branson & Faarc 2013). An additional study measured airway mucins in a group of 39 children before and after cardiopulmonary bypass surgery. Mucins are glycoproteins which form a part of the composition of mucus. They found that mucin levels were significantly increased post surgery and this may be suggestive of the need for physiotherapy for airway clearance post

surgery (Imura et al. 2016).However, ultimately there are not sufficient studies done on physiotherapy for pre and post operative care so it is difficult to draw a conclusion.

More studies need to be done specifically on paediatric patients to ensure we are moving forwards with the correct approach in post operative treatment. There is also very limited evidence available on pre operative physiotherapy in children. Only one study was found. However, this study was supportive. An intervention group of children also undergoing cardiac surgery, aged six years and less, received pre and post operative treatment, whilst the other group received post-operative treatment only. There were less post operative complications such as pneumonia and atelectasis, in the group that received the additional pre operative physiotherapy (Felcar et al. 2008). Based on the out dated as well as limited evidence on the above, it is difficult to formulate a conclusion as to whether physiotherapy is beneficial in these instances. There is a possibility that spending time on education and treatment techniques before theatre may influence the recovery time after, but this is merely an assumption due to lack of studies done.

2.3 Physiotherapy techniques

2.3.1 Percussions and Vibrations

Percussions are a form of ‘chest clapping’ using a cupped hand with a rhythmical flexion and extension action of the wrist whilst vibrations are fine movements also performed manually with the therapists hands, usually in time with the patient’s exhalation (Prasad & Pryor 2004). Although this technique is widely used in practice, there is limited evidence available. An RCT, of level II evidence, comparing the active cycle of breathing (ACBT), which will be discussed later on, with percussions and vibrations in children with cystic fibrosis (CF) found both enabled the expectoration of mucus. However, the ACBT allowed for better quantity and quality of mucus (Hristara-Papadopoulou & Tsanakas 2007). Another comparison of different airway clearance techniques assessed patient’s preference for and the effectiveness of postural drainage with percussions, intrapulmonary percussive ventilation (IPV) and high frequency chest wall compressions (HFCWC). In IPV a pulsatile flow of gas is sent through the lungs during inspiration, creating a type of internal percussion. HFCWC is when positive pressure air pulses are applied to the chest wall to break down and loosen thick secretions (Prasad 2004). Although there

was no preference for a particular technique, the wet weight of sputum expectorated was greater in the percussion and IPV group (Varekojis et al. 2003). The above studies do show that percussions may play a role in helping with sputum expectoration but when percussions were compared with positive expiratory pressure techniques, in an RCT of level II evidence which will also be discussed later on, the percussion group actually showed a decline in spirometry (McIlwaine et al. 1997).

An RCT compared manual chest physiotherapy techniques and suctioning with suctioning alone in 90 ventilated children. They found a significant decrease in central airway resistance in the chest physiotherapy group as opposed to suction alone. There were no significant differences in tidal volume, lung compliance or arterial blood gases although lung compliance did decrease in most of the participants post suctioning, again demonstrating that the therapist needs to be cautious when using this type of technique. Only the short-term effects of these procedures were noted (Main et al. 2004)

It is very difficult to come to a conclusion on the effectiveness of these techniques due to the controversial literature available as well as the shortage thereof.

2.3.2 Active Cycle of Breathing Technique

This is a breathing technique developed in Britain in the late 1980's. It is taught to patients to help improve lung function and aid in mobilising secretions (Prasad 2004). It consists of thoracic expansion and breathing control exercises to encourage the use of the correct muscles and to improve lung volumes. These are followed by the forced expiration technique (FET) usually in the form of huffing and then coughing (McIlwaine 2007). As discussed above, the ACBT seems to be more effective than percussions alone. The RCT of level II evidence spoken of previously found the ACBT to cause expectoration of a better quality of mucus in 35 children aged eight to 20 years (Hristara-Papadopoulou & Tsanakas 2007).A systematic review of the ACBT showed it to be more effective than other physiotherapy modalities (PD, percussions, vibrations) in terms of secretion clearance (Lewis, Williams & Olds 2011). In Mckoy's Cochrane review of ACBT in CF, it concluded that there is insufficient evidence to support or reject the use of ACBT above other

physiotherapy modalities and that it had similar outcomes in terms of lung function, sputum weight and oxygen saturation (McKoy et al. 2012). An additional study investigated the comparison of ACBT with HFCWC in children with CF aged nine to 16 years. Sputum weight increased and pulmonary function improved significantly more with ACBT (Phillips et al. 2004). The advantages of this technique are that it can be performed without a therapist at home once taught correctly. It is safe and effective and does not require any equipment. It cannot, however, be performed on babies or younger children that are not competent enough to learn the technique effectively (Prasad 2004).

2.3.3 Postural drainage

Patients are positioned during chest physiotherapy treatment to allow gravity to assist with the clearance of secretions. This is known as postural drainage (PD) but unfortunately there is limited literature available on this technique. The majority of the literature assesses postural drainage as part of another technique, for example together with percussions, with no studies comparing postural drainage versus no drainage whilst performing the same treatment (McIlwaine et al.1997). More studies compare standard postural drainage (head down position) to modified postural drainage (head tilted upwards) in 20 infants with cystic fibrosis with a mean age of two point one months. (Button et al. 2003). The modified PD is much more effective in the long-term with less upper respiratory complications and less gastro-oesophageal reflux (Button et al. 2003). PD with the head-up positioning is also safer in children, especially premature babies, as the auto-regulation of their cerebral blood flow is not yet fully developed and the head-down position may interfere with blood pressures (Fyfe et al. 2014).

2.3.4 Exercise

Cardio-respiratory activities are an effective way to help to mobilize secretions, especially incorporated with breathing exercises (McIlwaine 2007). They are also fun for children in that the therapy session becomes enjoyable as well as effective. The wet weight of sputum expectorated has shown to be greater when exercise is used together with breathing exercises compared to breathing exercises alone (Reix et al. 2012). In a level II study of an RCT, 34 children with CF were treated with either an exercise programme with individual expiratory manoeuvres or the ACBT alone. Lung function as well as patient satisfaction were both significantly better in the

exercise group (Reix et al., 2012). In another RCT of a group of asthmatic children, some received exercise therapy as a treatment modality whilst some did not. Although the exercise did not improve the inflammatory cytokines of the disease, it did improve peak expiratory flow, functional capacity and maximum inspiratory and expiratory pressures. It also allowed for more symptom-free days (Andrade et al. 2014). As discussed previously, exercise actually showed more beneficial effects (with children receiving asthma medications) even in those with exercise-induced asthma and helped to strengthen their lung function rather than cause harm (Welsh, Kemp & Roberts 2005). Exercise motivates children to move away from the current more sedentary lifestyles, which are mostly spent indoors, and allows for a healthier lifestyle going forward into adulthood (Riner & Sellhorst 2013).

2.3.5 Suctioning

This procedure is used to assist in clearing secretions when the patient is unable to do so themselves. It is an invasive, uncomfortable technique and therefore should only be performed when really necessary (Knox 1993). There are two types of suctioning techniques, open and closed suctioning. Open suctioning is when a suction catheter is inserted directly into the nasal or oral orifice to extract mucus and stimulate the cough reflex if present. It may also be used in ventilated patients where the circuit is then disconnected to allow for insertion of the catheter for suctioning. Closed suctioning consists of a sterile unit attached to the ventilator supporting the patient. The catheter is enclosed within a plastic bag and when suctioning takes place, it is inserted from this bag into the endotracheal tube without coming into contact with the outside air/bacteria (Clifton-Koeppel 2006). Due to the fact that the ventilation circuit does not need to be disconnected, closed-suctioning is assumed to be safer (Jongerden et al. 2012). However, the literature is inconsistent with this assumption. There have been numerous debates regarding closed versus open suctioning but unfortunately there is very limited literature available on the procedure of suctioning as a whole (Morrow & Argent 2008). Only one study stated that closed suctioning allowed for better recovery time than open suctioning (Clifton-Koeppel 2006) where as a more recent study showed both to be equally as safe in terms of having minimal effects on heart rate, mean arterial pressure and oxygen saturation (Jongerden et al. 2012), although this study was not specific to children alone.

There is great risk involved in causing further complications with suctioning especially in children whose airways are weaker and more susceptible to injury than adults. It is often assumed that the risks outweigh the benefits. Care must be taken to ensure that suction pressures are high enough to be effective but low enough not to cause harm (Knox 1993). Deep endotracheal suctioning (catheter inserted until resistance is felt) has a greater risk of causing harm to the child compared to shallow suctioning (catheter inserted until the end of the endotracheal tube). Literature shows that deep suctioning is not more beneficial than shallow suctioning in terms of oxygen saturation and heart rate and therefore is not necessary, especially as there is more potential to cause harm (Youngmee & Yonghoon 2003). There was no literature available on whether deep suctioning is better than shallow in other aspects such a chest x-rays, recovery time and respiratory distress symptoms and further studies will need to be done to determine this.

Although there is limited evidence on non-intubated suctioning, a level III-I study done on 39 children with CF, found oropharyngeal suctioning in the non-intubated child showed good sensitivity in detecting lower airway organisms when compared with broncho-alveolar lavage (BAL). However, a high level of distress was also found, especially in the two and three year olds who scored a four (serious distress with loss of control) on the Groningen distress scale (Doumit et al., 2015).

The psychological implications of the suctioning procedure should also be taken into account.

There is limited evidence available on clinical indicators observed to determine whether suctioning should be done or not. Therefore, there is not much guidance for clinical decision-making regarding the benefits versus harm in suctioning of a particular patient. It is left to the therapists own discretion. Further research is needed on this treatment technique.

2.3.6 Nasal Drainage/ Lavage

A saline instillation is often used in ventilated patients during chest physiotherapy and suctioning to help to extract thick mucus as well as in non-ventilated patients to clear the upper airways. A group of children performing nasal saline lavage showed decreased symptoms of congestion, coughing, rhinorrea, nasal itching and sneezing along with a better quality of life and improved nasal peak expiratory flow rate

(Wang et al. 2012). There were 60 atopic children in this study between the ages of three and 12 years, with a diagnosis of acute asthma. Twenty-nine received nasal irrigation whilst 31 did not. This was an RCT of level II evidence.

Consistency with compliance is required from the patient for maximal beneficial effects (Hong et al. 2014). Although this nasal lavage procedure can decrease the symptoms of sinusitis, the saline lavage does not really enter the sinuses themselves so is not seen as an actual treatment to cure sinusitis but rather a procedure for symptomatic relief (Snidvongs et al. 2014). However, in a level II RCT comparing antibiotics with nasal irrigation alone, showed both groups to equally improve symptomatically in terms of nasal itching, sneezing, facial pain, congestion, headaches and rhinorhea. Both groups also had equally decreased neutrophils on a cytological assessment of a nasal swab and both were without differences for bacterial assessments post treatment. The rating of Paediatric Rhinoconjunctivitis Quality of Life Questionnaire was similar for both groups, showing that nasal irrigation alone could be an effective treatment for sinusitis in children (Ragab et al. 2015)

There is controversy as to whether sodium chloride irrigation in ventilated children and infants is beneficial or more harmful. The purpose of sodium chloride irrigation is thought to be that it lubricates the suction tube, helps to loosen secretions and dilutes mucus to allow it to be extracted more easily. The physiological effect behind saline is that it restores the water layer that lines the airways and allows more water to be drawn into the thick mucus, allowing for it to be less viscous and more easily cleared (Reeves et al. 2012). The majority of studies done on adults have shown sodium chloride to decrease oxygen saturation post suctioning. Although the literature is limited, a study done on sodium chloride in suctioning ventilated children also showed a decrease in oxygen saturation one to two minutes post suctioning. Ten minutes after suctioning however, the saturation was the same as the group in which sodium chloride was not used. Further studies should be done to determine more long term effects of sodium chloride instillation but at present it should not be used routinely (Ridling, Martin & Bratton 2003).

