March 2013 • Volume 69 • Number 1

MISSION STATEMENT OF THE SASP

The SASP affirms that:

1. It provides a structure within which the needs of its members are met.
2. It strives to ensure the quality of physiotherapy services to all peoples throughout South Africa.
3. It does not discriminate on grounds of race, colour, creed, national origins, social status or gender in the practice of physiotherapy or in the administration of its organisation.
4. It safeguards the welfare of its members and makes representation against any form of discrimination against its members.
5. It acts as a planning, development and information resource to its members, to other health professions, to health planners at all levels and to the general public.
6. It supports unequivocally the provision of unitary health service and encourages all progress made in the integration of health care services.

Contents

RESEARCH ARTICLE
Physiotherapy management strategies for women post-caesarean section delivery in public hospitals in KwaZulu-Natal, South Africa
Authors: Reddy P, Frantz J

RESEARCH ARTICLE
Health related quality of life of survivors of trauma six months after discharge
Authors: Schneiderman J, Van Aswegen H, Becker P

RESEARCH ARTICLE
The association between trunk muscle endurance and lumbo-pelvic stability in adolescent low back pain: A cross sectional study
Authors: Lewis F, Wood W, Olivier B

POSITION PAPER
Position paper: The essential role of physiotherapists in providing rehabilitation services to people living with HIV in South Africa
Authors: Cobbing S, Chetty V, Hanass-Hancock J, Jelsma J, Myezwa H, Nixon SA

RESEARCH ARTICLE
Status of undergraduate community-based and public health physiotherapy education in South Africa
Authors: Mostert-Wentzel K, Frantz J, Van Rooijen A.J

RESEARCH ARTICLE
Approaches toward learning in physiotherapy
Authors: Keiller L, Louw A

RESEARCH ARTICLE
Changes in activity limitations and predictors of functional outcome of patients with spinal cord injury following in-patient rehabilitation
Authors: Joseph C, Mji G, Statham S, Mlenzana N, De Wet C, Rhoda A

CLASSIFIEDS

GUIDELINES FOR AUTHORS

QUESTIONS FOR CPD POINTS

COURSES

Journal abstracts are online at: http://ptglobal.net
Indexed in Publist.com and CINAHL
All articles that appear in this journal have been peer reviewed.
<table>
<thead>
<tr>
<th>Area</th>
<th>Editorial Board Member</th>
<th>Reviewer Board Member</th>
</tr>
</thead>
</table>
| Orthopedic; Neuro-musculoskeletal Medicine | Dr I Diener | R Parker  
R Barnes  
A Cuesta – Vargas  
T Burgess  
H Pharaoh  
F Fatoye  
Q Louw  
L Godlwana  
S Maharaj |
| Public Health & Health Promotion including HIV/AIDS, Womens Health | Prof van Rooyen | S Maart  
M Maleka  
L Chetty  
K Mostert – Wentzel  
J Phillips  
A Stewart  
M Hobdy  
J Jelsma  
G Godlwana  
S Maharaj  
T Steyl |
| Physiotherapy Education Research Methods | Dr Mbambo | J Mothabeng  
D Ernstzen  
M Rowe  
N Naidoo  
S Amosun  
M Marais  
L Morris |

<table>
<thead>
<tr>
<th>Area</th>
<th>Editorial Board Member</th>
<th>Reviewer Board Member</th>
</tr>
</thead>
</table>
| Cardiorespiratory | Prof Puckree | S Hanekom  
H van Aswegen  
S Hanekom  
S Maharaj  
F Karachee |
| Disability and Rehabilitation | Prof Amosun | N Mlenzana  
N Taukobong  
S Visagie  
A Rhoda  
R Mpofu  
G Mji  
S Stratham  
N Mlenzana |
| Neurology Adult & Paeds | Prof Jelsma | M Unger  
G Inglis – Jassiem  
V Mmabolo  
A Rhoda  
A Frieg  
P Struthers  
S Manie  
A Marais  
M Burgar |

Check out the SASP Website on www.physiosa.org.za

See also more SASP Provincial and SIG courses, look under “Congresses, Events & Course Calendar”
PHYSIOTHERAPY MANAGEMENT STRATEGIES FOR WOMEN POST-CAESAREAN SECTION DELIVERY IN PUBLIC HOSPITALS IN KWAZULU-NATAL, SOUTH AFRICA

ABSTRACT: South Africa has seen a steady increase in the rate of caesarean section deliveries, and while physiotherapists are often requested to treat these patients, there are no guidelines on their physiotherapeutic management. Current treatment is therefore based on clinical presentations of the patient. This paper reports on the physiotherapy management strategies for women post-caesarean section delivery used at four public hospitals in KwaZulu-Natal during 2011-2012. The study used a quantitative, cross-sectional, descriptive design. The sample consisted of 31 physiotherapists who completed an anonymous self-administered questionnaire, of whom eight had not treated post-caesarean section delivery women at all in the one year period. The results showed mobilization (100%), breathing exercises (94%) and education (94%) were common choices, with 68% selecting pelvic floor exercises as part of their management strategy. The study concluded that the current physiotherapy management strategy for women post-caesarean section delivery is based mainly on the doctors’ referral. Due to their limited knowledge about physiotherapy treatment, doctors overlook other complication(s) and potential complication(s) that could benefit from treatment post-delivery. The study showed that there is a need to improve the role and influence of physiotherapists in the multidisciplinary team.

KEY WORDS: PHYSIOTHERAPY MANAGEMENT, PHYSIOTHERAPY TREATMENT, CAESAREAN SECTION DELIVERY, SOUTH AFRICA, KWAZULU-NATAL.

INTRODUCTION
Physiotherapy has been involved in women’s health since the early 19th century (Mantle et al, 2006). While they were initially mainly involved with obstetric work, this gradually changed, and in the 1970s, physiotherapists also began to treat patients with gynaecological problems. (Mantle et al, 2006). Today, physiotherapists play an essential role in the multidisciplinary treatment team, and treat a wide variety of obstetric and gynaecological issues. In this capacity, they are required to keep abreast with the latest medical techniques and associated complications.

Caesarean section delivery (CSD) has become one of the most common surgical procedures performed by obstetricians (Penn and Arulkumaran, 2003). In 1989, the World Health Organization (WHO) stated that caesarean section rates should account for between 10-15% of births. Betrán et al (2007) reported that the global CSD rate was 15%, with higher rates found in developed countries (21.1%) compared to developing countries (2%). In Africa, South Africa has the highest CSD rates (Betrán et al, 2007), with an average of 16.1% in 2008/09 (Health Systems Trust, 2009). Provincially, KwaZulu-Natal has the highest CSD rates amongst district hospitals in the country at 22.1% (Health Systems Trust, 2009). An audit done by Naidoo and Moodley (2009) on a specialist private practice within KwaZulu-Natal found that maternal requests, breech delivery, HIV and previous CSD contributed to the high CSD rates in that particular practice. Literature has further cited that fear of vaginal delivery, the need for control in the birthing process (Lavender et al, 2012; Dhai et al, 2011), convenience, and the preservation of the pelvic floor (Dhai et al, 2011) are some of the reasons why women opt for a CSD. Although CSD are considered relatively safe (Dhai et al, 2011), there are still a number of complications associated with this procedure.
The rate of complications following CSDs has been reported at 36%, regardless of the type of CSD (van Ham et al, 1997). Complications include: sepsis, thromboembolic problems, anesthetic complications (Koroukian, 2004), an increased rate of maternal morbidity (Kuklina et al, 2009) and pneumonia (Belfort et al, 2010). Conflicting evidence is presented in the literature as to whether a CSD can prevent pelvic floor trauma when compared to a normal vaginal delivery. Literature has suggested that the incidence of urinary stress incontinence following a CSD may be reduced if the procedure is performed prior to the onset of labor (Chin et al, 2005). However, it is still evident that a significant number of women experience urinary stress incontinence following a CSD (Chin et al., 2005). Pregnancy is more significant than vaginal delivery as a factor for permanent urinary incontinence (Faundes et al, 2001) and is largely attributed to the increased mechanical compression placed on the pelvic floor area during pregnancy (Faunders et al, 2001; Mant et al, 2009).

A problem that is often unreported and untreated in pregnant women is lower back pain (Wang et al, 2004; Morgren and Pohjanen, 2005). While the pathophysiology and etiology of lower back pain in pregnancy is poorly understood (Morgren and Pohjanen, 2005), contributing factors highlighted in the literature are an increase in weight (To and Wong, 2003), and an increase in joint mobility due to hormonal changes (Marmach et al, 2003). In terms of lower back pain and the use of epidural anesthesia, the literature indicates that immediate post-operative back pain was prevalent in patients, but that this was significantly reduced over time, with no difference found after a year between patients who had received epidural analgesia and patients who had not (Macarthur et al, 1997). What is noteworthy is a review by MacEvilly and Buggy (1996), which stated that the type of anesthetic injected into the epidural space is also relevant in causing lower back pain.

Physiotherapists are well equipped to address these complications and prevent the onset of new ones with the use of manual therapy, exercise and/or electrotherapeutic modalities. However, there is currently no literature available on the physiotherapeutic management of women post-CSD, with the treatment techniques used being primarily based on patient presentation and clinical reasoning. This lack of research means that complication(s) or potential complication(s) post-CSD can therefore potentially not be addressed using best-practice methods. As there are no standardized physiotherapy management strategies for post-CSD complications used in South African hospitals, this study aimed to identify the management strategies used by physiotherapists to treat women post-CSD in four public hospitals in KwaZulu-Natal during 2011-2012. The objectives of the study were: (1) to identify the demographic profile of physiotherapists (2) to identify the physiotherapy management strategies of women post-CSD; (3) to identify the complications currently being addressed by physiotherapists in women post-CSD, (4) to determine referral to other members of the multidisciplinary team by the physiotherapists and the advice given to the women on discharge.

METHODS
The study utilized a quantitative, cross-sectional, descriptive survey design to determine the current management strategies employed by physiotherapists in the treatment of women post-CSD. It was conducted in 2012 at four public hospitals in KwaZulu-Natal using purposive sampling. The hospitals were selected on the basis that they were tertiary and/or regional hospitals, had a high obstetric and gynaecological patient turnover, and serviced a wide range of areas within the province. The study population consisted of all physiotherapists (N = 37) employed by the respective hospitals.

A self-administered, anonymous questionnaire was developed based on available literature (Mantle et al, 2006; Pasquina et al, 2006; Hay-Smith et al, 2009). The survey questionnaire was divided into four sections to address the study objectives; Section A: demographic details of the participants, Section B: the number of patients post-CSD treated and reasons for not treating patients, Section C: physiotherapy management post-CSD and Section D: referral to members of the multidisciplinary team and discharge advice. Section C identified the management of patients’ post-CSD or the strategies that would have been used by those participants who had treated a post-CSD patient in 2011-2012.

A pilot study was conducted to determine the validity and reliability for the questionnaire, with experts (N=5) in the area of women’s health being asked to review the questionnaire for content validity, after which minor changes were made. A focus group discussion was then done with physiotherapists not included in the study sample, for face validity and no problems were noted. Finally, the reliability of the study using the test-retest method was conducted among another group of physiotherapists (N=15) who were not included in the study. Repeatability analysis was undertaken using McNemar test between the same questions at pre- and post-test stage. No statistical difference (p = 1.00) was noted between the responses pre- and post-test.

As part of a PhD study, ethical approval (project number: 11/8/11) was obtained from the University of Western Cape Ethics Committee and the necessary documentation was sent to the respective hospitals within KwaZulu-Natal. Permission to conduct the study was obtained from all the relevant facility managers, the eThekwini District office and the Provincial Department of Health. Once permission was obtained, final arrangements were made with the Physiotherapy Departments at the hospitals to conduct the study. All participants signed an informed consent form prior to participating in the study, and the consent form was detachable from the questionnaire to retain anonymity. The participants were allowed to withdraw at any stage. Completed questionnaires were captured on Microsoft Excel and exported to SPSS version 15 where the data was analyzed. Descriptive data analysis was then carried out for each section of the survey. Fisher’s exact test was used to test for significance between categorical data; CI = 95%.
RESULTS
A response rate of 84% (N=31) was achieved, and the mean age of the participants was 32 years (SD±4.65). There were more females (n=28) than males (n=3). Of the participants, 45% (n=14) had 3-7 years of experience, 26% (n=8) had 8–12 years of experience and 29% (n=9) had 13–19 years of experience in Physiotherapy. In terms of post-graduate education, 96.7% (n=30) do not have any post-graduate degree(s) in Physiotherapy.

Of the 31 participants, 68% (n=21) had treated post-CSD patients, 6% (n=2) were unsure if they had treated post-CSD patients and 26% (n=8) had not treated post-CSD patients in 2011-2012. The self-reported number of patients treated following CSD by the participants varied, with a median of five and an interquartile range of 0–15. The most common reason reported by the participants for not having treated a CSD patient in the past year was that they had not been on an obstetric and gynaecology rotation (29%; n=9); other reasons are presented in Figure 1.

The mean number of physiotherapy treatment sessions rendered for each patient was 3.52 (SD±1.09), with the average treatment time being 15–30 minutes (67.7%; n=21). The year of undergraduate completion did not affect the average time spent treating a patient post-CSD (p=0.35). The average treatment time spent with a patient was also similar, irrespective of whether or not the participant treated a patient post-CSD (p=0.38) in 2011-2012. Various modalities were selected by physiotherapists for treating patients’ post-CSD. All of the participants (N=31) selected mobilization as a treatment technique for post-CSD patients. For this study, the term mobilization is defined as “the process of re-establishing the ability to move between postures (for example sit to stand), maintain an upright posture, and to ambulate with increasing levels of complexity (speed, changes of direction, dual and multi-tasking)” as per the NICE clinical guideline124 (2011). Other modalities selected are described in Figure 2.