2.4 Mechanical/ machine devices

2.4.1 Manual Hyperinflation

Occasionally manual breaths are given to allow for larger breaths or hyperinflations to improve oxygenation and lung compliance, re-inflate collapsed segments and to help in removing secretions. This is usually in a ventilated patient with a device called an Ambu-bag which is a self-inflating device operated with the therapists hand. A device called a Neopuff is also used for manual hyperinflation in neonates. The self-inflation devices are made by a variety of different manufacturers. Of great concern is that when these different devices were tested (although only on neonatal and infant doll models) they all gave different ventilation parameters in terms of tidal volume, peak inspiratory pressures, peak inspiratory flow and peak expiratory flow (Mara et al. 2013). This is especially dangerous in neonatal ventilation as their lungs are not yet fully developed and thus pressures need to be strictly monitored. It is suggested that a manometer be used at all times to ensure correct pressures are being administered via these hyperinflation devices. The devices could only be tested on mannequins so the study may have a few inaccuracies. A systematic review done on three studies showed manual hyperinflation to be effective in children aged zero to16 years (de Godoy, Zanetti & Johnston 2013). Further investigations need to be made into this mode of ventilation, especially as a treatment modality.

2.4.2 Positive Expiratory Pressure Therapy

PEP is breathing out against increased resistance either by means of a device or with pursed-lip breathing. This breathing technique may help to increase lung volumes (improve atelectasis), decrease hyperinflation and help with secretion clearance by moving mucus from peripheral airways more centrally to be cleared more easily. It is thought that by breathing out against a resistance, the lungs respond to this increased expiratory resistance by increasing lung volumes to achieve appropriate elastic recoil able to overcome the resistance, in turn recruiting and expanding collapsed airways. The slow expiratory flow in PEP also helps to decrease the pressure difference inside and outside of airway walls, which helps to prevent collapse of the airways. In turn more air can be expired resulting in less air trapping and decreasing hyperinflation (Olse, Westerdahl & Lannefors 2014).

PEP showed an improvement in spirometry in a group of children with CF when compared with percussions and postural drainage, which worsened lung function. This was an RCT. The PEP improved forced vital capacity (FVC), forced expiratory volume and forced expiratory flow (McIlwaine et al. 1997).The standard PEP method has also shown to be superior when compared with the flutter device (oscillating PEP) in children with CF(McIlwaine et al. 2001). The PEP device used consisted of a mask and a one-way valve with a resistor attached. Those treated with the flutter device had a FVC decline whilst the spirometry readings of the standard PEP group remained relatively stable. There were significantly less hospitalisations in the standard PEP group (Mcilwaine et al. 2001). The physiology behind the PEP mechanism explains the reason it is effective and the small amount of literature found, although slightly out of date, is supportive of this breathing technique.

2.4.3 Ultrasound and Laser Therapy

These devices have been discussed previously regarding the treatment of sinusitis. It has been shown that the literature available is limited and also out-dated, especially on laser treatments. These machines may have strong evidence on treating other conditions but need further studies to be done on their effects of treating sinusitis in paediatrics.

2.5 Education

Educating parents or caregivers and, where possible children themselves, is one of the most vital treatment tools we have as physiotherapists. Parents of children with a long-term pulmonary disease, such as CF or asthma, have a difficult time managing the child's symptoms whilst also trying to attend to the rest of the family (Tipping et al. 2010). They may feel despondent when the child is not cooperating with the home physiotherapy techniques as well as pressed for time trying to incorporate these home sessions. Managing a child is a difficult task on its own (Zarei et al. 2014) and a respiratory complication adds to the stressors. Parents have identified the transition
to different age groups in the child's life as a major stressful factor in trying to modify treatment techniques to suit the child's development (Tipping et al. 2010). As a result, education from the physiotherapist, if done appropriately, can have a hugely positive impact on the family's life. Care must be taken not to bombard the parents

with too much information and to give them home advice and guidance suitable for their specific needs (Tipping et al. 2010).

Empowering parents to be more knowledgeable on their child's condition gives them more self-confidence and increases their self-efficacy in management of the disease (Zarei et al. 2014), in turn decreasing stress and anxiety.

As school-aged children spend majority of their time in a school environment, care should be taken to ensure the school understands the child's treatment protocol and that a qualified health care member can attend to them should it be necessary (Cicutto, Gleason & Szefler 2015). The school set-up should be assessed to ensure the child will have continuous, long-term care. For example, in an asthmatic child one should make sure that they have a spare inhaler at school and that the teachers have a copy of the doctors and physiotherapists medication and management protocol (Cicutto, Gleason & Szefler 2015).

2.6 Chest physiotherapy in neonates

This is an extremely specialised field of chest physiotherapy. Due to their low birth weight and immature systems, treatment should be exercised with extreme caution. A study comparing the development of autonomic cardiovascular control in full-term infants with pre-term infants, found pre-term infants to have less parasympathetic and sympathetic control of their heart rate and blood pressure. These findings continued up to five to six months corrected age (Yiallourou et al. 2013). Correct positioning and handling of these infants is important and vital signs should be continuously monitored to ensure no harm is caused (Fyfe et al. 2014).

Prone positioning has been found to be more beneficial than supine to allow for better peripheral oxygenation and oxygen saturation, as well as to aid with decreasing stress, improving auto-regulation and enhancing development (Bembich et al.2012). It helps with strengthening of abdominal/trunk flexors as well as shoulder girdle strengthening and active head control. It also allows for better chest stability. Left side-lying seems to decrease gastro-oesophageal reflux and 'mimic' the position in utero, bringing hands to midline and also strengthening flexors promoting more normal development (Gouna et al. 2013). Although the right side-lying position has

not been looked at as extensively, left side-lying seems to be an alternative position to prone in allowing for better lung function (Gouna et al. 2013).Two case studies done on infants with acute respiratory distress syndrome post cardiac surgery showed prone positioning to improve oxygenation and ventilation and to decrease the inspired oxygen percentage when antibiotics and mechanical ventilation were not sufficient (Balachandran et al. 2012). This shows the importance of a treatment approach as minimalistic as positioning to improve lung function in this vulnerable population of patients.

Manual chest physiotherapy techniques should be used with care in these patients and only when necessary. A comparison between the conventional percussion and vibration treatment with a newer technique of 'lung squeezing' found the latter to be significantly more effective in correcting atelectasis using chest radiographs as an outcome measure. This technique consists of three to four compressions for five seconds at a time with a slow release. It is thought to decrease hyperinflation and in turn recruit more lung segments to expand. It seems to aid more in correcting ventilation distribution as both methods were able to extract similar amounts of mucus when suctioning (Wong & Fok 2003). A concern was that incidence of intraventricular haemorrhages increased in some of the neonates in both groups from a grade zero to a grade two to a grade three to four but this may be attributed to other factors. Nonetheless one needs to be extremely cautious in administering any manual techniques with these infants, ensuring that their heads are kept stable and supported at all times. Chest percussions and vibrations were effective at re-expanding the right lung of a 27 week old neonate only two hours post treatment (Pandya et al. 2011), although this was a case study of one patient of level IV evidence and it must be noted that each of these neonates can differ greatly.

2.7 Conclusion

This chapter has provided information on evidence-based practice and how it relates to the profession of physiotherapy. It has discussed various conditions treated by physiotherapists in the field of paediatrics as well as some of the modalities that are used and the literature that is available on each of these. It has emphasised the importance of taking precaution in the treatment of neonates and the paediatric population as a whole. It is hoped that this background provides the necessary guidance and insight into the relevance of this study.

CHAPTER 3: METHODOLOGY

This chapter will discuss the ethical considerations, study design, subjects, materials and measurements, procedure for data collection and data analysis

This study was conducted by sending out a survey via email to all physiotherapists working with paediatrics in respiratory care. It was sent to physiotherapists based in all nine provinces around South Africa.

3.1 Ethical Considerations:

Ethical clearance was obtained from the Human Research Ethics Committee of the University of the Witwatersrand, Johannesburg with M150117 as the certificate clearance number (see Appendix III). A participation information sheet was attached to the beginning of the questionnaire stating that submission of the questionnaire will be taken as the participant giving informed consent to participate in the study (Appendix I).

3.2 Study Design

The study design was a quantitative descriptive, cross-sectional survey- based study.(Grimes & Schulz 2002)

3.3 Participants

The participants for this study were qualified physiotherapists that work with paediatric patients in respiratory care in South Africa.

1.2.1) Inclusion criteria

- Physiotherapists registered with the Health professions Council Of South Africa (HPCSA)
- Physiotherapists who treat paediatric patients (birth- 12 years) in respiratory care

1.2.2) Exclusion criteria

- Physiotherapy students and community service physiotherapists were not included in the survey

3.4 Materials

A survey programme (RedCap) was used to design the survey as well as to distribute it electronically to the physiotherapists. The researcher underwent training to learn to use the Redcap software at a training course held by the University of the Witwatersrand. Data was directly exported into an excel spreadsheet from the RedCap programme, after completion of the survey.

3.5 Procedure

3.5.1 Survey-related methodology

A questionnaire was drafted based on an existing questionnaire developed in America (Jette et al. 2003) and also based on the objectives of the study. Ethical approval was obtained from University of Witwatersrand Human Research Ethics Committee. The survey was designed on Redcap.

A pilot study was conducted, utilising a focus group of ten paediatric physiotherapists to review the questionnaire content whilst answering it themselves. Suggestions were made as to whether particular questions should be omitted, modified or included. The length of time required to complete the questionnaire was also evaluated. Suggestions from two members of the focus group were implemented and all members of the focus group took, on average, 15-20 minutes to complete the survey which was acceptable. The results of the pilot study helped to validate the questionnaire by determining whether it had addressed the objectives of the study. The pilot also determined the reliability of the questionnaire and the survey-based programme. The final version of the questionnaire was shared with the focus group members for acceptance. (see Appendix II)

The survey was sent electronically to paediatric physiotherapists belonging to the paediatric special interest group (PSIG) and cardio-pulmonary respiratory groups (CPRG) of the South African Society of Physiotherapy (SASP), thus including physiotherapists working around all nine provinces in South Africa as well as those in both public and private practice. The chairperson of each of these groups assisted with submitting the survey link to the physiotherapists belonging to these groups.

The survey was active for three months and the Redcap software programme enabled reminders to be sent monthly to participants.
The total population of physiotherapists to whom the survey was distributed was 380 although there may have been some overlap with a physiotherapist belonging to both the Paediatric Special Interest Group (PSIG) and the Cardiopulmonary Rehabilitation Group (CPRG).

3.5.2 Literature search

All available articles of the English language relating to paediatric respiratory physiotherapy were searched with no exclusions regarding the types of articles or dates of publication. The quality of the articles were rated based on a rating system designed by the Unites States Preventative Tasks force. This rating system was also used in a study on EBP in an intensive care unit (Jones 2000).

3.6 Data Analysis

Data was captured in an excel spreadsheet after being exported from the database of the survey programme. The results consisted of demographic, categorical and continuous data. Various statistics were used to analyse the different types of data. Descriptive statistics were used to express demographic data and categorical data was summarised as frequencies and percentages. Continuous data were summarised as means and standard deviations whilst relationships between variables were assessed using the Pearson's Chi-squared test and the student t-test. These tests were done using formulas in Microsoft excel. Data was analysed at the 95% confidence interval.

CHAPTER 4: RESULTS

This chapter will present the results of the study in various tables and graphs. Of the 380 surveys distributed, 98 participants completed the survey and therefore the response rate was at 25.7% although as previously mentioned there may have been an overlap within the 380 surveys sent out in which one participant may have belonged to both the PSIG and the CPRG.

Seventy-six articles were identified in the literature review of this study and all were included as shown in the table below.

Table 4.1 Table of literature reviewed

DIAGNOSES	No of Articles	Strength of Article	Authors	Supportive	Non-Supportive	Ages
Asthma	8	Article 1 –level IV	De Boeck et al. 2008		X Review of general CPT	Pre-school& school age children
		Article 2 – level III-I	Barnabe et al. 2003	X PD,huff ,vibes		62 adults and 19 children aged 6-12 years
		Article 3 – level IV	Welsh, Kemp & Roberts 2005	X		6 – 17 years
		Article 4 – level IV	Schechter, 2007		X review of general CPT	6- 13 years
		Article 5 – level IV	Washington et al 2012	There is room for more extensive education to be given to patients and their caregivers by providers		Children 8-16 years with mild, mod or severe asthma
		Article 6 – level II	Garbutt et al 2015	X education		Children 3 – 12 years old
		Article 7 – level II	Lima et al. 2008	X inspirat -ory muscle training, Ex.		50 partici-pants aged 8-12 years
		Article 8- level II	Asher et al. 1990		X General CPT	

Pneumonia	6	Article 1 – level II	Paludo et al. 2008		X control =PD,vibes, cough 2nd group= medical rx	98 children aged 29 days – 12 years
		Article 2 – level IV	De Boeck et al. 2008		X Rev. of general CPT	Pre school and school age children
		Article3 – level IV	Abstract from Paludo study - above		X as above	89 children; 29 days - 12 years
		Article 4 – Level I	Chaves et al. 2013	X Gen. CPT	X Gen. CPT	Birth – 18 Yrs
		Article 6 – level II	Husseins & Elsamman, 2011	X PD, perc		60 infants, mean age 5 months
Bronchiolitis	6	Article 1 – level I	Perrotta, Ortiz & Roque, 2012		X Gen. CPT	0-24 Months
		Article 2 –level IV	Village 2006		X Gen. CPT incl. sxn	1 month- 2 Years
		Article 3- level II	Postiaux et al, 2011	X 15 expiration with provoked cough		20 infants with Mean age 4.2 months
		Article 4 – level II	Nicholas, Dhouieb 1999		X perc, vibes, PD	50 infants of average 2.8months
		Article 5 – level I	Castro-Rodriguez et al. 2013	N/A		N/A
		Article 6- level IV	Budhiraja et al. 2012	N/A		N/A
Cystic Fibrosis	5	Article 1- level IV	Schechter, 2007	X review of general CPT		Not stated
		Article 2- level II	Button et al, 2003	X PD		20 infants of Mean age = 2.1 months
		Article 3 – Level III-III	Rand, Hill & Prasad, 2013	Neither		All
		Article 4 – level III-III	Ledger et al 2013	X exercise, education		16 children aged 4-15 years

		Article 5 – level III-II	Desmond et al. 1983	X PD,pec vibes, cough		10 children aged 7-16 years
Pre-operative patients	1	Article 1 – level II	Felcar, Guitti, Marson & Cardoso, 2008	X PD,vibes perc,mob, ex		135 children aged 6 years and younger
Post-Operative patients	3	Article 1- level II	Reines, H. David; Sade, Robet M; Bradford, Barbara F; marshall John, 1982		X PD, vibes	50 children aged 9 months – 3 years
		Article 2– level II	Pasquinar, Tramer, Granier & Walder, 2006		X general CPT	Studies of all ages- more adults??
		Articel 3 – level IV	Branson & Faarc 2013		X perc, PD	Review of adult studies mostly and includes child study above (article 1)
Sinusitis	4	Article 1- level II	Ragab et al. 2015	X nasal irrigation		61 children
		Article 2 – level III-III	Hacarova 2000	X laser		Children & Adults
		Article 3– level II	Wang et al. 2012	X nasal irrigation		60 children aged 3 -12 years
		Article 4 – level III-III	Hong et al. 2014	X nasal irrigation		Mean age = 8. 3 years ; 4- 13 years and in total 77 children
		Article 5 – level III – I	Snidvongs et al. 2008		X nasal irrigation	

MODALITIES	No of Articles	Strength of Articles	Authors	Effective	Non-effective	Ages
Percussions & Vibrations	4	Article1 – level II	Hristara-Popadopoulou & Tsanakas, 2007	X		35 subjects aged 8 – 20 years Mean age = 12.37 years
		Article 2- level II	McIllwaine, Wong, Peacock & Davidson, 1997		X	40 patients aged 6 – 17 years
		Article 3- level II	Varekojis et al. 2003	X		24 subjects aged 12 years and older
		Article 4 – level II	Shannon et al 2014	X		93 children aged 3 days to 16 years
ACBT	5	Article 1- level II	Hristara-Popadopoulou & Tsanakas, 2007	X		35 subjects aged 8-20 years ; Mean age = 12.37 years
		Article 2- level IV	McIlwaine 2007	X		Studies on all different age groups of children, from infants& upward
		Article 3 – Level I	McKoy et al. 2012	X	X	60 studies identified in all ages
		Article 3- level IV	Phillips et al. 2004	X		Ages 9-16years
		Article 4- level I	Lewis, Williams & Olds 2011	X		All ages (review)

Postural Drainage	1	Article 1 –level II	Button et al. 2003	X		20 infants Mean age =2.1 months
Exercise	3	Article1- level IV	McIlwaine 2007	X		Studies on all different age groups of children, from infants and upward
		Article 2 – level II	Reix et al. 2012	X		34 children aged 7-18 years
		Article 3- level II	Andrade et al. 2014	X		33 children, 6-17 Years
Ultrasound and Laser Therapy	4	Article 1 – level IV	Newton 1996		X	Not Specified
		Article 2 – level III-III	Hacarova,	X		Children & adults
		Article 3 – level IV	Bartley & Young 2009	X		Not age specific
		Article 4 – level III-III	Naghidi, Ansari, Fasthali 2013	X		Adult patients
Suctioning	8	Article 1 – level IV	Knox 1993	Limited evidence		Not specified
		Article 2 – level IV	Morrow& Argent 2008	Limited evidence		Paeds- not Specified
		Article 3 – level III-I	Morrow 2006		X	78 infants of mean age 3.3 months
		Article 4 – level IV	Clifton-Koeppel 2006	More evidence needed – both views		N/A
		Article 5 – level II	Youngmee &Yonghoon 2003	Deep sxn not neccessary and more risk than benefits		27 neonates

		Article 6 – level IV	Davies et al. 2014	Insufficient evidence available.		N/A
	7	Article 7 – level II	Ridling, Maritn, Bratton 2003		X	24 patients 10 weeks- 14 years
		Article 8 – Level III-II	Jongerden et al. 2012	Neutral		All ages?
		Article 9 – level II	Main et al. 2004	More effective when used together with CPT		90 infants
PEP (mask)	3	Article 1 – level II	McIllwaine, Wong, Peacock & Davidson, 1997	X		40 patients aged 6 – 17 years
		Article 2 – level II	Mcillwaine et al. 2001	X		40 children 7 – 17 years
		Article 3 – level IV	Olse et al. 2014	X		N/A
Manual Hyperinflation	2	Article 1 – level I	De Godoy, Zanetti & Johnston, 2013	X		0-16 years
		Article 2 – level II	Novais de oliveria et al. 2013	Possibly harmful with incorrect settings		Doll model of infant&paediatric patient

Neonates	6	Article 1- level II	Wong & Fok 2003	Perc & vibes & PD not as effective as LST		56 pre-term neonates
		Article 2- level IV	Pandya et al 2011	X sxn , vibes, perc		Baby of 26-28wks at 968g.
		Article 3– level III-I	Yiallourou et al. 2012	N/A		25 pre-terms with 31 full-term
		Article4 – level II	Gouna et al. 2013	X posit - ioning		19 neonates 27-29wks
		Article 5 – level III-I	Bembich et al. 2012	X posit - ioning		20 neonates- age not specified
		Article 6 – level IV	Balachan-dran et al. 2012	X prone		3 infants: 2x 1month old & 1 x 2month old

Table 4.1 Abbreviations:

CPT- Chest physiotherapy (refers to vibes,perc,PD= general); PD- postural drainage; SXN- suctioning; Vibes-vibrations; Perc-percussions; Ex-exercise

Sample size and mean graduation period:

The current study had a sample size of 98 participants with a mean graduation period of 11 years and a standard deviation of 10,45 years.

The demographic data of the participants is summarized below.

Participants that completed the survey were from all nine provinces. The majority were from Gauteng, n=59 (60%) followed by the Western Cape, n=18 (18%), Eastern Cape, n=4 (4%), Limpopo, n=4 (4%), Kwazulu-Natal, n=4(4%) Freestate, n= 3 (3%), Mpumalanga, n= 3 (3%), North-West, n=2 (2%) and the Northern Cape, n= 1 (1%).

Table 4.2 Nature of degree

Variable		(n)
Nature of Degree	BSc	73
	MSc	15
	PHD	4
	other	9

Table 4.2 Abbreviations:

BSc-Bachelor of Science; MSc- Masters of Science; PHD- Doctor of Philosophy

This shows that the majority of the participants had a BSc qualification (n=73) The mean number of years qualified is 11.1 with a standard deviation of 10. 5 years.

Table 4.3 shows the involvement in additional professional courses and activities of the participants.

Table 4.3 Additional training and group affiliation

		Percentage (%)
Belonging to the paediatric special interest group		50
Affiliation to other Groups		57
Attend meetings of these groups	None	26.4
	few	19.4
	some	31.9
	many	16.7
	all	5.6
CPRG1	Completed	17.3
	Not done	73.5
	Unsure	9.2
Provide a paeds block	Yes	24.5
	No	73.5
	Unsure	2
Job Shadow	Yes	75.5
	No	21.4
	Unsure	3.1

Table 4.3 Abbreviations

CPRG- cardiopulmonary physiotherapy rehabilitation group

Half of the participants were members of the paediatric special interest group, n=49 with a large number stating that they didn't attend meetings of the groups they were

affiliated with (26.7%).There was an average of only two continuous professional development (CPD) courses, relating to children, attended per year where four are offered on average per year. Sixty seven point four percent (n= 66) stated that they had a practice protocol of guidelines of treatment approaches within their work environment whilst 32.6 % (n=32) did not.