Treatment modalities selected by the participants were similar regardless of when the participants graduated (Table 1). Percussion was the only modality selected most frequently (p=0.01) as a treatment choice by those who had treated post-CSD patients in the past year compared to those who had not (Table 1).

Other techniques reported by the participants included; “circulatory exercises and breathing exercises” (n=1), “coughing techniques” (n=1) and “infra-red lamp for post caesarean section hematoma” (n=1).

Forty five percent (n=14) of physiotherapists mentioned that they treated other complications following caesarean section and are shown in Figure 3.

Of the 31 participants who had and had not treated post-CSD patients in the past year, 19.4% (n=6) referred them to

![Figure 1: Reasons for not treating patients post-cSD](image1)

![Figure 2: Choice of physiotherapy treatment techniques for patients post-cSD](image2)

<table>
<thead>
<tr>
<th>Table 1: Modality selection vs year of graduation and treatment of women post-CSD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Modality Selection</strong></td>
</tr>
<tr>
<td>----------------------------</td>
</tr>
<tr>
<td>Percussion</td>
</tr>
<tr>
<td>Vibration</td>
</tr>
<tr>
<td>Deep Breathing Exercises</td>
</tr>
<tr>
<td>Inspiratory Hold</td>
</tr>
<tr>
<td>Active Cycle Breathing Technique</td>
</tr>
<tr>
<td>Pelvic Floor Exercises</td>
</tr>
<tr>
<td>Education</td>
</tr>
</tbody>
</table>

Two-tailed Fisher’s exact test
other members of the multidisciplinary team including a clinical psychologist (n=1), social worker (n=1), dietician (n=1), doctor (n=1) and occupational therapist (n=2). Advice on discharge was given by 90.3% (n=28) of participants, and is indicated in Figure 4.

**DISCUSSION**

The results from the study suggest that the current physiotherapy management strategy for women post-CSD is based mainly on the doctors’ referral, as doctors are only referring post-CSD patients who they deem necessary for physiotherapy. Therefore, other complications and potential complication as a result of the CSD procedure that should be identified by physiotherapists are not always addressed.

The physiotherapy management strategies selected for patients’ post-CSD were similar, irrespective of the year of qualification and whether participants had treated patients post-CSD or not during the previous year (Table 1). It can therefore be concluded that physiotherapists are not modifying their management strategies to meet the specialized needs of post-CSD patients, but are using standard treatment routines. This may be due to the fact that none of the participants had received any specialized post-graduate training in post-CSD management. It suggests that physiotherapists depend on their undergraduate knowledge and have not changed their management strategies to include recent evidence based research. Globally, physiotherapists are required to keep abreast with new information and incorporate evidence based research into their clinical practice (French and Dowds, 2008). The results of this study are similar to a review by Schreiber and Stern (2005), which suggested that physiotherapy management was not based on research, but rather on anecdotal and undergraduate information. Furthermore, a study by Stevenson and Lewis (2004) showed that although physiotherapists were in favour of evidence based research, they were reluctant to change their practice.

Anecdotal information from the hospitals used in this study indicates that some perform over 2000 caesarean sections per annum out of a total of 8400 births. With the study by van Ham et al, (1997) indicating that 36% of CSD women have complications and could require physiotherapy treatment, the low mean number of patients (mean=5) being treated by the participants demonstrates a low level of referral from obstetricians. There is evidence that physiotherapy can successfully treat postpartum problems post-CSD such as pelvic floor dysfunction and lower back pain (Britnell et al, 2005), and that in-hospital prophylactic treatment should also be rendered. What is noteworthy is the main reason selected for not having treated a patient post-CSD was not having been on that particular clinical rotation, with only one participant selecting “lack of referral from a doctor” (Figure 1). This indicates that obstetricians and gynaecologists are only referring patients who they deem necessary for physiotherapy. This is supported in the study by the mean number (mean=3.52; SD=±1.09) of treatment sessions rendered for a patient post-CSD. This is a high number of physiotherapy treatment sessions for uncomplicated post-CSD patients, as they are considered for discharge on day three post-operatively (South African Department of Health, 2007). Thus, the other reason for non-referral could be that uncomplicated post-CSD patients who would benefit from prophylactic treatment are not being referred for physiotherapy because doctors are unaware of the services physiotherapists render.

Participants in this study selected respiratory modalities (Figure 2) as part of their management strategy for patients’ post-CSD. Although there is minimal evidence in the literature reporting on respiratory complications following an uncomplicated Pfannenstiel incision for a caesarean section, participants stated that respiratory complications (16%) was one of the main problems they
addressed (Figure 3). This was followed by pain (13%) and muscle weakness (13%), while three participants mentioned lower back pain and sciatica, and two mentioned treating urinary incontinence as an added complication. The results suggest that obstetricians and gynaecologists at these hospitals mainly refer patients with respiratory complications for physiotherapy, indicating misconceptions regarding the services rendered by physiotherapists for patients’ post-CSD. This is despite the role and influence of physiotherapy in obstetric and gynaecological conditions being established more than five decades ago (Mantle et al, 2006) Freeman et al, (2000) advised that in order for patients to be referred to other members of the multidisciplinary team, health care professionals need to understand each other’s role and contribution towards patient care. Participants in this study indicated that they did refer patients to other members within the multidisciplinary team, with only one providing a reason for referral which was “to doctors, patient had severe abdominal pain - swab was left in the patient”. This demonstrates the importance of communication and understanding each other’s role when working as part of a team.

Advice on discharge was given to most of the patients, but only five (16%) participants specified pelvic floor exercises and nine (29%) specified back care and ergonomics as a home program. However, the literature indicates that in terms of potential problems following a CSD, urinary incontinence was prevalent (Chin et al., 2005) and lower back pain was frequently underreported (Wang et al, 2004; Morgren and Pohjanen, 2005). Studies have shown the benefit of a specific home exercise program for urinary incontinence (Haddow et al, 2005) and non-specific lower back pain (Kaukkainen et al, 2007) in post-CSD patients.

CONCLUSION
The Physiotherapy profession needs to educate obstetricians and gynaecologists about the role and effectiveness of physiotherapy techniques in patients’ post-CSD. Scholes and Vaughan (2002) stated that inter-professional education is thought to improve collaboration between the members of the multidisciplinary team which will result in more effective and efficient team work. This could include inter-professional education workshops on the role of physiotherapy within the multidisciplinary team treating women post-CSD to increase referrals for treatment.

The lack of advice on pelvic floor and lower back exercises as prophylactic treatment in postpartum home programme(s) suggests a gap in awareness of the prevalence and types of complications that may arise post-CSD by the physiotherapists. Physiotherapy courses that provide additional training using evidence based practice management practices for CSD patients would enable practitioners to provide more appropriate treatment. More research by the physiotherapy profession is also needed to identify the standard physiotherapy treatment needed by post-CSD women.

The study demonstrated the need for improvements in the role, effectiveness and influence of physiotherapists in their management strategy of post-CSD patients. Greater awareness by the referring clinicians of the conditions that physiotherapists can treat post-CSD will not only strengthening their role within the multidisciplinary team, but assist more women who would benefit from additional treatment.

ACKNOWLEDGEMENTS
The authors would like to thank the South African Society of Physiotherapy for their support and Professor R.Mpofu for her valuable input.

REFERENCES


HEALTH RELATED QUALITY OF LIFE OF SURVIVORS OF TRAUMA SIX MONTHS AFTER DISCHARGE

ABSTRACT: To investigate the health-related quality of life (HRQOL) of survivors of major trauma at six months following discharge, using two popular HRQOL tools.

A cross-sectional study was done on adult trauma survivors in Johannesburg. Subjects completed the EQ-5D and SF-36 HRQOL questionnaires. Additional demographic and clinical data were collected.

The majority of subjects reported some problems in usual activities and pain/discomfort as measured with the EQ-5D at six months. The mean EQ-5D VAS was 68 (+26.1). Lowest scores were reported in the role physical (44.6±41.6) and role emotional (44.1±45.4) domains of the SF-36. Mean SF-36 physical component summary (PCS) score (62.1±27.8) was higher than mental component summary score (58.7±20.1). EQ-5D VAS was found to be moderately correlated with age (r=-0.4; p=0.05). A negative correlation was found between SF-36 physical function score and ICU length of stay (LOS), hospital LOS and age (r=-0.4 (p=0.03), -0.4 (p=0.03) and -0.6 (p=0.00) respectively). Statistical significance was observed in the correlation between age and SF-36 general health domain (r=-0.4; p=0.02) as well as age and PCS score (r=-0.5; p=0.01).

Trauma survivors in Johannesburg experience limitations in specific emotional and physical domains of HRQOL at six months after discharge. Age was associated with the level of self-rated health as well as limitations in general health and physical function. ICU and hospital LOS were associated with limitations in physical function. There is a need for physical and psychological rehabilitation after discharge from trauma intensive care.

KEY WORDS: HEALTH-RELATED QUALITY OF LIFE; EQ-5D; SF-36; TRAUMA; INTENSIVE CARE.

INTRODUCTION
Road traffic fatality rates in South Africa are almost double the global average and pedestrians are involved in more than half of these fatalities. In contrast to worldwide statistics, road traffic injuries rank second to interpersonal violence in South Africa (Norman et al, 2007). It is important to consider the non-fatal aspect of these statistics as for each death there are several survivors with permanent sequelae as a result of the injuries sustained. Patients with trauma who are treated in the intensive care unit (ICU) with mechanical ventilation (MV) suffer from muscle weakness and dysfunction due to the effects of critical illness and immobility on the human body (Topp et al, 2002).

Much research has been conducted on the health-related quality of life (HRQOL) of survivors of critical illness after ICU discharge in other parts of the world (Hofhuis et al 2009; Ulvik et al 2008; Cuthbertson et al 2005; Granja et al 2002). Many of these reports highlighted limitations in HRQOL related to physical functioning and emotional health in survivors of critical illness. There is, however, little known about the HRQOL of critical care survivors following ICU discharge in the South African population (Karachi, Hanekom and Faure 2011; Van Aswegen et al 2010). Van Aswegen et al (2010), reported poor HRQOL outcomes in 40 survivors of penetrating trunk trauma in Johannesburg at six months following discharge particularly in relation to physical functioning. Karachi et al (2011), reported poor HRQOL outcomes in 46 surgical ICU survivors in Western Cape at 12 months following discharge also in relation to physical functioning. Due to obvious differences between African and European demographics, there is a need to further investigate the HRQOL of survivors of major trauma in South Africa specifically in order to come to relevant conclusions about the quality of life of these survivors and as to whether results from South African studies are comparable to that of the international trauma population. Although many HRQOL tools have been used worldwide, the EuroQol (EQ)-5D and Medical Outcomes Short Form-36 (SF-36) proved to be popular instruments in the assessment of HRQOL in...
ICU populations (Orwelius et al. 2010). In order to allow for comparisons to be made between HRQOL of South African survivors of critical illness and trauma and that reported on an international level, it becomes important to use universally accepted HRQOL tools.

In the South African population, the EQ-5D has been used in measuring the HRQOL in non-ICU populations (Jelsma et al. 2004; Jelsma et al. 2005; Louwagie et al. 2007); no evidence of its use in the assessment of HRQOL of the South African ICU population could be found. The SF-36 has been used to assess HRQOL in some non-ICU populations in South Africa (Benitha and Tikly 2007; O'Keefe and Wood 1996). Only two groups have used the SF-36 to assess HRQOL in critical care survivors in South Africa (Karachi, et al. 2011; Van Aswegen et al. 2011).

International reports confirm that survivors of critical illness experience delayed recovery of physical function at six months and even five years after discharge and emphasise the importance of rehabilitation interventions for such survivors to improve their HRQOL (Hough and Herridge 2012; Orwelius et al. 2010; Ulvik et al. 2008). Rehabilitation programmes exist in South Africa for people with chronic cardiac and/or pulmonary diseases, which have been shown to be effective in improving their ability to participate in cardiovascular exercises (improving ability to cope with work and activities of daily living [ADL]) and play a role in improving HRQOL. No rehabilitation programmes for survivors of critical illness in South Africa have been reported in the literature. Without knowledge of possible limitations in the HRQOL of survivors of major trauma, it is not known whether they too would benefit from a rehabilitation programme after discharge from the hospital. The aim of this study was to investigate the HRQOL of survivors of major trauma in Johannesburg six months after discharge using the EQ-5D and SF-36 (UK Version 1) HRQOL questionnaires. As the EQ-5D questionnaire had not been utilised in the South African ICU population as yet, the suitability of the questionnaire for this population required investigation.

**METHODS**

Permission was obtained from the University of the Witwatersrand Human Research Ethics Committee to conduct the study. Permission was obtained from the QualityMetric group to use the SF-36 questionnaire (UK Version 1) and from the EuroQol group to use the EQ-5D questionnaire. The SF-36 questionnaire comprises 36 questions consisting of eight domains: physical functioning (PF), social functioning (SF), role limitation due to physical problems (RP), role limitation due to emotional problems (RE), mental health (MH), vitality (VT), bodily pain (BP) and general health perceptions (GH). The domains are summarised in summary scores namely physical component summary (PCS) score and mental component summary (MCS) score (Hofhuis et al. 2009). The EQ-5D consists of two parts namely the EQ-visual analogue scale (VAS) (20 centimetre vertical scale) used to assess overall self-rated health (range 0-100) and a descriptive portion whereby the participant depicts health problems according to five items: mobility, self-care, usual activities, pain/discomfort and anxiety/depression. The participant marks one of three levels of severity (1=no problems, 2=moderate problems and 3=severe problems) for each of the five items and can then be classified into any one of 243 possible health states. Each state is referred to in terms of a five digit code (Hofhuis et al. 2009; Badia et al. 2001).