In table 4.4 the number of hours worked per day and the number of paediatric patients treated per day are presented.

Table 4.4 Hours worked and paediatric patients treated

	Mean	**Standard deviation**
Hours worked per Day	7.9	4.7
Paediatric patients treated per day	6.7	4.6

The average number of hours worked per day is 7.9 with a standard deviation of 4.7 and an average of 6.7 paediatric patients treated per day with a standard deviation of 4.6.Sixty one percent of the total patient numbers seen per month were paediatric patients.

In table 4.5 the percentage of time worked in urban or rural areas and in hospital or out-patient settings is shown.

Table 4.5 Percentage time worked in urban/rural areas and hospital/out-patient settings

		Percentage (n)
Area	Urban	86.7 (85)
	Rural	9.2 (9)
	Both	4.1 (4)
Setting	Hospital	14.3 (14)
	OPD	21.4 (21)
	Both	64.3 (63)
Type of hospital setting	Private	55.1 (54)
	Government	25.5 (25)
	Uni-affiliated	12.2 (12)

The majority of the participants worked in urban areas, n=85 (86.7%) and both hospital and out patients were the most common settings worked in, with 55% of the hospitals being private hospitals.

The following graph shows how the participants usually divided their different aspects of work time in an average month.

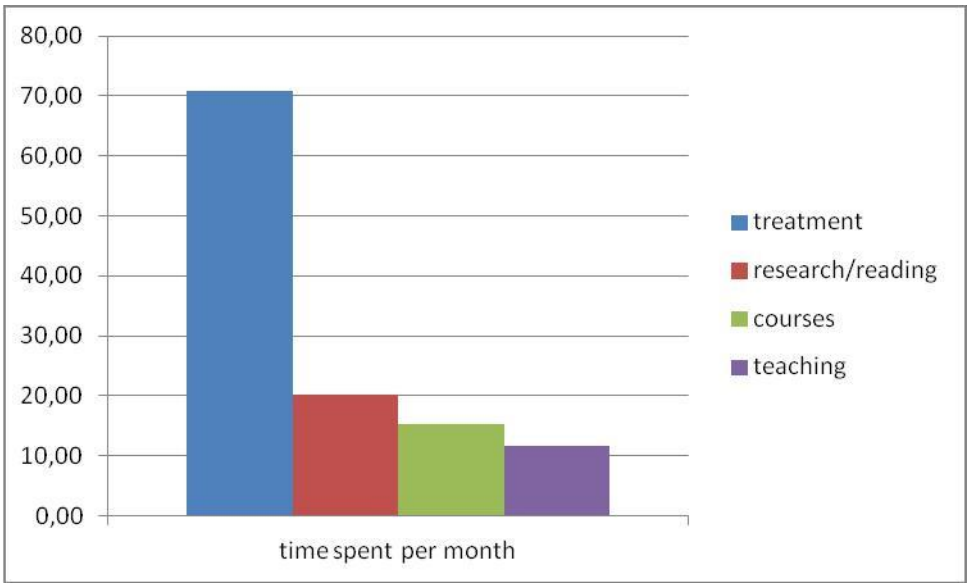


Figure 4.1 Percentage of work time spent in different areas

Figure 4.1 above shows that the majority of the physiotherapists' work time (71%) was spent treating patients with only a small amount spent doing further research or reading (20%), attending courses (15%) or teaching (12%).

The graph below shows what percentage of each age group discussed were treated in an average month.

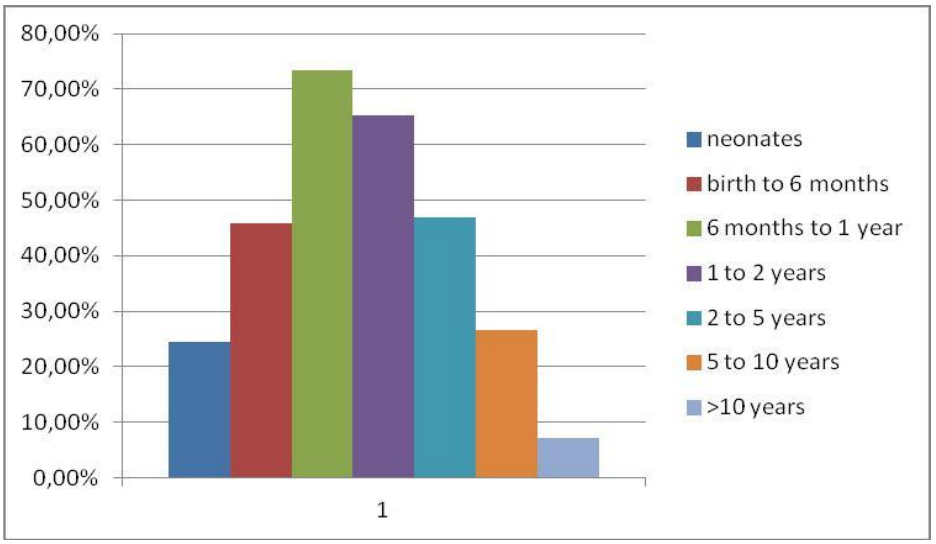


Figure 4.2 Percentage of age groups treated per month

Figure 4.2 above shows that the most common age group of children treated are between six months and one year and between one and two years of age. Children older than ten years were seldom treated. The percentage of neonates treated was more than 20%.

The percentage and range of particular conditions treated per month are shown below in table form.

Table 4.6 Conditions treated

Condition	Average percentage of total patients treated (%)
Bronchiolitis	27.9
Pneumonia	35.9
Sinusitis	12.1
Pre-operative patients	10.1
Post-operative patients	19.7
Asthma	12.4
Cystic fibrosis	8.8

The conditions most commonly treated are bronchiolitis (27.9%) and pneumonia (35.9%) with cystic fibrosis being the least commonly treated (8.8%).

In summary there is minimal evidence supporting conventional chest physiotherapy to treat bronchiolitis.

Post-operative patients were treated more frequently (19.7%) than pre-operative patients (10.1%).

Sixty percent of participants (n=59) stated that they treated intubated patients with 24,2% intubated patients being treated on average per month.

The table below shows how the majority of physiotherapists obtain their patient-base.

Table 4.7 – Patient referral

Means of referral:	**Hospital pateints (%)**	**Rooms patients (%)**
Screening	22.2	n/a
Doctor	78.6	79.6
Nursing sister	13.3	n/a
Physiotherapist colleague	12.2	44.9
Other allied health Professional	24.5	n/a
Advertising	n/a	20.4
Word of mouth	n/a	57.1

The majority of both hospital (78.6%) and outpatient clientele (79.6%) were received via a doctor's referral. Most participants went to a colleague for patient advice, n=80 (81.6%), followed by a doctor, n=63 (64.29%) or an investigation of the literatureavailable,n=95(68.37%).

In terms of the procedure of specimen-taking, 74.5% (n=73) of participants were involved in taking sputum specimens. Table 4.8 below shows how often the different types of specimens were obtained by the participants.

Table 4.8 Percentage of types of specimens obtained

Specimen	**Percentage (n)**
M, C & S	73.5 (73)
NPA	33.7 (33)
NPA: PCR	36.7 (36)
Throat swab	10.2 (10)
Other	8.2 (8)

Table 4.8 Abbreviations

M, C & S - Microscopy, culture and sensitivity; NPA - Nasopharyngeal aspirate

NPA: PCR- Nasopharyngeal aspirate: Polymerase chain reaction

The majority of specimens obtained were for sputum M,C&S (73.5%) with the least amount being for throat swabs (10.2%).

The table below shows the extent to which participants use the various treatment modalities, discussed previously, in clinical practice.

Table 4.9 Frequency of modalities used

Modality	Always % (n)	Often % (n)	Seldom % (n)	Never % (n)
Percussions	14.3 (14)	70.4 (69)	12.2 (12)	3.1 (3)
Vibrations	14.3 (14)	72.4 (71)	13.3 (13)	0.0 (0)
PD	13.3 (13)	53.1 (52)	25.5 (25)	8.2 (8)
Suctioning	6.1(6)	63.3 (62)	19.4 (19)	11.2 (11)
Hyperinflation	0.0 (0)	6.1 (6)	37.8 (37)	56.1 (55)
IPPB	1.0 (1)	7.1 (7)	31.6 (31)	60.2 (59)
Spirometry	1.0 (1)	38.8 (38)	33.7 (33)	26.5 (26)
BB	4.1 (4)	59.2 (58)	25.5 (25)	11.2 (11)
Mobilisation	28.6 (28)	55.1 (54)	11.2 (11)	5.1 (5)
Positioning	27.6 (27)	52.0 (51)	13.3 (13)	7.1 (7)
Patient intubation	0.0 (0)	3.1 (3)	11.2 (11)	85.7 (84)
Patient extubation	3.1 (3)	16.3 (16)	22.4 (22)	58.2 (57)
PNF	0.0 (0)	22.4 (22)	26.5 (26)	51.0 (50)
ACBT	11.2 (11)	54.1 (53)	24.5 (24)	10.2 (10)
Mechanical devices	0.0 (0)	15.3 (15)	30.6 (30)	54.1 (53)
Education	39.8 (39)	49.0 (48)	10.2 (10)	1.0 (1)

Table 4.9 Abbreviations

PD- postural drainage; IPPB- intermittent positive pressure breathing; BB- blow bottle; PNF- peripheral neuromuscular facilitation; ACBT- active cycle of breathing technique

The most common modalities used were percussions and vibrations with few participants using mechanical devices or manual hyperinflation techniques. A large number made use of education and breathing exercises but few were involved in assisting with the intubation or extubation of patients.

For those that did make use of mechanical devices, the specific types of devices used are shown below.

Table 4.10 Percentage of physiotherapists that utilise mechanical devices

Device	Percentage (n)
Vibromat	37,8(37)
Oscillator	6.1(6)
Electric toothbrush	7.1(7)
Ambu-bag	11.2 (1)
Other	7.1(7)

There are still therapists making use of devices such as the oscillator (6.1%) and electric toothbrush (7.1%). A larger percentage of therapists opt to use a vibromat (37,8%) compared to an oscillator (6,1%).

The protocols to determine whether a patient is a candidate for suctioning, are shown below.

Table 4.11 Suction protocol as determined by physiotherapists

		Percentage (n)
Routine suctioning done		6.1 (6)
Suction determined by whether or not child is able to blow their nose		60.2 (61)
Suction by observation		80.6 (79)
Suction by mothers observation		18.4 (18)
Suction by doctor instruction		22.5 (22)
Closed vs open suction	Open	50.0 (60)
	Closed	11.2 (11)
	Both	23.5 (23)

Open suctioning was used a lot more frequently, n=60 (50%) than closed suction, n=11 (11.2%). It is important to note that routine suctioning was still shown to be done by six point one percent of the participants. Sixty percent of participants stated that they made use of a saline instillation when suctioning.