Permission from the management of two trauma centres in Johannesburg was obtained to conduct the study and to gain access to the hospital database and subject files. A retrospective cross-sectional study design was used for a cohort of adult subjects that survived trauma. In order to identify potential subjects for the study, the admission books and records of the respective ICUs were searched for those subjects who were discharged from ICU six months prior to the study. The subjects were contacted telephonically by the physiotherapist who was responsible for their care at the particular hospital and permission was sought from that person for the researcher to contact the subject regarding the study. The abovementioned physiotherapist also explained the aims of the study to the subject and excluded those not eligible. Male and female subjects, aged 18 years and older who suffered major trauma, received intubation and MV at one of the two trauma centres and were discharged six months ago, were eligible for inclusion. Subjects were excluded if they had an ICU length of stay (LOS) <24 hours, MV <24 hours, severe communication problems, diminished mental capacity, suffered lesions affecting the central nervous system, terminal malignancy, lived outside of Johannesburg and surrounding areas or were imprisoned after discharge. Recruitment of subjects began in May 2009 and extended to October 2010.

Once permission was obtained from the subject, the researcher contacted him/her telephonically. The study aims and procedure was explained to the subject in more detail to make sure that he/she understood what was expected of them. An appointment was arranged between the researcher and the subject, at the particular trauma centre that the subject frequented, at a time that suited both. The researcher attempted to arrange appointments with subjects on the day of their scheduled follow up appointment with the trauma surgeon in order to reduce transport costs. Those subjects who could not be seen by the researcher on the day of their appointment with the surgeon were given a separate appointment date. They were reimbursed for their additional travel expenses. On the day of the scheduled appointment with the researcher, written informed consent was obtained. The subject completed the English (UK) SF-36 (version 1) and the English EQ-5D questionnaires in a self-administered fashion. The researcher was present to assist the subject with any questions that were unclear to him/her but in no way attempted to influence the subject’s responses. Generally one participant at a time was seen by the researcher. The same researcher obtained written consent and was present while each participant completed the two HRQOL questionnaires.

Demographic information (age, gender, admission diagnosis, Glasgow Coma Scale, vital signs, full blood count and arterial blood gas results, ICU and hos-
hospital LOS) was collected using the subject’s hospital file and ICU charts. The Acute Physiology and Chronic Health Evaluation (APACHE) II score for each subject was calculated from this information using a freely available online calculator as these scores were not readily documented on ICU charts or in medical files. The Injury Severity Score (ISS) was obtained from an administrator in the casualty department of the two trauma centres.

**Statistical Analysis**

SF-36 questionnaires were scored with the SF Health Outcomes™ Scoring Software package (Release 1.0) to convert raw scores into domain scores ranging from 0 – 100 (transformed scores). There were no missing data. Values for PCS and MCS scores (norm-based scores) were obtained through merging of the domain scores. EQ-5D scores were calculated using the standard SPSS syntax developed by the EuroQol group. Frequency, percentage and cross tabulation were used to summarise categorical data pertaining to EQ-5D items, gender and trauma type. Continuous variables such as age, LOS, injury severity, EQ-5D VAS, SF-36 domain and summary scores were summarised using means and standard deviations (SD). Trauma type and gender categories were compared with respect to continuous variables using Student’s T-test and one-way analysis of variance (ANOVA). In the latter, when necessary, pair-wise comparisons between three trauma groups were done using the Bonferroni approach. Where homogeneity of variance between groups could not be assumed, the one-way ANOVA for ranks was performed. The EQ-5D VAS, SF-36 scores were assessed in relation to age, hospital and ICU LOS using Pearson’s-product-moment correlation coefficient. A p-value of ≤0.05 was deemed statistically significant.

**RESULTS**

A total of 200 patients were admitted into the one trauma ICU in the six months prior to the study. Of these admissions, 31 deaths were recorded. The number of patients admitted into the second trauma ICU totalled 1115 and 65 deaths were recorded. The types of trauma seen at both centres varied between blunt and penetrating trauma and polytrauma. Not all admissions into the second trauma ICU presented with a diagnosis of trauma as this ICU also served as an overflow to the surgical and respiratory ICUs. Contact details were obtainable for 32 subjects at six months following ICU discharge. Of these, five subjects were excluded (not intubated and mechanically ventilated (n=3); ventilated <24 hours (n=1); paraplegia (n=1)); hence 27 subjects (n=27) participated in the study.

Demographic characteristics are displayed in Table I. Missing data is owing to the lack of obtainable hospital records for some subjects. The vast majority of subjects were male (81.5%). More than half of the subjects were involved in polytrauma (51.8%) due to motor vehicle or pedestrian vehicle accidents. The average LOS in ICU and in hospital for this group of subjects was longer than 20 days.

Subjects took approximately five minutes to complete the EQ-5D questionnaire (range: 1-9 minutes). Extreme problems were reported in the pain/discomfort (n=2) and anxiety/depression (n=2) items of the questionnaire for a small minority of subjects at six months following ICU discharge. Of these, five subjects were excluded (not intubated and mechanically ventilated (n=3); ventilated <24 hours (n=1); paraplegia (n=1)); hence 27 subjects (n=27) participated in the study.

Demographic characteristics are displayed in Table I. Missing data is owing to the lack of obtainable hospital records for some subjects. The vast majority of subjects were male (81.5%). More than half of the subjects were involved in polytrauma (51.8%) due to motor vehicle or pedestrian vehicle accidents. The average LOS in ICU and in hospital for this group of subjects was longer than 20 days.

Subjects took approximately five minutes to complete the EQ-5D questionnaire (range: 1-9 minutes). Extreme problems were reported in the pain/discomfort (n=2) and anxiety/depression (n=2) items of the questionnaire for a small minority of subjects at six months following ICU discharge. Of these, five subjects were excluded (not intubated and mechanically ventilated (n=3); ventilated <24 hours (n=1); paraplegia (n=1)); hence 27 subjects (n=27) participated in the study.

**Table I: Demographic characteristics of subjects at six months following discharge**

<table>
<thead>
<tr>
<th></th>
<th>Male (n=22)</th>
<th>Female (n=5)</th>
<th>Total (n=27)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years) mean (±SD)</td>
<td>37 (12.4)</td>
<td>37.4 (13.4)</td>
<td>37 (12.6)</td>
</tr>
<tr>
<td>APACHE II (n=19) mean (±SD)</td>
<td>11.8 (9)</td>
<td>16.8 (14.1)</td>
<td>12.7 (10.3)</td>
</tr>
<tr>
<td>ISS (n=20) mean (±SD)</td>
<td>16.9 (12.3)</td>
<td>13.4 (11.3)</td>
<td>16.2 (12.2)</td>
</tr>
<tr>
<td>ICU LOS (days) mean (±SD)</td>
<td>22.3 (13.9)</td>
<td>22.6 (25.7)</td>
<td>22.3 (16.7)</td>
</tr>
<tr>
<td>Hospital LOS (days) mean (±SD)</td>
<td>27 (23.3)</td>
<td>26.6 (24.4)</td>
<td>26.8 (10.3)</td>
</tr>
<tr>
<td>Type of trauma n (%)</td>
<td>6 (27.3)</td>
<td>1 (20)</td>
<td>7 (25.9)</td>
</tr>
<tr>
<td>Blunt</td>
<td>5 (22.7)</td>
<td>1 (20)</td>
<td>6 (22.2)</td>
</tr>
<tr>
<td>Penetrating</td>
<td>11 (50)</td>
<td>3 (60)</td>
<td>14 (51.8)</td>
</tr>
<tr>
<td>Polytrauma</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

APACHE : Acute Physiology and Chronic Health Evaluation; ISS: Injury Severity Score; ICU: intensive care unit; LOS: length of stay

**Table II: Descriptive item results of the EQ-5D six months after discharge expressed as number (percentage) (n = 27)**

<table>
<thead>
<tr>
<th></th>
<th>Mobility</th>
<th>Self-care</th>
<th>Usual activities</th>
<th>Pain/discomfort</th>
<th>Anxiety/depression</th>
</tr>
</thead>
<tbody>
<tr>
<td>No problems</td>
<td>13 (48.1)</td>
<td>17 (63)</td>
<td>9 (33.3)</td>
<td>9 (33.3)</td>
<td>12 (44.4)</td>
</tr>
<tr>
<td>Some problems</td>
<td>14 (51.9)</td>
<td>10 (37)</td>
<td>18 (66.6)</td>
<td>16 (59.3)</td>
<td>13 (48.2)</td>
</tr>
<tr>
<td>Extreme problems</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2 (7.4)</td>
<td>2 (7.4)</td>
</tr>
</tbody>
</table>
reported no problems in self care items (n=17). A similar number of subjects reported no problems or some problems with mobility (n=13 and n=14 respectively). A similar number of subjects reported no problems or some problems with anxiety/depression (n=12 and n=13 respectively). The mean score for the EQ-5D VAS was 68 (±26.1).

Subjects took approximately 15 minutes to complete the SF-36 questionnaire (range: 5-25 minutes). A higher domain score indicates better HRQOL; a lower score indicates limitations in the respective domains of HRQOL (see Figure I) (Orwelius et al 2010). Highest
scores were reported in the GH domain (mean 65.7 (±27.7)). Lowest scores were reported in the RP (mean 44.6 (±41.6)) and RE (mean 44.1 (±45.4)) domains indicating problems with work or other daily activities as a result of physical health and emotional problems respectively. Mean PCS score was 62.1 (±27.8) and mean MCS score was 58.7 (±20.1). Mean PCS was higher than mean MCS score.

A comparison of the EQ-5D items with the type of trauma and subject gender was done (Table III). More subjects with blunt or polytrauma reported having some problems in the mobility item compared to those with penetrating trauma who reported having no problems with mobility. The majority of subjects with blunt and polytrauma reported some problems in the usual activities item as well as in the pain/discomfort item. An equal number of subjects with penetrating trauma reported no problems and some problems with usual activities. A small number of the penetrating (20%) and polytrauma (9.1%) subjects described extreme problems in pain/discomfort. A small number of the penetrating (20%) and polytrauma (9.1%) subjects described extreme problems in pain/discomfort. Males with blunt trauma had the lowest mean EQ-VAS score at six months compared to those with polytrauma who had the highest score. The EQ-VAS was found to be moderately correlated with age (r=0.4; p=0.05); thus with an increase in age, a decrease in VAS was evident.

Table IV illustrates comparisons between EQ-5D items and various outcome measures assessed. Regarding mobility, mean ICU LOS was 14.5 days (±9.6) and 30.9 days (±18.7) respectively for those reporting no problems and those reporting some problems on the EQ-5D questionnaire; therefore a longer ICU LOS resulted in more problems with mobility (p<0.05). Those subjects who reported some problem in the mobility item of the EQ-5D had a prolonged period of hospital stay compared to those subjects who reported no problem with mobility (p<0.05). Subjects who reported having some problems in the self-care item of the EQ-5D had a longer hospital LOS compared with those who reported no problems (p<0.05).

The SF-36 PF score had a moderately negative association with ICU and hospital LOS and a strongly negative association with age (correlation coefficient (r) = -0.4 (p=0.03), -0.4 (p=0.03) and -0.6 (p=0.00) respectively); therefore, an increase in ICU and hospital LOS was associated with a decrease in physical functioning.

| Table IV: Comparison between EQ-5D items and the various outcome measures assessed. |
|---------------------------------|----------------|----------------|----------------|----------------|----------------|
|                                | ICU LOS        | HOSPITAL LOS   | APACHE II      | ISS            | AGE            |
| Mobility                       |                |                |                |                |                |
| No problems                    | 14.5 (± 9.63)  | 22.33 (± 17.31)| 16.00 (± 6.81) | 18.12 (± 8.97) | 33.14 (± 12.21)|
| Some problems                  | 30.85 (± 18.73)| 40.83 (± 23.73)| 18.46 (± 8.20) | 23.54 (± 8.74) | 40.64 (± 12.38)|
| Extreme problems               |                |                |                |                |                |
| Statistical significance       | p<0.05         | p<0.05         | p>0.05         | p>0.05         | p>0.05         |
| Self-care                      |                |                |                |                |                |
| No problems                    | 19.17 (± 16.77)| 25.76 (± 19.18)| 18.46 (± 7.85) | 20.54 (± 8.96) | 33.78 (± 11.51)|
| Some problems                  | 29.00 (± 15.77)| 45.71 (± 24.80)| 16.00 (± 7.59) | 23.00 (± 9.50) | 42.50 (± 13.26)|
| Extreme problems               |                |                |                |                |                |
| Statistical significance       | p>0.05         | p>0.05         | p>0.05         | p>0.05         | p>0.05         |
| Usual Activities               |                |                |                |                |                |
| No problems                    | 14.56 (± 9.04) | 20.56 (± 12.94)| 22.67 (± 6.22) | 24.17 (± 11.48)| 34.22 (± 12.54)|
| Some problems                  | 26.53 (± 18.42)| 38.20 (± 24.57)| 15.43 (± 7.33) | 20.40 (± 8.04) | 38.16 (± 12.85)|
| Extreme problems               |                |                |                |                |                |
| Statistical significance       | p>0.05         | p>0.05         | p>0.05         | p>0.05         | p>0.05         |
| Pain/discomfort                |                |                |                |                |                |
| No problems                    | 14.56 (± 11.26)| 21.89 (± 15.96)| 18.80 (± 5.93) | 19.80 (± 11.56)| 30.22 (± 8.15) |
| Some problems                  | 25.18 (± 18.46)| 36.36 (± 24.69)| 16.92 (± 8.45) | 20.29 (± 7.56) | 39.53 (± 13.79)|
| Extreme problems               | 38.00 (± 1.41) | 52.00 (-)      | 19.00 (± 9.90) | 34.00 (0)      | 44.50 (± 10.60)|
| Statistical significance       | p>0.05         | p>0.05         | p>0.05         | p>0.05         | p>0.05         |
| Anxiety/Depression             |                |                |                |                |                |
| No problems                    | 20.69 (± 13.91)| 27.46 (± 15.97)| 18.82 (± 8.32) | 21.27 (± 9.52) | 33.07 (± 11.25)|
| Some problems                  | 24.92 (± 19.75)| 38.11 (± 29.18)| 16.63 (± 7.23) | 20.33 (± 8.29) | 39.62 (± 13.81)|
| Extreme problems               | 21.00 (± 22.63)| 29.00 (± 32.53)| 12.00 (0)      | 34.00 (0)      | 44.00 (± 11.31)|
| Statistical significance       | p>0.05         | p>0.05         | p>0.05         | p>0.05         | p>0.05         |

Results are reported as mean (standard deviation)
LOS and an increase in age resulted in a decrease in the PF score. Statistical significance was observed in the moderately negative association between age and GH (r=-0.4 (p=0.02)) and age and PCS (r=-0.5 (p=0.01)); hence, an increase in age was associated with a decrease in GH and PCS.

Subjects reported that the EQ-5D was more user-friendly and easier to understand than the SF-36. They found the English language used in the SF-36 questionnaire difficult to comprehend and required more assistance from the researcher in completing this questionnaire compared to the EQ-5D questionnaire; however the SF-36 provided a more detailed account of HRQOL. Due to the nature of data obtained from the SF-36 (continuous) and EQ-5D (categorical) questionnaires, a statistical comparison of results between the questionnaires could not be performed.

**DISCUSSION**

This study is one of a few that has investigated the HRQOL of survivors of major trauma in Johannesburg and South Africa. An important finding was that subjects presented with a reduction in specific emotional and physical domains of HRQOL at six months following ICU discharge.

Demographics related to gender and injury type in the current study are similar to that reported by other authors (Van Aswegen et al 2011; Ulvik et al 2008; Norman et al 2007). Subjects in this study had a prolonged ICU and hospital LOS which put them at risk for the development of physical debilitation. Bailey et al. (2007) stated that patients who received MV for a period longer than four days were at considerable risk of such debilitation. Prolonged MV has been defined by some as >48 hours and by others as ≥7 days (De Jonghe et al 2007; Chang et al 2005). The duration of LOS reported in this study was substantially longer than that reported by some authors (Orwelius et al 2010; Ulvik et al 2008; Cuthbertson et al 2005). It should be noted that Cuthbertson et al. and Orwelius et al. reported on mixed populations of critical care survivors and not solely survivors of trauma. Our LOS results are not dissimilar to that reported by Van Aswegen et al (2011) who reported on survivors of penetrating trunk trauma only.

Subjects were found to experience problems in all five items of the EQ-5D at six months with some reporting extreme problems in the pain/discomfort and anxiety/depression items. The HRQOL reported in this study was reduced when compared to the subjects in the study by Granja et al. (2002) where HRQOL was measured using the EQ-5D six months after ICU discharge; however, Granja et al. (2002) studied a mixed ICU population where only four percent of the sample had a diagnosis of trauma. Since those that experience trauma are generally younger (<40 years) and in good health prior to the incident, it might be reasonable to assume that their expectations of HRQOL after the traumatic incident will be reported as poor. This could explain why the results from the current study showed reduced HRQOL as measured with the EQ-5D. The EQ-VAS of the trauma population reported on by Granja et al. (2002) was 70 and in congruence with that reported in this study.

Reported HRQOL as measured with the SF-36 questionnaire showed that subjects in this study had not achieved optimal HRQOL in any of the domains nor with regard to the summary scores at six months. Lowest scores were found in the RP and RE domains. Subjects perceived having less physical limitation to HRQOL than limitations due to emotional factors in their daily lives at six months after ICU discharge. During informal discussions with the participants, it was found that less than half had returned to work. Arguably, the implication of this fact is that subjects struggled with a reduced sense of self-worth and lack of integration into their community. This fact could translate into the low reported MCS scores; however, a limitation of this study is that return to work was not assessed objectively.

With the exception of GH and VT, all SF-36 domain scores in the current study were decreased when compared with the domain scores reported by Orwelius et al. (2010). Their study sample was a mixed ICU population where 12% had a diagnosis of trauma. The current study did not investigate changes in HRQOL over time as did Orwelius et al. (2010). Orwelius et al. (2010) reported no considerable change in HRQOL over time (6-36 months after ICU discharge), and thus the measurement of HRQOL at six months (current study) provided a fair depiction of the subject’s current state of HRQOL. Van Aswegen et al. (2011) measured HRQOL at one, three and six months after hospital discharge in survivors of penetrating trunk trauma. They reported low PCS scores at six months for subjects who had prolonged MV whereas MCS scores were comparable with that of a healthy group at six months. In the current study subjects reported higher mean PCS and MCS scores and also a higher PCS score than MCS score which is in contrast to that reported by Van Aswegen et al. (2011). These subjects however, suffered different types of trauma while the study by Van Aswegen et al. (2011) included only those with penetrating trunk trauma. The difference in type of trauma and the experience of such could bring about a difference in perception of HRQOL.

An association was found between age and EQ-VAS which is similar to the findings reported by Granja et al. (2002) who found age to be significant in the association with mobility, self-care, usual activities and pain/discomfort. Significance was reached in the association between ICU and hospital LOS and the mobility item of the EQ-5D in the current study and as well as between hospital LOS and the self care item; thus with an increase in time spent in ICU and in hospital, more limitation was found to be present in these items at six months following discharge. A moderate association was observed between ICU and hospital LOS and PF domain of the SF-36. Similarly, an increase in time spent in ICU and in hospital resulted in a decrease in the PF domain score. (Orwelius et al. 2010) described ICU LOS to have no association with HRQOL but hospital LOS was found to have a significant relationship with such.

It was reported that survivors of penetrating trunk trauma who were treated in ICU with MV, suffered from muscle weakness/dysfunction and limitations in exercise capacity up to six months following discharge due to the effects of
Critical illness and prolonged bed rest on the human body (Van Aswegen et al. 2010). Exercise therapy has been shown to have beneficial effects on physical and psychological well-being and could potentially be a beneficial intervention strategy to improve HRQOL for survivors of major trauma after hospital discharge. Stathopoulou et al. (2006) conducted a meta-analysis investigating the effect of exercise intervention on mental health. It was hypothesized that the mechanism of action of the beneficial effects of exercise can be attributed to both psychological and physiological factors. Physiological factors included changes in metabolism and availability of central neurotransmitters. Psychological effects of exercise included changes in coping strategies and the interruption of negative thoughts. (Jones et al. 2003) investigated the effectiveness of a rehabilitation programme on the recovery of survivors of critical illness after discharge. They found that the SF-36 PF score for subjects in the rehabilitation group was closer to normal and significantly different from those in the control group. In light of the above it might be reasonable to suggest that exercise therapy, commenced after discharge from the hospital, might have a beneficial effect on the physical and psychological recovery of survivors of major trauma.

Some limitations to the current study include the fact that hospital records for a portion of subjects could not be attained. This was problematic as data for the whole sample could not be retrieved for APACHE II and ISS and may have influenced the significance of the associations of severity of illness with HRQOL. Subjects also found the English language used in the SF-36 questionnaire (Version 1) difficult to comprehend. Furthermore, as the questionnaire spoke of ‘miles’ and ‘yards’, some found it difficult to place the questions in context. It is recommended that HRQOL for trauma victims be assessed on ICU admission through proxies; even though there are known limitations to the use of proxies in HRQOL assessment, it may be possible to ascertain by how much HRQOL had deteriorated due to the traumatic insult as well as ICU and hospital LOS.

This study provides valuable baseline information on the HRQOL of survivors of various types of major trauma at six months after discharge and provides a platform for future research in this field in South Africa.

CONCLUSION
Survivors of major trauma experience limitations in emotional and physical HRQOL domains at six months after discharge. Age was associated with the level of self-rated health as well as limitations in general health and physical function. ICU and hospital LOS were associated with limitations in physical functioning. The results of this study support the recommendation that rehabilitation, in the form of physical and psychological interventions, be offered for survivors of trauma after hospital discharge to adequately address the identified limitations in HRQOL.

REFERENCES


Jelsma J, Maclean E, Hughes J, Tinise X, Darder M 2005 An investigation into the health-related quality of life of individuals living with HIV who are receiving HAART. AIDS Care 17:579-588.


THE ASSOCIATION BETWEEN TRUNK MUSCLE ENDURANCE AND LUMBO-PELVIC STABILITY IN ADOLESCENT LOW BACK PAIN: A CROSS SECTIONAL STUDY

ABSTRACT: Decreased trunk muscle endurance has been identified as a risk factor for adolescent LBP, and poor lumbo-pelvic stability has been found to be associated with LBP in the adult population. The aim of the study was to investigate the association between adolescent LBP, trunk muscle endurance and poor lumbo-pelvic stability.

Design: A cross sectional study.

Participants: 80 adolescents in grade 8 to grade 11, aged 12 to 17 years, at three high schools in Gauteng, who agreed to participate in the study.

Method: Data was collected by means of a validated questionnaire and physical tests. The active straight leg raise test was used to record the lumbo-pelvic stabilising muscles. The Sorensen, Shirado and side-bridge tests were used to record trunk extensor, flexor and side flexor muscle endurance, respectively.

Results: The results revealed a lifetime prevalence of LBP of 82.50%, one year prevalence of 78.80% and point prevalence of 23.80%. Adolescents with LBP demonstrated decreased trunk extensor muscle endurance but increased trunk flexor muscle endurance (p=0.044), compared to non-LBP adolescents. Poor lumbo-pelvic stability was not associated with adolescent LBP, but was associated with decreased extensor trunk muscle endurance (p=0.031).

Conclusion: There was an association between trunk flexor muscle endurance and adolescent LBP, and between decreased trunk extensor muscle endurance and poor lumbo-pelvic stability. No association was found between LBP and poor lumbo-pelvic stability.

KEY WORDS: ADOLESCENT, TRUNK MUSCLE ENDURANCE, LOW BACK PAIN, LUMBO-PELVIC STABILITY, RISK FACTORS.

INTRODUCTION

Low back pain (LBP) is a common and well-documented cause of pain and disability (Balague et al 2012, Limon et al 2004). Studies have shown a high prevalence of LBP in school aged children, despite the common perception that it is not frequently reported in this age group (Watson et al 2002). The aetiology of low back symptoms in adolescents is poorly understood (Watson et al 2003). It has been suggested that adolescent LBP has important consequences for the occurrence of adult LBP (Hestbaek et al 2006, Harreby et al 1995).


Dysfunctional movement patterns caused by changes in strength or flexibility, poor endurance, or abnormal neural control can result in tissue damage, which could result in decreased stability of spinal structures, and increased demand placed on the already inefficient muscles, resulting in a dysfunctional degeneration cascade (Barr et al 2005). Patients with LBP often present with trunk muscle imbalances and movement dysfunction in either the local or the global muscle system (Comerford and Mottram 2001). The ability of the trunk muscles to maintain appropriate levels of activation over long periods of time may be more important than maximum strength, to protect the passive structures of the lumbar spine from injury (Evans et al, 2006). Decreased trunk muscle endurance has been identified by Andersen et al (2006) as a risk factor for adolescent LBP in school aged children.
LBP, while poor lumbo-pelvic stability has been found to be associated with LBP in the adult population (O’ Sullivan et al 2002). A possible a causal relationship between LBP and decreased spinal stability was suggested by Sjolie and Ljunggren (2001). However, in a study by Jordaan (2005), no association was found between adolescent LBP and poor lumbo-pelvic stability. The aim of the current study was to investigate trunk muscle endurance and poor lumbo-pelvic stability as potential risk factors in adolescent LBP.

**METHODOLOGY**

This was a cross sectional study. The population chosen were adolescents of both genders in grade 8-11 (aged 12-17 years), attending a member school of the Independent Schools Association of South Africa (ISASA), in the Central Gauteng region. An ISASA school was chosen as a sample of convenience due to accessibility. At the time of the study there were 67 schools registered as ISASA member schools in the Central Gauteng region. Possible schools were narrowed down to 24 schools based on schools with both male and female students and similar sports offered. From these 24 schools that were approached only three agreed to participate in the study. Volunteers from which consent and assent was obtained were included in the study. Adolescents with a history of spinal surgery; any use of orthotic device such as brace or lumbar support; surgery, fractures or other orthopaedic procedure to pelvis or lower limbs within the last six months; adolescents with known spinal pathology (Scheurmann’s disease, spondylolysis, spondylolisthesis, rheumatic disease); or with visible abnormal spinal curvature (scoliosis, kyphosis); neurological conditions which alter motor tone; and any other serious co-morbidities were excluded.