The treatment approaches to sinusitis are tabulated below.

Table 4.12 Sinus treatment

Type of treatment	Percentage (n)
Ultrasound	28.6 (28)
Laser	32.7 (32)
Nasal lavage	26.5 (26)
Other	17.4 (17)

Ultrasound, n=28 (28.6%) and even more commonly, laser therapy, n=32 (32.7%) were used more often than nasal lavage, n=26 (26.5%) in treatment of sinusitis.

The treatment approaches to asthma are shown below.

Table 4.13 Asthma treatment

Asthma treatment types	Percentage (n)
Education	39.8 (39)
Breathing exercises	21.4 (21)
Percussions or vibrations	2.0 (2)
Provide a follow-up date	29.6 (29)
Provide a home-programme	55.1 (54)

The most common approach was education. Only half of the participants provided a home-programme, n=54 (55.1%) and less than half, n=29 (29.6%) provided follow-up sessions for the asthmatic patient.

The graph below shows the types of literature most often read by participants

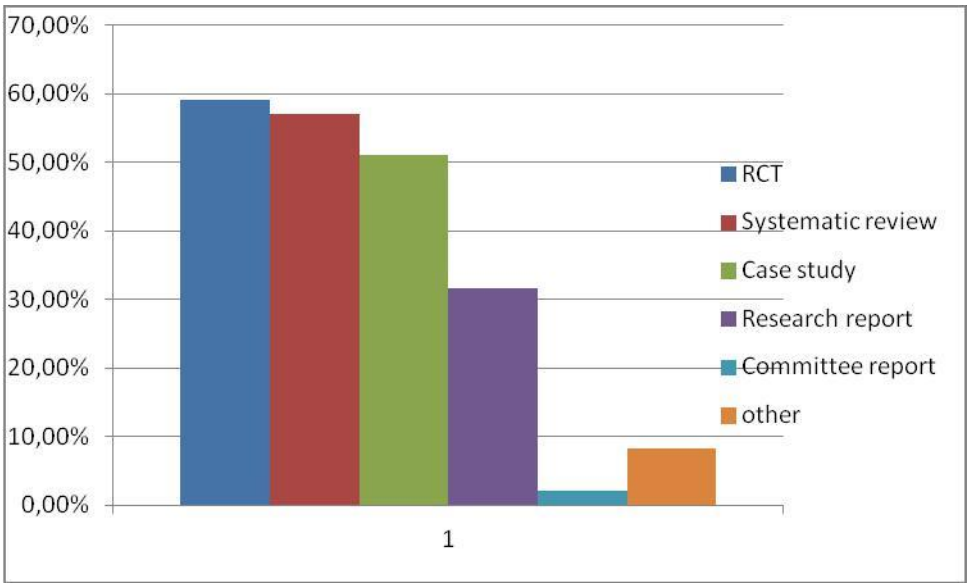


Figure 4.3 Types of literature reviewed

Most paediatric physiotherapists make use of RCTs,
systematic reviews and case studies (Figure 4.3) as their literature of choice.
On average, participants read three point seven articles per month.

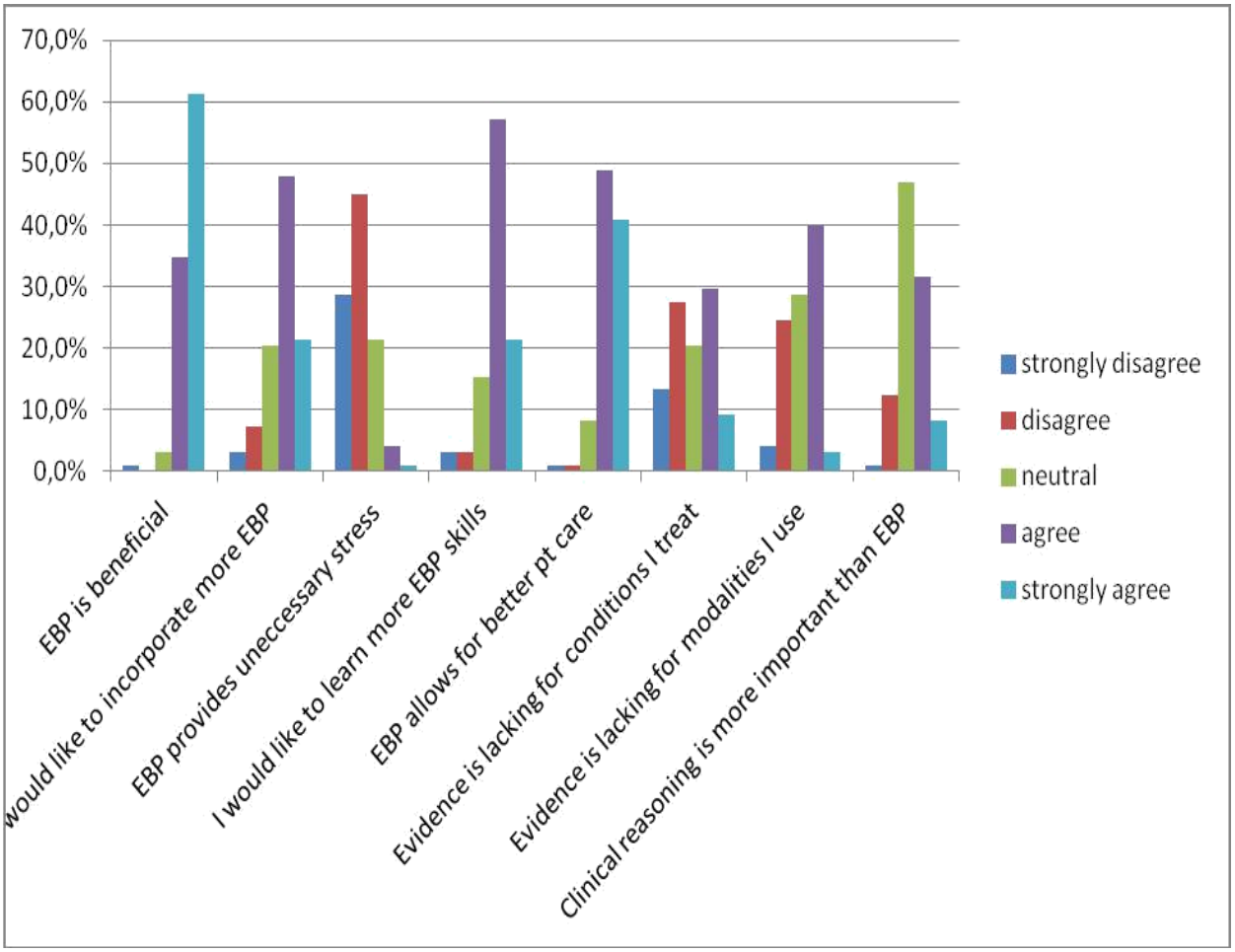


Figure 4.4 Opinions of EBP

Figure 4.4 shows that sixty percent of physiotherapists' feel that EBP is beneficial and that they would like to incorporate it more into clinical practice, as well as learn more skills to better their performance in conducting EBP. The majority feel that there is a shortage of literature to support the conditions they treat and modalities they use and more therapists feel that clinical reasoning plays a larger role.

The graph below shows how often paediatric physiotherapists make use of the literature in decision-making within clinical practice.

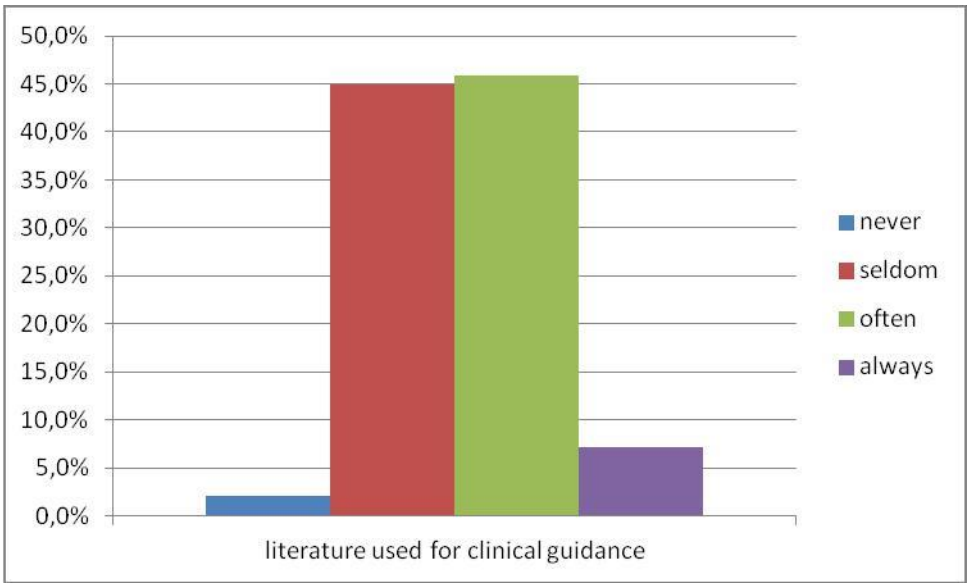


Figure 4.5 Using literature to make decisions

This graph shows that 44,9% of the participants rarely used evidence-based practice to guide them whilst the other half (45,9%) often made use of the literature at hand. Only a small percentage didn't use any literature (two percent) whilst seven percent always made use of the literature.

The majority of participants' work environment was satisfactory for performing EBP as 76,5% had access to literature databases at work, 89,8% stated that they knew how to perform a literature search with 76,6% of them having received training on EBP. Sixty-one point two percent knew how to rate the strength of a particular article.

Comparisons

A comparison of trained participants compared to non-trained participants in the understanding of evidence-based practice

A student t-test was used to determine whether there was any significant difference in knowledge of EBP scores between participants who have received training in EBP at an undergraduate or postgraduate level, and those who had not. The group who received training scored significantly higher than those who had no training ($p=0.04$).

A comparison of the number of years qualified to the understanding of evidence-based practice

The Pearsons Coefficient test was used to determine whether there was any significant difference in the number of years qualified and the knowledge of EBP score. There was no correlation between number of years qualified and EBP score r=0.02 (Pearsons coefficient).

The EBP scores were calculated for each participant by scoring them as to whether or not they understood specific terms relating to EBP and how well they felt they were able to conduct a literature search. They were also scored on their abilities to categorize different types of studies into the correct levels of evidence. A final score was calculated to give their total EBP knowledge scores.

Conclusion

To summarise the above results, South African paediatric physiotherapists spend the majority of their work day on treatment of patients with minimal time on research, courses and teaching. Although they are affiliated with various groups, few attend the meetings of these groups and only half belong to the PSIG.

The most common age groups treated are six months to two years with bronchiolitis and pneumonia being the most common respiratory conditions treated and CF the least common. Percussions and vibrations are used most frequently whilst IPPB, hyperinflation and PNF are not often used. Mechanical devices were also not used often but those that did make use of these devices mostly used the vibromat as an additional chest treatment device and laser or ultrasound for treatment of sinusitis. Patient extubation was not often performed by paediatric physiotherapists and patient intubation even less so. Six percent of the physiotherapists always suctioned their patients regardless of the presentation.