Data collection included a questionnaire and physical testing. The questionnaire was used to obtain information on LBP and the characteristics and behaviour of pain. The questionnaire had been validated previously and permission was granted to use it (Jordaan, 2005). The physical tests measured trunk muscle endurance and lumbo-pelvic stability. All measurements were taken by the principal author and intra-rater reliability was established prior to the study.

Back extensor endurance was recorded using the Sorensen test (Arab et al 2007, Evans et al 2006, Demoulin et al 2004). The participant was positioned in prone with the upper edge of the iliac crests aligned with the edge of the table and the pelvis, knees and ankles fixed to the table via three straps. The participant was asked to hold the upper body in a horizontal position in line with the lower body with the arms folded across the chest for as long as possible. The test was stopped after 240 seconds if the participant was still holding the position.

Abdominal endurance was recorded using the Shirado test (Bernard et al 2008, Ito et al 1996). The participant was positioned in supine, arms crossed over their chests and hips and knees flexed to 90°. The test begins when the participant lifts their upper body from the examination table. The position was held for as long as possible, or until the position could no longer be maintained, the test is stopped after 240 seconds (Evans et al 2006).

Trunk lateral flexor endurance was recorded using the side bridge endurance test (Evans et al 2006, McGill et al 1999). The participant lay on their side with the legs extended, resting on their forearm with the elbow flexed to 90°. The top foot was placed in front of the lower foot for support. The participant was instructed to lift the hip off the bed, support themselves on their one elbow and their feet, and maintain a straight line with the whole body throughout the test. The uninvolved arm was held across the chest with the hand placed on the opposite shoulder. The position was held for as long as possible.

The active straight leg raise (ASLR) test was used to measure the functional control of the lumbo-pelvic stabilising muscles (Mens et al 2001). The participant was instructed to lift one leg 20cm above the bed, keeping the leg straight. The participant was then asked to rate the difficulty of the movement according to the following scale: not difficult at all, minimally difficult, somewhat difficult, fairly difficult, very difficult, unable to do (Mens et al 2001). This was repeated on the other leg. The measurement was also quantified by the readings on three pressure biofeedback units, which were used to measure control of the rotatory component of the pelvis (Jordaan 2005). Two pressure biofeedback units were positioned beneath the posterior superior iliac spines on each side just lateral to the midline, to monitor coronal rotation of the pelvis. One pressure biofeedback unit was placed beneath the leg at the ankle of the resting leg to monitor an increase in pressure when the other leg was lifted in the ASLR test. Each was inflated to a baseline pressure of 40mmHg. A change of pressure more than 16mmHg was considered poor, a change of between 9 and 15mmHg was considered moderate and a change in pressure of 8mmHg or less was considered good performance (Jordaan 2005). This measurement was described by Jordaan (2005) and has been used in other studies on adolescent low back pain (Fanucchi et al 2009).

During all testing procedures, participants were instructed to stop if they experienced any pain. No participants reported pain during any of the testing.

**RESULTS**

**Prevalence of LBP**

The lifetime prevalence of adolescent LBP in this group was 82.50% (n=66), one-year prevalence was 78.80% (n=63), and point prevalence was 23.80% (n=19).

**The association between trunk muscle endurance and adolescent LBP**

Adolescents with a history of LBP (n=66) showed higher levels of trunk flexor endurance than non-LBP subjects (n=14) (p=0.044). The results are presented in Figure 1.

Although adolescents with a history of LBP showed weaker extensor trunk muscle endurance than those without LBP, no direct association was found (p=0.304). The results are presented in Figure 2.

No association was found between LBP and side flexor muscle endurance.

**The association between lumbo-pelvic stability and adolescent LBP**

No association was found between LBP and participants’ perception of the ease of lifting the right and left ASLR (p=0.275 and p= 0.373 respectively). The results are presented in Figure 3.

No association was found between LBP and either the right or the left pressure change, as measured at the PSIS (p=0.287 and p= 0.719 respectively). The results are presented in Figure 4.

The association between trunk muscle endurance and lumbo-pelvic stability.
The results of the mean muscle endurance and the average pelvic rotation control during ASLR are presented in Figure 5. There was a statistically significant association between the ASLR test and trunk extensor muscle (p=0.031). Those adolescents with better performance of the ASLR test had better endurance of the trunk extensor muscles. Those participants with a good muscle control during ASLR (pressure change on the biofeedback less than 9mmHg) had better endurance scores for all four endurance tests.

**DISCUSSION**

The life-time and year prevalence of LBP among adolescents found in this study are higher than those recorded in other studies in which life-time prevalence has been recorded between 26% to 69.30% (Jordaan 2005, Kovacs et al 2003, Fairbank et al 1984) and one-year prevalence between 50% and 57% (Jordaan 2005, Sjolie & Ljunggren 2004). Point prevalence of adolescent LBP in this study is similar to that reported in other studies which have documented point prevalence between 13% and 23.90% (Masiero et al 2008, Watson et al 2002, Lebouef-Yde & Kyvik 1993). The results of this study indicate that adolescent LBP could be a common complaint of South African adolescents. The concern is that an association has been reported between adolescent and adult LBP (Hestbaek et al 2006, Harreby et al 1995) and intervention programmes may thus need to be instituted to prevent LBP to become recurrent or chronic in nature.

The mean value for trunk flexor muscle endurance in participants with a history of LBP was higher than in individuals with no history of LBP (p=0.04). Although the results of this study are contrary to those reported by Salminen et al (1992), they are similar to those reported by Bernard et al (2008) and Perry et al (2009). Perry et al (2009) suggest that the LBP is a result of the flexor dominance and that the dominant flexion or compressive loading forces of the trunk flexor muscles can exert increased pressure on the lumbar spine. It cannot be determined from this study if the changes seen in trunk muscle flexor endurance are the cause or effect of LBP. It could be that the flexor muscle endurance is increased due to compensatory mechanisms of the global muscles in an effort to improve spinal stability or it could be the cause of LBP as suggested by Perry et al (2009). Conversely, trunk extensor muscle...
endurance was decreased in those adolescents with a history of LBP, although the result was not statistically significant. These results are similar to other studies in which decreased trunk extensor muscle endurance was recorded in adolescents with LBP (Bernard et al 2008, Andersen et al 2006, Sjolie and Ljunggren 2001, Salminen et al 1995). Another study shows both deficits and excesses of back muscle performance related to LBP (Perry et al 2009). The results of this study indicate that in adolescents with LBP the rehabilitation programme should perhaps address trunk muscle endurance.

The results of the current study suggest that poor lumbo-pelvic stability is not associated with adolescent LBP. The majority of adolescents within the study, whether they presented with LBP or not, demonstrated poor lumbo-pelvic stability when assessed with the ASLR test via pressure biofeedback as well as by perceived difficulty during the ASLR test. These results are similar to those reported by Jordaan (2005), but in contrast with other studies that report an association between adult LBP and poor lumbo-pelvic stability (Comerford and Mottram 2001).

The ASLR test, as described by O’Sullivan et al (2002), is a measure of lumbo-pelvic stability and measures the control of the deep stabilising muscles, by monitoring the rotation of the pelvis. A poor result indicates decreased stabilisation due to weakness of the local stability muscles. This may result in increased or uncontrolled segmental motion and poor dynamic stability. In the current study the pressure biofeedback apparatus was put under the PSIS’s, monitoring the rotation of the pelvis (Jull 1993), and thus the global muscle balance (Jull et al 1993). The deep muscle function was not monitored. Poor lumbo-pelvic stability does not appear to be a dysfunction specific to adolescents with LBP. While this method for measuring lumbo-pelvic stability is used clinically, it has yet to undergo rigorous validity testing. Further studies are required to provide construct validity. In this study, the findings from the pressure biofeedback as described by Jull et al (1993) were similar to that of the perceived difficulty as described by Mens et al (2001), providing an element of concurrent validity.

No previous studies, in adults or adolescents, have been found to compare the results of this study in which lumbo-pelvic stability and trunk muscle endurance have been investigated. In both these the integrity of the global muscles stabilising system was assessed. The results of this study indicate that those adolescents with a good control during the ASLR had better muscle endurance for all the trunk muscles and those adolescents with poor control during the ASLR had decreased muscle endurance with lower mean scores. This was only statistically significant for extensor muscle endurance.

CONCLUSION

Lumbo-pelvic stability, as measured with rotation of the pelvis in the ASLR test and perceived difficulty of the ASLR test, showed no association with adolescent LBP. Trunk muscle endurance showed a stronger association. Adolescents with LBP presented with increased trunk flexor muscle endurance and decreased trunk extensor muscle endurance. Those adolescents with better lumbo-pelvic global stability had better trunk muscle endurance results. This was only statistically significant for extensor trunk muscle endurance (p=0.031).
REFERENCES


SA JOURNAL OF PHYSIOTHERAPY 2013 VOL 69 NO 1 21
POSITION PAPER: THE ESSENTIAL ROLE OF PHYSIOTHERAPISTS IN PROVIDING REHABILITATION SERVICES TO PEOPLE LIVING WITH HIV IN SOUTH AFRICA

ABSTRACT: Despite increased access to highly active anti-retroviral therapy (HAART) in South Africa, there remains a high risk of people living with HIV (PLHIV) developing a wide range of disabilities. Physiotherapists are trained to rehabilitate individuals with the disabilities related to HIV. Not only can South African physiotherapists play a significant role in improving the lives of PLHIV, but by responding proactively to the HIV epidemic they can reinforce the relevance and value of the profession in this country at a time when many newly qualified therapists are unable to secure employment. This paper offers recommendations that may help to fuel this response. These ideas include enhancing HIV curricula at a tertiary level, designing and attending continuing education courses on HIV and researching Southern African rehabilitation interventions for HIV at all levels of practice. Furthermore, it is vital that physiotherapists are at the forefront of directing multi-disciplinary responses to the rehabilitation of PLHIV in order to influence stakeholders who are responsible for health policy formulation. It is hoped that this paper stimulates discussion and further ideas amongst physiotherapists and other health professionals in order to improve the quality and access to care available to PLHIV in South Africa.

KEY WORDS: HIV, PHYSIOTHERAPY, REHABILITATION, RESEARCH, RESPONSE.

Sub-Saharan Africa bears an inordinate share of the worldwide HIV burden, with an estimated 11.3 million people living with HIV (PLHIV) in 2009 (UNAIDS 2010). AIDS-related deaths have fallen in this region from 1.4 million in 2001 to 1.3 million in 2009 and this trend looks set to continue with the more widespread availability and uptake of highly active anti-retroviral therapy (HAART) (UNAIDS 2010). The statistics above tell a story. Ultimately there will be more and more people living with HIV and consequently far more people living with disabilities as a result of their HIV infection (Myezwa et al, 2011, Nixon 2011). Physiotherapy as a profession can play a key role in assisting PLHIV manage these disabilities and improve their holistic participation in the occupational, social and recreational aspects of their lives.

The changing nature of the local HIV epidemic coincides with an important time in the evolution of the profession of physiotherapy in South Africa. The occupational specific dispensation (OSD) negotiations for physiotherapy were completed in 2010, and resulted in salary increases for public sector physiotherapists; primarily at Grade 1 level (NPSWU, 2010). Despite this development, many qualified physiotherapists perceive that the profession remains undervalued, both in a remunerative sense and in terms of an understanding of what physiotherapists actually do as first line practitioners (SASP, 2009). This is highlighted by the shortage of physiotherapy posts at a number of state institutions and the difficulty facing some newly-qualified physiotherapists in securing employment following their year of community service. Despite these job shortages, the number of physiotherapists being trained at South African tertiary institutions continues to increase, in line with specific government directives to train...
more health professionals (DOH, 2011). For example, the annual first year intake at the physiotherapy department at the University of KwaZulu-Natal (UKZN) has increased from approximately 30 students to more than 50 students in the past decade.

The demand for any medical service, such as physiotherapy, is determined by a country’s burden of disease. It is to be noted that the disease burden is described by Disability Adjusted Life Years (DALYs), a composite measure which incorporates both the number of years lost to mortality and the number of years lived with disability (Murray, 1996). According to the proposed National Health Insurance (NHI), South Africa faces a quadruple burden of disease, with the mortality and morbidity related to HIV/AIDS second only to non-communicable diseases, resulting in this country having a burden of disease almost double that of other developing countries (Econex, 2009). A correct analysis of this burden of disease is crucial in the allocation of resources and the forecasting of demand for specific medical services. In April 2012, the Department of Health began piloting the NHI in 10 selected districts (DOH, 2012).

In order to enhance the relevance and value of the profession, South African physiotherapists working in all sectors need to respond proactively and energetically to the HIV epidemic (Myezwa and Stewart 2012, Nixon 2011). This is particularly important in ensuring that physiotherapy is not forgotten when any revised resource allocation occurs under the NHI. This task should not be borne solely by state physiotherapists, but should be supported by physiotherapists working in the private sector as well as in tertiary education, all of whom stand to benefit from an increased understanding of the abilities and skills of physiotherapists. Furthermore, it is important that physiotherapists work closely with other allied health professionals, such as occupational therapists and speech therapists, in achieving these goals. Interdisciplinary teams of health-care professionals involved in rehabilitation can offer a range of rehabilitative services through a comprehensive, coordinated and collaborated programme (Jelsma et al, 2002).

As experts in exercise, physiotherapists are ideally placed to offer services to PLHIV, via the development of well-planned and progressive rehabilitation and exercise programmes. While physiotherapists may be well aware of this, it was encouraging to note that a recent newspaper article in a national publication (Malan, 2012) outlined the crucial role physiotherapists and other health care professionals play in the function and well-being of PLHIV, while at the same time highlighting the fact that this role is often not acknowledged. The effects of exercise on the physical and mental well-being of PLHIV have been explored in a number of studies, many of which have been conducted in the high income countries. These studies are well summarised in two systematic reviews by O’Brien et al (2009 and 2010) on the effects of resistance exercise and aerobic exercise interventions on PLHIV. The conclusions were that there were positive effects of exercise including improvements in cardiopulmonary fitness, muscle strength and certain measures of psychological status as well as increases in body weight. Both forms of exercise were further found to be safe for PLHIV, incurring no additional health risks to participants. Overall, no significant changes in immunological status (as evidenced by CD4 count and viral load) were noted. Similarly, in a low income East African context, Mutimura (2008) found that exercise does not negatively affect CD4 count and improved several components of quality of life, body fat distribution and metabolic indices, which may in turn have positive effects on HAART adherence and other treatment initiatives. More research, however, is required regarding the physiological and psychological effects of exercise and therapy on PLHIV in a relatively under-funded Southern African public sector context.

South Africa has taken a leading role in producing research pertaining to the rehabilitation of PLHIV and disability. Myezwa et al (2009) conducted a study to assess eighty HIV in-patients at the Chris Hani Baragwanath Hospital in Gauteng province, South Africa. Using the ICF checklist (WHO, 2003) to assess the impairments, activity limitations and participation restrictions experienced by these patients, the researchers found that over 70% of the participants in this study reported impairments related to digestive, neuromuscular, respiratory and sensory function as well as emotional and mental problems and decreased energy levels and sleep quality. These impairments led to activity limitations such as reduced mobility and problems with self-care as well as participation restrictions, including the ability to engage fully in community, social and civil life. Other physiotherapist-led studies found similar impairments to be present in contrasting settings (Jelsma et al, 2006, Van As et al, 2008, Myezwa 2011). Ferguson and Jelsma (2009) and Potterton et al (2010) highlighted the motor and cognitive developmental challenges facing HIV infected children and the positive influence of a home stimulation programme.

Other disciplines have also revealed data showing that impairments such as HIV dementia (Joska 2010, Lawler 2010, Lawler 2011) neuropathy (Maritz 2010), depression and anxiety (Brandt 2009, Freeman 2007), changes in body function such as pain (Friend-du Preez et al, 2010, Nair and Muthukrishna 2009), fatigue (Nair and Muthukrishna 2009, Gerntholz et al, 2006), emotional challenges, sensory problems (Maritz 2010) as well as activity problems particular in the area of mobility (Nair and Muthukrishna 2009, Patel 2009) and self-care (Oketchi 2011) are prevalent in a significant amount of people living with HIV (many of whom have access to treatment). Not only do these studies reveal the myriad of problems that PLHIV face, but they further underscore the urgent need for increased therapy resources in the area of HIV management.

Physiotherapy as a profession can play a major role in improving both the health and quality of lives of PLHIV. Here, we offer recommendations on the way forward and hope to encourage discussion about possible solutions to enhance future rehabilitation interventions for PLHIV.
PHYSIOTHERAPY TRAINING PROGRAMMES TO ENHANCE HIV CURRICULA:
An audit of physiotherapy curricula in South African universities (Myezwa, 2008) revealed many gaps in the teaching of HIV-related material to physiotherapy students. It is therefore necessary that these tertiary institutions examine their curricula to ensure that relevant and up-to-date teaching on HIV is included. Ideally, academics from the various training institutions could collaborate in the design and development of a comprehensive curriculum (Myezwa and Stewart, 2012). In an effort towards realising this goal, a survey of 58 physiotherapy academic staff at eight South African universities was recently conducted (Myezwa et al, 2012). This survey found a high level of consensus (above 80 percent) amongst these academics as to which HIV-related topics should be taught in their individual programmes. These topics included HIV pathophysiology, anti-retroviral therapy, HIV-related disorders and teaching on HIV and disability. This theoretical grounding should be reinforced and developed by ensuring that students have frequent opportunities to treat and rehabilitate PLHIV during their clinical placements. The challenge now for individual institutions is to ensure that these topics are mainstreamed into their curricula.

CONTINUING EDUCATION ON HIV FOR ALL PRACTICING PHYSIOTHERAPISTS:
Secondly, private and public sector physiotherapists should be encouraged to attend seminars or workshops on topics pertinent to the physiotherapy management of HIV. This would enable physiotherapists interested in this clinical area to update their knowledge in this ever-evolving field. It might even be suggested that, just as resuscitation and ethics CPD points are required for reregistration with the HPSCA, a course in HIV should be included as an additional requirement. In order to both highlight the value that physiotherapists as a profession can offer as well as encourage multi-disciplinary collaboration, it would be opportune to invite other health care professionals to these training events. An example of such a workshop is currently being piloted by a collaboration between the Health Economics and HIV/AIDS Research Division (HEARD) and the UKZN. (HEARD, 2012). The material for the workshop will be available in 2013.

MORE RESEARCH IS REQUIRED ON REHABILITATION IN THE CONTEXT OF HIV IN SOUTH AFRICA:
Thirdly, there is a dearth of evidence for interventions in HIV within a Southern African context and it would be prudent for the profession to accelerate and facilitate the production of evidence to inform physiotherapy practice and education, and to contribute to HIV policy. A pilot study conducted recently by HEARD (Hanass-Hancock et al, 2012) indicates that HIV-related disability might not only influence adherence but might also be closely linked to issues around mental health and coping. Research should also explore the role of rehabilitation, and physiotherapy specifically, in improving adherence to ART and other aspects so crucial to the HIV epidemic.

PHYSIOTHERAPISTS NEED TO BE PROACTIVE IN CLINICAL CARE:
Fourthly, it is important that physiotherapists take an active leadership role in initiating and directing multi-disciplinary responses to the rehabilitation of PLHIV, rather than wait patiently for referrals which may never appear (Myezwa et al, 2009). This proactive approach needs to be taken with an understanding of the South African Department of Health (DOH) vision of public health care delivery in South Africa moving towards community-based care (CBR) and home-based care (HBC) models. In addition the first line practitioner status that physiotherapists enjoy should encourage an approach to screen assess and treat relevant problems among HIV patients. According to the South African Department of Health, (DOH 2001) these models promote the treatment of people in or near their homes and encourage participation by people, responds to the needs of people, encourages traditional community life and creates responsibilities.

PHYSIOTHERAPISTS SHOULD BE AT THE HIV DECISION-MAKING TABLE:
Finally, in the longer term, it is crucial that in the interests of the profession, all physiotherapists are involved in demonstrating the value that they can add in both the public and private sectors to stakeholders who are responsible for policy formulation and decision-making. This is obviously not limited to PLHIV but in an ever-competitive resource-poor South African context, physiotherapy should ensure that they are in the vanguard of the response to HIV-related disability and impairments. In order for our profession to grow and thrive it is not good enough for physiotherapists to merely know what they themselves can do, it is vital that they let others at all levels of health delivery know of the positive impact they can have on PLHIV.

To conclude, physiotherapists should be key role players in providing rehabilitation to PLHIV in the era of HAART. The need for rehabilitation services will increase as PLHIV live longer lives. The onus lies on all physiotherapists to seize this opportunity to promote the critical role that the profession should be playing in response to the HIV epidemic in this country. With improved training and research in this area, proactive clinical intervention and the building of collaborative relationships with other health professionals, physiotherapists can add significant value to the lives of PLHIV, while at the same time strengthening the standing of the profession in South Africa.
REFERENCES


Freeman M 2007 Factors associated with prevalence of mental disorder in people living with HIV/AIDS in South Africa. AIDS Care, 19(10):1201-9


Lawler K 2011 Neurobehavioral effects in HIV-positive individuals receiving highly active anti-retroviral therapy (HAART) in Gabarone, Botswana. PLoS One, 6(2),17233

Malan M 2012 Healing touch helps HIV patients. The Mail & Guardian. 17-23 Feb


National Public Service Workers Union (NPSWU) 2009 The International Classification of Function Disability and Health (ICF) in adults visiting the HIV outpatient clinic at a regional hospital in Johannesburg, South Africa. AIDS Care, 21(1): 50-58


STATUS OF UNDERGRADUATE COMMUNITY-BASED AND PUBLIC HEALTH PHYSIOTHERAPY EDUCATION IN SOUTH AFRICA

ABSTRACT: Curricula of health education institutions need to be periodically revised to be aligned with its context. This study explored the status of physiotherapy curricula in South Africa as point of departure for benchmarking by individual institutions.

A document analysis was done of the university physiotherapy departments (N=8) in South Africa. Institutional ethical clearance and permission from the heads of departments were obtained. Content analysis was used to analyse the South African Qualifications Authority exit-level outcomes and the university study guides for community placements.

Most universities employed a form of service-learning, with interventions in a range of settings. Five themes emerged: practice of evidence-based physiotherapy, rendering physiotherapy services, acting professionally, communication, and collaboration. The country’s priority conditions were addressed. Teaching-learning strategies included group activities (class or education sessions), community projects, home visits and portfolios of evidence. Personal and small-group reflections were prominent.

The undergraduate community physiotherapy curricula in South Africa address the health profile of the population and priorities in the health system to different degrees. The variation between universities should be interpreted with caution as the study guides only gave a limited snapshot into each institution’s curriculum. However, findings suggest that each physiotherapy university department may have gaps in preparing physiotherapy undergraduate students for the needs of the South African population and expectations of the Government. Possible ways to share teaching-learning resources are recommended.

KEY WORDS: EDUCATION, COMMUNITY, PUBLIC HEALTH, SERVICE LEARNING, DOCUMENT ANALYSIS.

INTRODUCTION
All South African (SA) medical schools have undertaken major curriculum reform over the past 20 years (Burch 2007). However, published literature describing transformational curriculum changes and their educational impact is limited (Burch 2007). Information on publications regarding physiotherapy curricula is also scarce. Internationally two efforts towards physiotherapy curriculum frameworks were found; one developed in Europe (Broberg et al 2003) and the other in Canada (Darrah et al 2006). Broberg et al (2003) organised their framework along three aspects: content, student learning and the socio-cultural context. Darrah et al. (2006) developed the CORE (client-orientated research and evaluation) Model of Best Practice and Clinical Decision-making around four principles which are the integration of theory, clinical practice and research; client-orientation and concepts from the International Classification of Functioning, Disability and Health (ICF). Both of these models, although they incorporate contextual factors, have a clinical perspective that does not embrace public health or community development – two core issues relevant to the local context.

Similarly, Stainsby and Bannigan (2011) identified skills for physiotherapy students working in community settings in the United Kingdom. The four skills sets - communication, function, assessment and treatment, coping in an uncontrolled environment and prioritisation - was limited to physiotherapy in home settings. Ramklass (2009a) asserts that in SA, physiotherapy education has “remained relatively static” since 1994. Education at one university investigated still did physiotherapy clinical training mainly in urban and institutionalised settings (Ramklass 2009b). The author also identified gaps in knowledge and skills around practice in resource-poor settings, language and cultural barriers, social responsibility, empathy, interpersonal relationships and administra-

Correspondence Author:
Karien Mostert-Wentzel
PO Box 223, Newlands,
Pretoria, 0049
South Africa
Email: karien.mostert@up.ac.za

Mostert-Wentzel K. MBA¹
Frantz J. (PhD)²
Van Rooijen A.J. (PhD)²

¹ Department of Physiotherapy, Faculty of Health Sciences, University of Pretoria, South Africa.
² Department of Physiotherapy, University of the Western Cape, South Africa
tion. Innovation at two other universities, however, did describe clinical learning in community settings (Futter 2003). Although in the one study students worked mainly at clinics during their service-learning placement and did domiciliary visits with community workers (Krause 2007). In comparison, the community-based placements addressed wider public health elements, such as the cultural determinants of health (Futter 2003).

The first step when reviewing curricula is to revisit the “problem” that the curriculum needs to address in terms of the health profile and policies of the country (Kern et al. 2009). Owing to the dynamic nature of the health sector, curricula for the education of healthcare practitioners, including physiotherapists, need to be periodically reviewed for relevance and quality (Davenport et al. 2009).

South African health policy environment
The health sector is a key player in the South African Government’s strategy to fight poverty, discrimination and to build the nation (Democracy and Governance Human Science Research Council (HSRC) 2005). The vision for the health sector is “A Long and Healthy Life for All South Africans” (Department of Health 2009). The National Department of Health specifically agreed to improve life expectancy of South Africans, to curb child and maternal mortality, to decrease the burden of HIV and tuberculosis and to increase the effectiveness of the healthcare system, as part of the Presidency’s Medium Term Strategic Framework (Department of Health 2012a).