Patient referral for hospital and out-patients was mainly from a doctor and most of the physiotherapists went to colleagues for patient advice before consulting the literature. Three to four articles were read on average per month and these mostly consisted of RCTs, systematic reviews and case studies.

Although most of the physiotherapists had a positive opinion of EBP, only half admitted to consulting the literature to make clinical decisions and the majority felt that clinical reasoning plays a larger role. Those that had received training in EBP

proved to be more knowledgeable in this field although the number of years of experience had no correlation to their understanding of EBP.

CHAPTER 5: DISCUSSION

This chapter will discuss the results of the study and compare these outcomes to previous studies where relevant. It will also discuss the limitations of the study and the implications and recommendations for future studies.

5.1 Demographic data

The study sample was comparable with a similar study in paediatric physiotherapists where a sample size of only 82 physiotherapists with a mean graduation period of 14 years was obtained (Kerr et al. 2015).

The majority of the participants had a Bachelor of Science (BSc) qualification and the number of years they had been qualified for varied greatly, with a standard deviation of ten years. Paediatric physiotherapists with different levels of experience participated in the study. Half (50%) of the group belonged to the paediatric special interest group. Sixteen point seven percent stated that they attended many of the group meetings of the organisations they were affiliated with and 5.6% attended all of their group meetings , where as 26,4 % did not attend the meetings at all. This indicates that although therapists may be affiliated with a particular group, they may not be actively involved or benefiting from the group at all.

The participants worked on average for eight hours per day with 60, 7% of their total patient load being paediatric patients. Job shadowing opportunities were provided in 75, 5% of the work environments. Only 24, 5 % of the environments in which the participants worked provided a university-affiliated paediatric block for students studying physiotherapy. Clinical practical experience is often as important as the university theory curriculum in guiding students in their future clinical careers. This was shown in a study in which first and second year students undertook an exercise training programme with Downs syndrome paediatric patients. All of the students found this to be beneficial as they gained confidence and felt better equipped to deal with paediatric patients (Shields et al. 2013). More than a fifth of patients referred for physiotherapy at Chris Hani Baragwanath hospital in 2010 were paediatric patients (Vachiat 2012) and very few universities in South Africa cover training of all the diagnoses of these paediatric patients. Only one out of three of the universities in

the study had an independent paediatric block and lecturer (Vachiat 2012).There is a need for undergraduate training to focus more on paediatric-specific clinical education to up skill new graduates into having more confidence and knowledge regarding management of paediatric patients.

The majority of the participants worked in urban areas in both hospital and private practice facilities, the most common being in private hospitals.

Demographic data was similar to a study conducted in Australia that assessed EBP amongst physiotherapists. Their sample of 140 participants had an average qualification of 11.9 years with majority working in private practice as well as hospitals (Iles & Davidson 2006). However, unlike in this study, most of the participants worked in government hospitals compared to private. This can be related to the differences in the structure of the South African health- care system compared to those in Australia.

5.2 Conditions most commonly treated

As depicted in table 4.2, bronchiolitis and pneumonia were the most common conditions treated (27.9% and 35.9%), with cystic fibrosis being the least common (8.8%). This indicates that paediatric physiotherapists are not necessarily treating the conditions which have the most supportive literature more frequently. This is understandable as cystic fibrosis is a relatively rare condition.

The evidence available on bronchiolitis (appendix IV) is mostly unsupportive of physiotherapy, including the Cochrane review that concludes physiotherapy being of no benefit (Perrotta et al. 2007). However, physiotherapists are continuing to treat this disease. Pneumonia is treated more often than bronchiolitis although there is also minimal supportive evidence. As stated, it can be speculated that physiotherapists are treating these conditions based on clinical experience alone.

Cystic fibrosis has some of the largest amount of supportive literature for respiratory physiotherapy in children (appendix IV) but it is the least common condition treated. However, this approach towards conditions treated could also be attributed to the fact that the more frequently treated conditions are merely more common paediatric conditions in the South African setting. Pneumonia is a common childhood disease in South Africa. Approximately 600 000 pneumonia- associated paediatric deaths occur annually in African children. In South Africa 0,14 episodes occur per child per

year with 11.1% of cases being severe (Roux et al. 2015). CF is less common especially in mixed race and black populations. The less common genetic mutation of 3120 + IG>A is thought to be the main cause of CF in these populations with roughly 1000 deaths occurring in the black population per year. The disease is also often not detected with a delay in diagnoses (Masekela et al. 2013).

Post –operative patients were treated more often than pre- operative patients. This is in contrary to the evidence found in the literature. Although there is limited and out- dated evidence for both, post-operative physiotherapy has been found to worsen symptoms in children post cardiac surgery. A study by Felcar et al. (2008) showed pre- operative physiotherapy for cardiac surgery to decrease the severity of post- operative complications. Both studies were level II evidence, although the post- operative study had a younger age group and smaller sample size (Reines et al.1982). The concern is that there is an extreme shortage of literature available to guide therapists in the correct approach to managing paediatric patients with pulmonary complications.

In table 4.8, asthma is looked at in more detail. The treatments most commonly used are in concurrence with the literature. Education (39.8%) was the most popular treatment of choice, followed by breathing exercises and lastly percussions and vibrations (only two percent). The literature is most supportive of educating asthma patients, as well as their parents, for more effective results (Garbutt et al. 2015). In the current study, only 29. 6% of patients were followed-up post asthma treatment, which is fairly low. According to the literature, follow-up consultation visits to support and constantly educate parents and their children are of utmost importance (Washington et al. 2012). Only half of the participants (55. 1%) in the current study provided a home-programme for asthmatic children which is still not sufficient as it does not help to merely educate the family. They need constant guidance and an appropriate management plan at home (Tipping, Scholes, Cox 2010) and in the child's schooling environment. This allows for better control of the symptoms, better management of the disease and improved self-confidence and work ethic in the child (Cicutto, Gleason, & Szefler 2015).

In an asthma education and home programme the main goals are to achieve and maintain asthma control, to allow the child to attend school regularly, participate in activities, to sleep restfully, to develop normally and to minimize the amount of acute asthma exacerbations (Motala 2009). Information on the correct way to use an

inhaler should be taught and provided and an action plan should be continuously referred to for guidelines on how to manage different symptoms and when to consult an emergency department (Boulet et al. 2015) Education programmes should include bookets with information such as reminders of the risks and trigger factors (Doliner et al. 2000) and regular follow-up appointments are vital to ensure correct compliance with treatment (Boulet et al. 2015; Motala 2009).

5.3 Literature available on conditions treated

The studies reviewed on asthma were of various levels of strength, ranging from level II (Garbutt et al. 2015) to level II-I and IV (Barnabe et al. 2003; Washinton 2012;De Boeck 2008; Welsh 2005; Schechter 2007) for stable asthma. Half of the studies supported physiotherapy in stable asthma (Garbutt et al. 2015; Welsh 2005) and the other half on stable asthma treatment (Schechter 2007; Barnabe et al. 2003; De Boeck 2008) and uncontrolled asthma treatment (Asher et al. 1990) did not support physiotherapy. An RCT of level II evidence, supportive of physiotherapy in partially controlled asthma was found (Lima et al. 2008). Those on bronchiolitis and pneumonia were mostly level I II or IV with majority of the studies being unsupportive of physiotherapy (Paludo 2008; Perotta, Oritz & Rogue 2007; Village 2006). Physiotherapists are treating bronchiolitis based on clinical experience alone. The studies on CF ranged from level II to IV and were mostly supportive (Schechter 2007; Button 2003; Ledger 2013). The small amount of literature found on pre and post operative physiotherapy were of level II to IV in strength, mostly unsupportive of post operative physiotherapy(Reines et al. 1982; Pasquinar 2006; Branson & Faarc 2013), whilst the one found on pre operative physiotherapy was supportive (Felcar et al. 2008). Depending on the treatment modality used, studies found for sinusitis treatment were both supportive and unsupportive, ranging from level II (Wang 2012) to IV (Hacarova 2000).

5.4 Modalities

In table 4.4, percussions and vibrations were the most common treatment modalities of choice. Hyperinflation and IPPB, amongst a few others, were not frequently used. There is a paucity of literature available to support percussions and vibration as a treatment modality due to lack of research in this area. Very few

participants assisted with intubation, more were involved in extubation but still not many (only three point one percent of participants performed intubation often and 11.3% performed it seldomly whilst 16.3% often performed extubation although 22.4% performed this seldomly), possibly due to the fact that most physiotherapists feel that these techniques are outside of their scope of practice. Spirometry was said to be used often by 38.8% of participants, blow bottle exercises by 59.2% (four point one percent always used this) and the ACBT by 54.1% of participants (11.2% always used this). Only a small percentage said they seldomly or never used these techniques. This was reassuring when looking at the supportive literature for more active physiotherapy techniques (M. McIlwaine 2007) along with ACBT and breathing exercises (appendix IV). Twenty percent of participants seldomly used postural drainage, 52% often did and 13% always used this technique, even although the literature on this technique in the paediatric population is virtually non-existent except in a study that mostly discussed the concerns of 'head-down' tilting in children with CF (Button et al. 2003).

Thirty-nine percent of participants said that education always formed part of their treatment technique with 49% stating that they often use education in treatment. It would be valuable to enlighten physiotherapists to what a vital, simple tool education can be and to get all of them to incorporate some form of education within their clinical approach to allow for longer lasting beneficial effects (Tipping, Scholes, Cox 2010).

As stated in the literature review, suctioning is an extremely invasive technique which should only be performed on the child when absolutely necessary (Knox 1993). It is concerning to see that 22. 5 % of physiotherapists are deciding whether or not to suction a child merely from the instructions of a doctor. Physiotherapists should make a decision with their own insight into the clinical appearance of the children as there are not yet any defining guidelines as to whether suctioning is indicated or not (Davies et al. 2014) . Another concern is the fact that six percent are doing routine suctioning which is not justified, especially with the possible harm it may cause to children and the limited amount of literature available (Morrow 2008).

5.5 Literature available on modalities used

Studies found on percussions and vibrations were of level II strength with some being ineffective (Mcillwaine et al. 1997) and others effective (Varekojis et al. 2003; Hristara-popadopoulou & Tsanakas 2007), although often not as effective as another technique used (Hristara- Popadopoulou & Tsanaka 2007). Postural drainage had only one study of level II strength which supported only modified 'head-up' positioning (Button et al. 2003). Literature on exercise therapy was level II and IV strengths and all found this an effective treatment technique (Mcillwaine 2007; Reix et al 2012; Andrade et al. 2014). Although some of the literature on ultrasound and laser therapy proved effective, the literature was of poor strength and outdated. Studies on suctioning ranged from level II-IV (Morrow 2006; Youngmee & Yonghoon 2003; Jongerden et al. 2012) but the majority stated that further evidence was required to determine whether this is an effective technique (Morrow 2008; Clifton-Koeppel 2006; Davies et al. 2014). All articles reviewed on PEP were level I to level IV strengths and all found this to be an effective modality (Mcillwaine et al. 1997; Mcillwaine et al. 2001; Olse, Westerdahl & Lannefors 2014). Manual hyperinflation had two studies of level I and II strengths, one showing it to be effective (de Godoy et al. 2013) and the other ineffective and even dangerous when used with incorrect settings (Mara et al. 2013). Physiotherapy treatment of neonates was found to be effective although these were mostly level III-III and IV articles and mostly related to positioning than a particular manual technique (Wong & Fok 2003; Gouna 2013; Bembich et al. 2012;) One case study of level IV evidence showed chest physiotherapy to correct atelectasis in a neonate (Pandya et al. 2011).