These policies build on the three streams of the re-engineering of the primary health care system: (1) district clinical specialist teams; (2) strengthening of school health services; and (3) ward based primary healthcare teams (Department of Health 2012b; Department of Health Ministerial Task Team 2012). Although physiotherapists are not an integral part of this team, they play a role in building capacity in these teams, which include community health workers. (World Health Organization 2006). The gap in the provision of community health workers, a core member of the primary health care teams, is substantial (Department of Health 2011a). The implication of this under-provision is that other team members may have to step into areas of general competence needed by the team, such as epidemiological surveys, health promotion and prevention, palliative care, social mobilisation, linking resources with community needs, improvement of health outcomes and the celebration of team health days (Lehmann and Sanders 2007). In South Africa practitioners of traditional African medicine are also role players in providing health care (Health 2008a). Therefore, “a key professional competency is the ability to work with teams consisting largely of basic and ancillary health workers and supportive staff” (Frenk et al. 2010: 1 984). Another responsibility for health practitioners is therefore the transfer of skills to these cadres of workers (World Health Organization 2006; Department of Health 2011c).

Even in its guidelines for health establishments, the Department of Health emphasises public health (Department of Health 2011c). In this document “public health” is defined as follows: “The Public Health domain” covers how health facilities should work with [non-governmental organisations] NGOs and other health care providers along with local communities and relevant sectors, to promote health, prevent illness and reduce further complications; and ensure that integrated and quality care is provided for their whole community, including during disasters” (Department of Health 2011b: 11).

Within the decentralised district health system, partnerships with community structures, such community-based organisations (CBOs), for mobilising community action and advocacy around health issues are, indeed, a recurrent theme (Department of Health 2004; 2005a; 2005b; 2007a). In addition, the Department of Health developed guidelines for the management of health services, including the use of technology in the delivery of healthcare services and mentorship (Department of Health 2011c; 2012c).

Health profile of the South African population
The health profile of the country is another driver of the curriculum (Kern et al. 2009). The quadruple burden of disease in SA (Groenewald et al. 2012) comprises (1) communicable, maternal and nutritional diseases; (2) HIV and tuberculosis (TB); (3) non-communicable diseases; and (4) injuries. The top ten risk factors of mortality directly relevant to physiotherapy are tobacco addition, lack of physical activity and hypertension and diabetes (as risk factors) (Groenewald et al. 2012). Other target groups that receive emphasis in the South African health policy environment are children, youth, women and people living with disability (Department of Health 2011a; 2012a; Health 2012b).

Aim of the study
The purpose of this article is to give an overview of education in community physiotherapy in South Africa – from study guides for community placements – as a guide for benchmarking by individual institutions. Another aim is to discuss how current health priorities discussed above, are reflected in these curricula.

METHODS
Research setting and population
SA has a three-tiered health system with healthcare services being rendered at primary, secondary and tertiary levels (Coovadia et al 2009), with some clinics and hospitals having additional outreach programmes. The training of health science students therefore needs to occur in different settings, including community-based organisations. In South Africa, eight city-based universities offer physiotherapy training as a four-year degree at Level 8 of the South African Qualifications Authority (SAQA): the University of the Cape Town, Free State, Kwa-Zulu Natal, Limpopo (Medunsa campus), Pretoria, Stellenbosch, Western Cape and Witwatersrand. Urban community-based training is accessible, but rural and remote placements have significant logistical and especially cost implications. Programmes need to comply with
the minimum standards set by both the relevant Quality Control Council’s Standard Generating Bodies (SGBs) and the Health Professions Council of South Africa (HPCSA). All university departments that offered physiotherapy programmes were invited to participate in the study.

**Research design**
The research design for this study was a document analysis - a type of audit where documents are scoured to gain a clearer picture of a situation being investigated. The documents that were analysed were the SAQA Physiotherapy Qualifications document (2005) with institution’s exit level outcomes and the study guides of community and/or physiotherapy placements (2008) at the identified training institutions.

**Data collection strategies**
The registered SAQA qualifications were downloaded from the National Qualifications Framework (NQF) website. To obtain the relevant study guides from the training institutions, an e-mail explaining the aim and procedure of this study was sent to the heads of the departments. Three types of documents were requested – the curriculum for community-based education; learning outcomes of syllabi preparing students for work in community and public health settings; and the learning outcomes for the placement(s) themselves. Follow-up e-mails were sent and telephone calls were made to the relevant individuals until at least one document had been received from each university.

**Ethical considerations**
The Ethics Committee of the Faculty of Health Sciences, University of Pretoria, approved the study (Ref 93/2008). Providing the requested documents implied informed consent to participate.

**DATA ANALYSIS PROCEDURES**
Qualitative content analysis was applied to manifest content of the texts (Graneheim and Lundman 2004). The unit of analysis was all the documents in each category (SAQA and study guides) from one university. Words, phrases, sentences or paragraphs “containing aspects related to each other through their content and context” (Graneheim and Lundman 2004: 106) were handled as meaning units for coding purposes. A first round of paper-based open coding was done. The list of codes were subsequently abstracted into categories and linked into themes. A second round of coding was done using AtlasTi 6.2 software. Frequency counts were done in Microsoft Excel (Version 2003).

**RESULTS**

**Description of the sample**
The officially registered SAQA physiotherapy qualifications at the time of the study were used. Of these registered, seven were dated 2009 and one was dated 2006. Six universities submitted study guides, one submitted the syllabus of a module and one sent topics of a module.

**Document analysis of the SAQA programme registration documents**

**National Qualification Framework (NRF) sub fields**
The sub fields selected by the physiotherapy university departments for registration of their qualifications (n=8) are indicated in Table 1. The highest number of universities (n=3) were registered in the field traditionally associated with the rehabilitation component of comprehensive healthcare, and two in curative health. Two selected a field in the preventative extreme of the comprehensive health care continuum, with one selecting a pure science sub field.

**SAQA exit level outcomes**
The main themes or competencies, which emerged from the analysis of the exit-level outcomes of the qualifications as registered with SAQA, are listed in the first columns of Table 2 and Table 3. The number of analysed meaning units linked into themes.
Table 3. Categories and themes (competencies) for the SAQA exit-levels outcomes for the registered undergraduate physiotherapy qualifications (N=8)

<table>
<thead>
<tr>
<th>Theme competency</th>
<th>Categories</th>
</tr>
</thead>
</table>
| Act professionally | - Attributes: Caring, ethical, autonomous, socially responsive, flexible, innovative, life-long learner and leader; critical and creative thinker and problem-solver  
- Scope and realities of the profession and relevant laws and policies adhered to  
- Self- and peer-review |
| Communicate and Collaborate | - Multidisciplinary team work  
- Health education provision  
- Written and verbal communication  
- Client-centred approach |
| Render a physiotherapy service | - Community needs addressed  
- Comprehensive services provided: preventive, promotive, curative and rehabilitative  
- Families, groups, societies and the broader population served  
- Staff developed  
- Systems thinking |
| Practice evidence based | - Scientific evidence appraised, used and developed |

Table 4. Summary of the categories and themes in the outcomes for study guides (N=8)

<table>
<thead>
<tr>
<th>Theme</th>
<th>Category (Topics)</th>
<th>University</th>
<th>No. of universities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundational Principles</td>
<td>Determinants of health</td>
<td>X X X X X X</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Disability theory</td>
<td>X X X X X X</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Social responsibility</td>
<td>X X X</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>The rehabilitation process</td>
<td>X X</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Asset-based approach</td>
<td>X X</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Bio-psychosocial model</td>
<td>X X</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Community development</td>
<td>X X</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Introduction to population health</td>
<td>X</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Participatory models</td>
<td>X</td>
<td>1</td>
</tr>
<tr>
<td>Health system and policies</td>
<td>Health-care system/ District health</td>
<td>X X X X X</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Levels of care</td>
<td>X X X X</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Laws, acts, policies</td>
<td>X X X</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Welfare policy (e.g. grants)</td>
<td>X X</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Inter-sectoral collaboration</td>
<td>X</td>
<td>1</td>
</tr>
<tr>
<td>Health education and promotion</td>
<td>Adult education skills/ Skills transfer</td>
<td>X X X X</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Health education</td>
<td>X X X X</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Screening</td>
<td>X X X</td>
<td>3</td>
</tr>
<tr>
<td>Management</td>
<td>Evaluation</td>
<td>X X X X</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Assess the environment</td>
<td>X X</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Planning and organising programmes and projects</td>
<td>X X</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Outcome measures in public health</td>
<td>X X</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Information technology</td>
<td>X</td>
<td>1</td>
</tr>
</tbody>
</table>

Not included: Reflection, Communication skills, Group dynamics, Time management, Cultural and gender sensitivity, Ethical and Professional conduct and interdisciplinary collaboration.
that contributed to each theme is given in columns according to university, with the total number of meaning units supporting each theme or competency in the last column of Table 2. The categories that made up each theme are listed in the second column of Table 2.

**Document analysis of study guides of community placements**

A summary of the findings from the study guides are presented in Table 4-6. Table 4 highlights the categories and themes according to university with the summed totals. In table 5, the teaching and learning settings and type of patients (by age group and condition) treated by students that were explicitly mentioned in the study guides are summarised. Table 6 lists the teaching and learning strategies employed at each university.
DISCUSSION
Findings from this study give an overview of education in community physiotherapy in South Africa in terms of topics dealt with in the undergraduate community physiotherapy curricula and teaching-learning strategies followed to develop five exit level competencies: to deliver a physiotherapy service, to act professionally, to collaborate, communicate and to practice according to scientific evidence. Four themes emerged from study guides namely foundational topics, such as the determinants of health; the health system – specifically district health – and policies; health education and promotion, and the management of physiotherapy services.

National Qualifications Framework (NQF) sub fields
Programmes were registered in five different fields of the NQF. The NQF sub field that each institution selected for registration of the respective qualifications may signify the underlying philosophy of each course. Only two institutions selected a field in the preventative extreme of the comprehensive health care continuum. This continuum stretches from health protection and health promotion at one end, to cure, as well as rehabilitation and palliative care, at the other. As physiotherapy’s scope covers the full spectrum of comprehensive health care and in light of the quadruple burden of disease in SA, the finding shows the difference in focus of universities while complying with the core prescriptions of the HPCSA (2003).

Exit-level and community block outcomes
The topics under the theme “foundational principles” are related to the philosophy and perspectives that guide physiotherapy interventions. For example, not only are there interventions that address disablement (impairments, activity and participation limitations) important (e.g. “the rehabilitation process.”), but also attending to the factors that cause dysfunction in the first place (“determinants of health,” “biopsychosocial model”). Having a preventative stance implies moving beyond the individual patient to integration back into the community which they form a part of (“Public Health”). The themes in this topic imply attention to physiotherapist and community strengths and facilitators (“asset-based approach”). The topics also speak to the fact that physiotherapy is not only about disease, but also about uplifting communities (“community development”), working with clients and not for them (“participatory models”) and tackling inequities in the service (“social responsibility”) and human right issues (“disability theory”).

Secondly, the theme “health system and policies” dealt with understanding the healthcare system (“levels of care,” “inter-sectoral collaboration”) and the policies and acts guiding practice (“laws, policies,” and “welfare policy”). Skills to educate patients about their health (“adult education skills/skills transfer,” “health education” and identifying risk factors (“screening”)) were dealt with under the theme “health education and promotion”. Finally, the theme “management” addressed the issue of strategically providing and organising physiotherapy services (“assess the environment,” “planning and organising programmes and projects”) and measuring their effect at population level (“outcome measures in public health”). The “management” theme also dealt with the use of information technology when providing services.

In the SAQA qualification documents of the universities the cross-field outcomes therefore received much attention. These are general competencies to prepare students for the challenges of the work environment, such as being able to work in teams and to be able to communicate – important themes in current curriculum frameworks (Shilton et al. 2008; Therapy Project 2008; Barry et al. 2009; Lin et al. 2009; Verma et al. 2009; National Physiotherapy Advice Committee 2010; Grace and Trede 2011;)

Table 7. Summary of roles and attributes for medical doctors/physiotherapists internationally

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>- Care provider</td>
<td>- Care provider</td>
<td>- Practitioner</td>
<td>- Practitioner</td>
<td>- Putting patient/</td>
<td>- Public health strategies</td>
<td>- Clinical practitioner</td>
</tr>
<tr>
<td>- Communicator</td>
<td>- Communicator</td>
<td>- Professional</td>
<td>- Professional (Information Skills)</td>
<td>population needs at the centre</td>
<td>- Supervising and delegating to others</td>
<td>- Understand foundational principles</td>
</tr>
<tr>
<td>- Community</td>
<td>- Collaborator</td>
<td>- Scholar and</td>
<td>- Professional (Socialisation, values)</td>
<td>needs at the centre</td>
<td>- Leading</td>
<td>- Render a physiotherapy service</td>
</tr>
<tr>
<td>leader leader</td>
<td>- Health</td>
<td>scientist</td>
<td>- Change agent (leadership attributes)</td>
<td>Supporting</td>
<td>- Managing</td>
<td>- Work within the health system and policies</td>
</tr>
<tr>
<td>Decision-maker</td>
<td>- Advocate</td>
<td></td>
<td></td>
<td>Educating</td>
<td>- Teaching</td>
<td>- Communicate and collaborate</td>
</tr>
<tr>
<td>Manager</td>
<td>- Professional</td>
<td></td>
<td></td>
<td>Leading</td>
<td>- Developing and implementing health policy,</td>
<td>- Manage</td>
</tr>
<tr>
<td></td>
<td>- Professional</td>
<td></td>
<td></td>
<td>Managing</td>
<td>- Research</td>
<td>- Act professionally</td>
</tr>
<tr>
<td></td>
<td>- Scholar</td>
<td></td>
<td></td>
<td>- Research</td>
<td>- Advocating for patients/clients and for health</td>
<td>- Practice evidence-based physiotherapy –</td>
</tr>
<tr>
<td></td>
<td>- Manager</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- Manage</td>
</tr>
</tbody>
</table>

* Five-star doctor; * Tomorrow’s doctor  * Chartered Society for Physiotherapy: Outcomes and objectives of education;  * Generic behaviours;
* Clinical functions were not specifically coded
Alignment with the policy environment and health profile of the South African population

Almost all of the universities indicated that they address the social determinants of health, the district health system and health education in their curricula. These themes are aligned with the country’s vision to alleviate poverty and improve the life-expectancy of its people (Department of Health 2002; 2004; The Presidency RSA 2008; Department of Health 2009; The Presidency RSA 2010; Department of Health 2012c). A focus on health education and health promotion is the case in physiotherapy education both developed and developing countries. For example, in the UK health promotion and the theme of ‘staying healthy’ are embedded in the final year of the curriculum (Chartered Society of Physiotherapy c.2012). Within this theme, students learn how to safely prescribe, implement and monitor physical activity programmes in order to address obesity, to help prevent ill health and falls in the elderly, and to improve the health of people with learning disabilities and mental health issues.

Equally well-presented in South African outcomes is the evaluation of programmes which links with improved effectiveness of the health care system (Department of Health 2007). However, the level of attention that three streams of re-engineered primary health care receive is not clear (Department of Health 2008a; 2012d; Department of Health Ministerial Task Team 2012). One may be skeptical as no-one explicitly referred to work with mid-level workers, volunteers and practitioners of traditional African medicine. As only one university indicated schools as a setting of education, it appears as if school health has not been embraced. The rest of the themes, such as community development and social responsibility, were explicitly addressed by less than half of the universities. Another apparent neglected field is that of e-Health (Department of Health 2012e).

Physiotherapists are skilled to address the quadruple burden of disease in the RSA, however, priority conditions have been mentioned explicitly only in the minority of the education institutions. Paradoxically to the Government’s focus on child and youth health (The Presidency RSA 2009; The Presidency RSA and The United Nations Children’s Fund 2009; Department of Health 2012a; 2012d), the majority of study guides were explicit about services to older clients.

All the settings were outside of hospitals, like at clients’ homes, industry and community institutions (homes for the elderly). Less than half of the institutions specified home visits as a learning opportunity during the community/public health placement.

TEACHING-LEARNING STRATEGIES

Learning opportunities

These universities whose documents included learning strategies tend to use authentic problem-oriented stimuli to facilitate learning, ranging from paper-based to computer-based learning, from case-based, credit-bearing educational experiences to field work and service learning. Projects such as screening, field work and service learning, were common. These approaches are fundamental components for developing complex competencies, such as those indicated in the learning outcomes (Frantz and Rhoda 2007; Rodger et al. 2008; Adam et al. 2013).

Educators, indeed, endorse service learning for teaching complicated ideas such as the social determinants of health and to develop civic-minded graduates (Hatcher and Erasmus 2008; Hunt, Bonham and Jones 2011). The andragogy has been useful in teaching preventative medicine, promoting wellness and public health (Buckner et al. 2010; Chastonay et al. 2012). The reciprocal relationship between learning and service benefits the clients through increased access to health care (Jimenez et al. 2008).

Service-learning is defined as a “course-based, credit bearing educational experience in which students (a) participate in an organized service activity that meets identified community needs, and (b) reflect on the service activity in such a way as to gain further understanding of course content, a broader appreciation of the discipline,
and an enhanced sense of personal values and civic responsibility.” (Bringle and Hatcher 2009:38).

Examples of reflexive activities utilised in these South African universities are assignments like presentations, individual reflection on one’s own strengths and weaknesses, reflection in small groups and discussions about ethical issues (Eyler 2002). A portfolio (used by two institutions) is particularly useful, when combined with feedback, to demonstrate professional development (Mori, Batty and Brooks 2008; Buckley et al. 2009).

**LIMITATIONS OF THE RESEARCH**

A limitation of the study is that the study guides were used as a proxy for the full curriculum and were possibly not a true representation of the curriculum. The findings are not a comprehensive view of the universities’ education standards in terms of community and public health physiotherapy, as no university’s full curriculum was available for the document analysis. One reason may be that the timing of the request was not quite convenient, as people were scaling down at the end of the academic year. Also exit-level competencies are broadly stated and do not reflect detailed elements, such as the type of healthcare workers seen as part of the health care team.

Findings from the study-guide document analysis must therefore be interpreted with caution, as the documents that were analysed provided only a snapshot of the curriculum. Outcomes not listed by certain universities may well be covered in other blocks or modules. Clinical competencies were also excluded from the document analysis.

The document analysis included only documents from the final two years of the four-year degrees. However, a systematic review of clinical- and community-based education of medical students found that early exposure – within the first two years of study – had a range of benefits similar to Futter’s (2003) findings (Dorman et al. 2006). These benefits included improved motivation, professional development, confidence and communication when interacting with patients, as well as clinical skills. Students better understood the structure and function of the healthcare system and the role of preventative care.

**IMPLICATIONS FOR PRACTICE**

Despite progress towards community-based education, each of the universities has gaps in their community/public health curricula that need to be reviewed against the health policies and priorities in the country. The special interest group for public health of the South African Society of Physiotherapy (SASP) has been slow to come off the ground. Academics need to drive this initiative. Forming a virtual community of practice using a social media platform like Google groups may be a viable option. Resources, such as case studies, can be shared via this platform. Due to the interdisciplinary nature of public health, linking with multidisciplinary groups, such as the recently launched Rural Rehab South Africa (RuRaSa) (www.ruralrehab.co.za/) is recommended.

Recently qualified physiotherapists are a rich source of information about the realities of community service in South Africa that should be tapped. Incorporating these physiotherapists’ experiences of community physiotherapy would further contribute to authentic educational experiences. For example, they need to develop resiliency during their studies to deal with sub optimal practice environments in the public sector (Mostert-Wentzel, Frantz and van Rooijen 2013). A Delphi study with clinicians, managers and academics identified that the clinician role stays central even in community work. Professionalism, communication and collaboration, inquiry-led practice, clinical prevention and health promotion, population health and management and leadership are essential complementary elements in community physiotherapy (Mostert-Wentzel 2013).

**REFERENCES**


Department of Health Ministerial Task Team 2012. District clinical specialist teams in South Africa: Ministerial task team report to the honourable Minister of Health Dr Aaron Motsoaledi. Pretoria, RSA: Department of Health.


General Medical Council (United Kingdom) 2009. Tomorrow’s doctors. London: GMC.


Medical Rehabilitation Therapists (Registration) Board of Nigeria n.d. Harmonised curriculum of studies for the Bachelor of Physiotherapy (B.PT.) degree programme in Nigerian universities as a standard control measure. [Internet]. [cited 2011 Nov 11] Available from: http://www.wcpt.org/node/33154


APPROACHES TOWARD LEARNING IN PHYSIOTHERAPY

ABSTRACT: The aim of this study was to investigate the approaches toward learning of undergraduate Physiotherapy students in a PBL module to enhance facilitation of learning at the Stellenbosch University Division of Physiotherapy in South Africa. This quantitative, descriptive study utilized the Revised Two-factor Study Process Questionnaire (R-SPQ-2F) to evaluate the study cohorts’ approaches toward learning in the module. Results of the data instruments were analysed statistically and discussed in a descriptive manner.

There were a statistically significant greater number of students who adopted a deep approach toward learning at the commencement of the academic year. Students showed a trend toward an increase in their intrinsic interest in the learning material as the module progressed.

Students in the Applied Physiotherapy Module (ATP) started to shift their focus from a surface learning approach to a deep learning approach. Further research is needed to determine the long-term changes in approach toward learning and the possible determinants of these changes. This can be done in conjunction with the implementation of quality assurance mechanisms for learning material and earlier preparation of students for the change in the learning environment.

KEY WORDS: PROBLEM-BASED LEARNING, PHYSIOTHERAPY, LEARNING APPROACHES.

INTRODUCTION
The use of Problem Based Learning (PBL) is a viable instructional approach in the training of physiotherapists (Solomon, 2005). Research regarding approaches toward learning in PBL is however not as prevalent in physiotherapy as in medicine and nursing (Lewis et al 2009), (Saalu et al 2010). In the aforementioned fields, students often change their approach toward learning depending on the environment in which they find themselves (Groves, 2005; (Dolmans et al 2010). PBL as an instructional approach, lends itself to a self-directed, deep approach toward learning as it requires a high cognitive level of engagement by students (Loyens et al 2008). The question is however, does PBL as an instructional approach indeed affect the approach students have towards learning? If an institution can gain knowledge of the students’ approaches toward learning, it could be beneficial to educational institutions as a means to inform curriculum innovation or to evaluate a new curricular approach.

We conducted research into the influence a PBL module have on the approaches towards learning undergraduate physiotherapy students have. Our research question was therefore: Does a PBL module have an effect on undergraduate physiotherapy students approaches toward learning?

LITERATURE
Within the physiotherapy students’ academic environment at this institution, various learning theories are pertantly embedded within their curriculum in order to enhance learning. One such learning theory is that of Constructivism, which refers to how students learn through creating meaning from things and/or situations which they have been exposed to previously (Schunk 2004). Another theory which is applicable is that of Social Learning, in which learners gather information for learning based on social experiences (Torre et al 2006). PBL as an instructional method, attempt to include both of these learning theories. One of the main characteristics of PBL is that it emphasizes self-directed learning (SDL) which “demands discipline on the part of the students” (Moust et al 2007). The ATP module in the Physiotherapy Division allows students to utilise their knowledge base and foster effective participation in a collaborative manner. This will potentially enable them to develop the afore-mentioned self-directed learning skills (Loyens et al 2006). SDL as a quality of PBL can therefore be seen as an advantage that can be gained from the decision to make use of PBL in the ATP module.

PBL have a positive effect on students (clinical) skills, learning styles, retention of knowledge, enhanced integration and application of basic science concepts into clinical contexts, to name a few (Vernon and Blake, (1993) Groves (2005), (Moust et al 2005). Conversely, disadvantages of PBL include the fact that students may be unaccustomed to the high levels of responsibility, the effect on transfer between problem situations in a course and similar ones in real life, the assessment methods and the lack of expert facilitators Collier (2000), Gijbels, Dochy et al (2005).

Recognising that this pedagogical approach has its advantages and dis-
advantages, we also identified that it can stimulate students to process knowledge on a deep level (Loyens et al. 2008).

APPROACHES TOWARD LEARNING
A deep approach toward learning is characterized by studying for real meaning and understanding (Greasley et al. 2007). Students adopting this approach toward learning engage with the subject matter in a way which promotes real understanding (Ellis et al 2008). This is contrasted by a surface approach toward learning in which students study by means of reading to remember disjointed facts (Greasley et al., 2007). Students adopting this approach rely on external regulation and concentrate on the surface features of the work they are required to engage with within their learning environment (Papinczak 2009).

Conducting research on approaches students have toward learning, can guide the assessment and teaching styles in a direction to encourage students to adopt more effective approaches (Greasley et al. 2007).

AIM OF THE STUDY
This study aimed to identify the approach toward learning that this cohort of students were adopting, as it had not yet been determined in this environment.

METHODS
Context of the Study
The first and second years of the B.Sc. Physiotherapy degree at Stellenbosch University (SU) (South Africa) are comprised of a predominantly, though not exclusive, lecture-based approach to pedagogy. One of the modules in both the first and second year, namely, Physiotherapy Science (PTS), aims to equip students with the theoretical knowledge as well as technical skills which they are to use in their third and fourth year in the Clinical Physiotherapy module (CPT) and the Applied Physiotherapy (APT) module. In the CPT module, students are required to provide physiotherapeutic care to patients. The APT module was developed utilising a PBL approach in the third year and an Enquiry Based Learning (EBL) approach in the fourth year. This was done in order to bridge the gap between the basic theoretical modules in the first two years and the CPT module where these theories and practical techniques need to be applied. Students are thus exposed to entirely new forms of learning opportunities through this module. This could lead to frustration and dissatisfaction as students are required to make the transition from a traditional module based approach (where lecturing is the core mode of instruction), to a new approach half-way through their course (Choi et al. 2009). This blended curriculum, with regard to the various instructional approaches in each year of the course, is illustrated in Table 1, identifying how the various modules overlap and in turn lead into each other.

In keeping with the SU teaching and learning policy which requires a student centered approach to teaching (SU Policy on Teaching and Learning, 2007), the Division of Physiotherapy adopts a hybrid-PBL approach. The hybrid approach used at SU refers to the fact that unlike pure PBL curricula, students in the APT are given guidance through practical classes and the provision of background learning resources by the academic staff (Savery and Duffy, 2001); (Moust et al. 2007). This is preceded by a tutorial session in which students are presented with various cases/problems relative to clinical situations and building on subject matter learnt in the previous years. Students are required to submit and present their summarized information on the learning outcomes relevant to the case as their learning material, during a feedback session. Students also formulate multiple choice questions based on everything they have learnt at that stage. Should students engage on a superficial level with the content sourced by them during the PBL cases, it could negatively impact on their management of patients in the clinical setting. Thus, students enrolled in the APT module should benefit in their academic and clinical domains from adopting a deep approach toward learning.

STUDY METHODOLOGY
This descriptive, quantitative study was conducted shortly after the 3rd year students started with the APT module. The final data collection was conducted once the students had completed their first

Table 1: Schematic representation of the 4 Phases of the Physiotherapy Curriculum at Stellenbosch University

<table>
<thead>
<tr>
<th>Phase 1 Scientific Basis</th>
<th>Phase 2 Intermediary</th>
<th