5.6 Patient referral and patient advice

Almost all of the participants obtained their patients, whether in hospital or private patients, from doctors' referrals and the majority (81.3%) went to colleagues for advice on a difficult case. Doctors' advice was sought by 64.6% of the participants whilst 68.4% stated that they consulted the literature to help with insight into a complicated patient. Although physiotherapists are considered first-line practitioners within an out-patient setting, doctors are still the main source of patient referrals (79%). An international survey to the World Confederation of Physical Therapists

(WCPT) member organizations found that most countries exercised professional autonomy with self-referral and direct access to patients but not to the extent they would like. They found barriers in doing so. Areas such as Africa struggled more than Europe and the main barriers were legislation and insurance policies and medical aid refusing reimbursement unless accompanied by a doctor's referral (Bury & Strokes 2013). The WCPT developed guidelines in 2011 that physiotherapists must comply with in order to exercise professional autonomy. Physiotherapists need to base their approach on sound evidence to present a more informative case to medical aid and other health care authorities, demonstrating appropriate knowledge to assess patients without the need for an accompanying referral.

5.7 Mechanical devices

Few physiotherapists use mechanical devices. The most common being the vibromat (37.8%) which has no research to support its use in treating children. Six percent use an electric toothbrush which has no supporting literature and seven percent utilise the newer oscillator machine, with the only respiratory study being done on rats (Korkina 2006). Sinusitis is treated most often with laser therapy, followed by ultrasound and lastly nasal lavage. There is out-dated literature of poor strength available on laser therapy and ultrasound has no supportive evidence done on human subjects (Hacarova 2000). Nasal lavage has the most supportive evidence but is used the least of the three modalities (Hong 2014).The question is whether these mechanical devices are being used based on clinical evidence, clinical experience or merely because they have been used for so many years in the past that therapists have accepted them as being effective.

5.8 Age groups treated

The age group of six months to two years was most commonly treated by paediatric physiotherapists with neonates making up 25 % and children older than 10 years only seven percent. The majority of the supportive literature for respiratory physiotherapy is based on full term and older children, with very little evidence for physiotherapy treatments in neonates other than positioning (Gouna 2013; Bembich et al. 2012). Older children also have less risk of harm being caused with manual techniques as they are a less vulnerable population (Fyfe et al. 2014).

It is interesting that the age group of neonates still forms 25% of treatments even although there is minimal literature in favour of respiratory techniques in these small infants.

5.9 EBP knowledge

The participants that had received training in EBP had a significantly better (p=0.04) understanding and knowledge of EBP compared to those that had not received any training. This was comparable to another EBP study in which trained physiotherapists rated their EBP skills more highly then the untrained physiotherapists and also had a better understanding of EBP (Iles & Davidson 2006). This stresses the importance of education for EBP. In the same study, recent graduates rated their EBP skills more highly than older graduates, but did not conduct EBP more often (Iles & Davidson 2006). In the existing study the number of years qualified had no correlation with EBP knowledge (r=0.02). Recent graduates may have difficulty incorporating EBP when starting out in clinical practice, but older graduates also state that it is more difficult for them to change their already structured treatment approach (Barnard 2001).

5.10 EBP techniques and opinions

The majority of participants read RCTs and systematic reviews followed closely by case studies when conducting a literature search. A similar investigation found that physiotherapists read mostly RCTs and systematic reviews but discarded case studies as they felt they were not reliable literature resources (Janssen et al. 2015). Although the first two types of literature usually form part of the highest level of evidence, participants read on average only three point seven articles per year.

Physiotherapists generally have a positive attitude towards EBP but a lack of time, understanding and skills and an inability to access databases proved to be the biggest challenges preventing physiotherapists from conducting EBP (Iles & Davidson 2006; Janssen et al. 2015; Mota et al. 2015). The majority of participants in the current study stated that they had received training in EBP skills and knew how to conduct a literature search, having a supportive work environment in which to do so with access to the relevant databases. This shows that many of the factors promoting EBP were present in their workplace. However, only half of the

participants stated that they often made use of the literature to make clinical decisions with the other half seldom partaking in a literature review. This finding was similar in a systematic review. In the majority of the studies reviewed, only half stated that they used databases to assist with clinical decision-making (Mota et al. 2015). EBP is not being used even with facilitators to do so being present, possible due to time constraints and a lack of motivation to do so.

The opinions on EBP varied although majority of the participants were supportive of EBP. Nearly all of them felt it to be beneficial and that they would like to incorporate EBP more into clinical practice and develop EBP skills as it provided better patient care. They felt that evidence was lacking both for conditions treated in practice and modalities used, but more so for the modalities used. An interesting finding was that there was mostly a neutral feeling on whether clinical reasoning plays a larger role than EBP, with more being in agreement with the role of clinical reasoning than EBP. Some physiotherapists feel that EBP takes away from clinical practice time and therefore will provide less income (Barnard 2001). Others feel that in the majority of the profession one is unable to measure or properly research treatment techniques as it is too difficult and often an ethical dilemma. They also feel that the evidence available rarely provides one with a conclusion to use within practice as the articles are vague and unreliable and thus clinical reasoning plays a larger role (Janssen et al. 2015).

Although there is some controversy around opinions regarding EBP, the majority of participants are in agreement with EBP but are struggling to put it into practice. There is a need to combine EBP with physical practice within the clinical setting. This could be done through EBP education and re-structuring of the workplace environment along with appropriate time management. EBP needs to become as much a priority as a hands-on treatment approach so that each sector can benefit the other.

The challenge is that although mainly low levels of evidence exist for this particular research field, physiotherapists need to use their own judgement and experience in justifying the reasoning behind their treatment techniques.

Evidence based practice occurs when clinical decision making is based on research evidence as well as clinical expertise and experience and patient values and expectations. This implies that in the absence of good evidence clinical expertise and experience can be used to inform clinical decision making- this would still be

considered evidence based practice. (CONSORT website http://www.consort-statement.org accessed 9 March 2016)

5.11 Summary of the main objectives

Considering the main objectives of the study, the most common conditions treated and modalities used by paediatric physiotherapists are not necessarily those with the most supportive evidence. Only half of these therapists evaluate the literature and even in doing so, they are still relying more on clinical experience than basing their decisions on supportive, high quality studies. It is complicated to study the effectiveness of a technique due to the fact that there cannot be a treatment group and a control group that does not receive treatment. This may cause ethical issues. The difficulty here is that there is a shortage of evidence for paediatric respiratory physiotherapy as a whole, thus even with the intentions of conducting EBP, decision- making based on available evidence is challenging.

5.12 Limitations of the study

A large amount of the literature is obsolete and therefore may not be as valid as if it was conducted more recently. This is mainly due to the fact that there is a shortage of more current studies relating to respiratory physiotherapy, especially in paediatrics.

The positions used for postural drainage is a question that could have been included in the survey to determine how often they are making use of the 'head-down' position. The technique of inspiratory muscle training could also have been included in the questionnaire and discussed in the study, although it is mostly a technique used in adults and infrequently in the paediatric population.

When asked to tick the option of 'other' within the questionnaire, specifications of 'other' were not taken into account in data collection.
Due to a limited number of physiotherapists working with paediatric respiratory patients, the sample size was relatively small. Many of the surveys sent out were incomplete as many of the participants stated that they only worked in the neuro-developmental field. Physiotherapists who work in paediatrics but are not members of the SASP were not included in the study and therefore the survey results cannot be generalized.

Participants only had a select number of options to choose from for physiotherapy modalities and the specific conditions treated, even although there may be many more conditions treated and modalities used by paediatric physiotherapists in practice. Their choices were limited.

Ventilated children were not included in this study, the main focus was on spontaneously breathing children and thus not all types of paediatric patients treated with respiratory physiotherapy were looked at.

A more systematic and comprehensive tool should have been used in the literature review to rate the quality of evidence in the articles found.

5.13 Implications for clinical practice

More EBP needs to be conducted within the clinical setting, making use of the small amount of literature available. Treatment approaches should not merely be accepted to work just because they have been done before. They should rather be challenged and investigated so that a well researched and effective health care service can be administered, especially for paediatric patients. Physiotherapy practices should provide resources for conducting research as well as enough time and support to ensure employees are able to do so. Heads of physiotherapy departments and practice owners may influence employees attitudes towards EBP and thus all physiotherapists need to be empowered regarding EBP and its potential benefits to patient care.

5.14 Recommendations

More advanced courses in EBP should be held in provinces all over South Africa to discuss the importance thereof and to provide the necessary skills to perform a literature review correctly. This will challenge therapists to question their treatments and to think more broadly within the profession.

5.15 Suggestions for further research

Further well - conducted, rigorous research into the field of paediatric respiratory physiotherapy is required to obtain current evidence based information to better inform evidence based paediatric respiratory physiotherapy. Randomised clinical trials to investigate the efficacy of different physiotherapy techniques in different paediatric populations are required.

CHAPTER 6: CONCLUSION

This study determined the types of conditions being treated and modalities being used by paediatric physiotherapists around South Africa. It assessed the literature available on these topics and the strength of the particular studies. It determined the physiotherapists' opinions and understanding of EBP, giving an idea of the number of physiotherapists who are incorporating EBP into clinical practice.

Pneumonia and bronchiolitis are two of the most common conditions treated with percussions and vibrations being the most popular techniques used. The majority of the physiotherapists' feel that EBP plays a large role in clinical practice, although most feel that clinical reasoning is even more important.

The literature available on respiratory physiotherapy in paediatrics is extremely limited, making it challenging to conduct EBP to ensure that the best possible treatment is administered. It is important for further studies to be done within this field of practice to help guide paediatric physiotherapists in their treatment approach. It would be beneficial for more extensive training to be available to assist physiotherapists with further knowledge of EBP and the appropriate skills to analyze the available literature.

This study aids in identifying what is currently being done in paediatric respiratory physiotherapy practice and highlights areas which need to be addressed to allow for more positive outcomes. It also focuses on the aspects where research is lacking and the need for further studies to be conducted in specific areas of practice. It is beneficial to understand what is needed to better the profession of paediatric respiratory physiotherapy. Although a lot of the literature is obsolete, of a low-level or lacking in content, respiratory physiotherapy still plays a role in management of the paediatric patient in various ways and therefore clinical experience and scientific knowledge should not be discarded in areas where no research evidence exists. These aspects need to be integrated into a three-way clinical decision making model in order to deliver the best level of care even with the limited resources available.

In conclusion, EBP within the paediatric respiratory physiotherapy setting is dependent on additional resources and learning. It forms an important aspect of a holistic treatment approach together with clinical experience and reasoning. By

Integrating these factors, an effective and evidence based health care service can be administered to children throughout South Africa.

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APPENDIX I: PARTICIPANT INFORMATION SHEET

My name is Kim Burelli and I am doing a research report for my masters thesis on evidence-based-practice in the paediatric respiratory physiotherapy setting in the Gauteng province. The research will involve the attached questionnaire and the objectives of the questionnaire are to determine the types of conditions being treated by paediatric physiotherapists as well as the types of treatment techniques being used. It is also to determine whether physiotherapists are evaluating the literature related to this scope of practice and to discover what type of literature is available. This will benefit the profession of paediatric respiratory physiotherapy in creating awareness of the importance of conducting evidence-based- practice along with clinical experience in treating patients to allow for a better quality of patient care.

I am inviting you to be a part of the study by answering the attached questionnaire if you are currently treating patients from birth until 12 years of age.(If you are in your community service year or only treating adult patients then it is not necessary for you to partake in the study and you may discard this mail.) Please complete the attached questionnaire and it will be sent back to me. Participation is voluntary and by completing and submitting the questionnaire it will be assumed that your consent has been granted to partake in the study. You will remain anonymous throughout the study and the findings of this study will be reported in the final research report. You may withdraw from the questionnaire at any time before submitting, with no penalties. You are welcome to contact me should you have any questions regarding the study.

Regards

Kim Burelli (Principal Investigator) 082 565 0238

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Professor Joanne Potterton (Supervisor) Joanne.Potterton@wits.ac.za

Natalie Benjamin (Supervisor) Natalie.Benjamin@wits.ac.za

APPENDIX II: QUESTIONNAIRE

For the purpose of this study, evidence-based practice is defined as 'the practice of physiotherapy guided by relevant, high –quality clinical research' (Campos, Beckencamp & Moseley, 2013).

SECTION 1 : DEMOGRAPHIC

Education:

- What are the number of years qualified as a physiotherapist excluding community service year?
- What is the nature of your degree/ degrees? Bsc Physiotherapy / Msc Physiotherapy / PHD/ Other
- Which university was your degree/ degrees obtained from? (you may mark more than one) WITS / University of Pretoria / University of Potchefstroom / University of Cape Town / University of Western Cape/ Stellenbosch University / University of the Freestate / University of Kwazulu Natal/ Medunsa
- How often do you do paediatric – related CPD courses per year?
- Do you belong to the paediatric special interest group? Yes/ No
- Please state (if any) what other groups you are affiliated with?
- How often do you attend the meetings of the groups you are affiliated with? Never / Almost none of the meetings / some of the meetings/ almost all of the meetings/ I attend every meeting available
- Do you provide a paediatric block for university students? Yes / No/ I don't know
- Do you provide job shadowing opportunities? Yes/ No/ I don't know
- Have you completed the CPRG I? Yes / No

Nature of work:

- How many hours on average do you work per day?
- What is the number of paediatric patients you treat on average per day?
- What number of the above paediatric patients are respiratory patients? None of the above/ 25 % of the above/ 50 % of the above/ 75 % of the above/ All of the above
- What percentage of your total patient numbers per month are paediatric patients? Less than 5% / 5-25% / 30-50% / 50 -70% / more than 80 %
- What is the most common age group of patients treated? Neonates / birth – 6 months / 6 months – 1 year / 1 – 2 years / 2 – 5 years/ 5 -10 years/ Older than 10 years
- What percentage of your total work time of each month do you spend on: (0%/ 10%/ 20%/ 30%/ 40%/ 50%/ 60%/ 70%/ 80%/ 90%/ 100%)
    I. Physiotherapy treatment
    II. Research / reading
    III. Courses
    IV. Teaching/ education

Location of work:

- What province do you work in?
- Do you work in an urban or rural setting or both? urban / rural / both
- If both, what percentage do you work in each? (10%/ 20%/ 30%/ 40%/ 50%/ 60%/ 70%/ 80%/ 90%)
- Do you work with hospital or out patients or both? hospital / out patients/ both
- If both, what percentage do you work in each? (10%/ 20%/ 30%/ 40%/ 50%/ 60%/ 70%/ 80%/ 90%)
- If you do hospital work, what is the nature of the hospital? (you may mark more than one) – Private/ government / university- affiliated

SECTION 2: CONDITIONS

- How are your hospital patients obtained?(you may mark more than one) Screening / doctors referral / allied staff referral / nursing sisters referral / colleague referral
- How are your out patients obtained? (you may mark more than one) Doctors referral / word of mouth / advertising / colleague referral
- Does your practice have a protocol or set of guidelines for the management of specific conditions? Yes / No
- What are the most common conditions treated? (0%/ 10%/ 20%/ 30%/ 40%/ 50%/ 60%/ 70%/ 80%/ 90%/ 100%)
    I. Cystic fibrosis
    II. Bronchiolitis
    III. Pneumonia IV. Asthma
    V. Neonates with respiratory complications VI. Sinusitis
    VII. Pre-operative patients
    VIII. Post- operative patients
- Are you involved in obtaining sputum specimens for the laboratory? Yes/ No
- If answered Yes to the above, please mark which types of specimens (you may mark more than one) sputum MC&S / nasopharyngeal aspirate for viruses / nasopharyngeal aspirates for PCR (broad spectrum)/ throat swabs / other
- Where would you most likely go to get advice regarding a difficult patient case? Doctor / colleague / internet / literature review – related articles/ other

SECTION 3: MODALITIES

- What are the most common treatment techniques you use in clinical practice? Never/ seldom/ often/ always
    I. Percussions
    II. Vibrations
    III. Postural drainage
    IV. Airway suctioning
    V. Manual hyperinflation (ambu – bagging)
    VI. Intermittent positive pressure breathing (IPPB)

VII. Incentive spirometry exercises
VIII. Blow- bottle exercises
IX. Mobilization
X. Positioning
XI. Assisting with patient intubation
XII. Assisting with patient extubation
XIII. PNF – rib springing techniques
XIV. ACBT (active cycle of breathing therapy)
XV. Mechanical devices (if used please state which devices)
XVI. Education

- If suctioning is part of your treatment techniques, how do you determine whether it is necessary to suction a patient? (you may mark more than one) Age of child (ie: if unable to blow nose) / clinical observation / mothers report of childs symptoms / doctors instructions / routine suctioning is done / you do not suction any patients
- Do you treat intubated patients? Yes / No
- If answered yes to the above, what percentage of patients treated per month are intubated?
- Do your perform closed or open suctioning more frequently? Closed suctioning / open suctioning/ equally often
- How do you decide whether to use a saline instillation when suctioning an intubated patient? Routinely / doctors instructions / clinical observation / you do not use a saline instillation
- If you treat asthmatic children, please state your most valuable treatment technique? Percussions or vibrations/ breathing exercises/ education of child and/or parent
- Do you follow – up on asthmatic patient progress? Yes/ No
- Do you provide information on a home programme for the parent or child? Yes/ No
- If treating sinusitis, what treatment do you use? Ultrasound/ laser therapy/ nasal irrigation or lavage/ other

SECTION 4: EVIDENCE – BASED PRACTICE

Mark one of the five options for each statement:

- Applying evidence-based practice (EBP) is beneficial in physiotherapy – strongly disagree / disagree / neutral / agree / strongly agree
- I would like to incorporate more EBP but don't often get around to it – strongly disagree / disagree / neutral / agree/ strongly agree
- EBP places unnecessary additional stress on physiotherapy practitioners – strongly disagree / disagree / neutral / agree / strongly agree
- I would like to learn more skills to equip me to incorporate EBP into my daily work ethic – strongly disagree / disagree / neutral / agree / strongly agree

- EBP allows for better patient care – strongly disagree / disagree / neutral / agree / strongly agree
- There is a large amount of evidence lacking to show physiotherapy having a beneficial effect on the conditions I treat – strongly disagree / disagree / neutral / agree / strongly agree
- There is a large amount of evidence lacking to support the treatment modalities I use – strongly disagree / disagree / neutral / agree / strongly agree
- Clinical reasoning plays a much larger role than EBP in physiotherapy practice – strongly disagree / disagree / neutral / agree / strongly agree
- How many articles do you read / review within your clinical practice in a typical month?
- What is the nature of the majority of the articles read? Case study / randomized control trials / systematic reviews / research report/ committee report/ other (please specify)
- How often do you use the literature and research findings in the process of decision – making in clinical practice? Always / often / seldom / never

<u>SECTION 5:</u> RESOURCES

- Are you able to access relevant databases or internet at your practice to do a literature search? Yes / No
- Would you know how to do a literature search on a specific topic? Yes / No
- Do you know how to rate the strength of a specific article to determine whether it is valid literature? Yes / No
- Did you receive any training during your university studies on hoe to perform a literature search/conduct EBP? Yes / No
- Do you know how to rate the strength of a specific article to determine whether it is valid or not? Yes/ No
- Please rate the following types of resources in terms of their strength in evidence ie: 1 = highest level of evidence 6 =lowest level of evidence:
    I. Systematic review
    II. Quasi-experimental
    study III. Case-control study
    IV. Randomised control trial
    V. Well designed study without randomization
    VI. Committee report
- How do you rate your understanding of the following terminology? Extremely poor/ poor/ average/ good/ excellent
    I. Pilot study
    II. Meta-analysis
    III. Intention to treat
    IV. Absolute risk
    V.Relative risk
    VI. Publication bias

VII. Treatment effect size
VIII. Number needed to treat
IX. Confidence index
X. Clinical importance
XI. Probability
XII. Reliability
XIII. Statistical significance

- Rate your level of skills with the following tasks: very poor/ poor/ average/ good/ excellent
  I. Ability to search the PEDRO database II. Ability to search the Cochrane library III. Research skills
  IV. Ability to analyse evidence against set standards
  V. Ability to access evidence
  VI. Ability to convert information into answerable questions
  VII. Computer skills
  VIII. Ability to apply information to individual cases
  IX. Ability to determine how useful information is
  X. Ability to identify gaps in the literature

APPENDIX III: ETHICS CLEARANCE CERTIFICATE



R14/49 Miss Kim Burelli

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)

CLEARANCE CERTIFICATE NO. M150117

NAME: (Principal Investigator)	Miss Kim Burelli
DEPARTMENT:	Physiotherapy Online Survey with Physiotherapist around Gauteng
PROJECT TITLE:	Evidence-Based Practice in the Paediatric Physiatherapy Setting
DATE CONSIDERED:	30/01/2015
DECISION:	Approved unconditionally
CONDITIONS:	
SUPERVISOR:	Mrs Natalie Benjamin and Prof Joane Potterton
APPROVED BY:	Professor P Cleaton-Jones, Chairperson, HREC (Medical)
DATE OF APPROVAL:	23/03/2015

This clearance certificate is valid for 5 years from date of approval. Extension may be applied for.

DECLARATION OF INVESTIGATORS

To be completed in duplicate and **ONE COPY** returned to the Secretary in Room 10004, 10th floor, Senate House, University.
I/we fully understand the conditions under which I am/we are authorized to carry out the above-mentioned research and I/we undertake to ensure compliance with these conditions. Should any departure be contemplated, from the research protocol as approved, I/we undertake to resubmit the application to the Committee. **I agree to submit a yearly progress report.**

Principal Investigator Signature _____ Date _____

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES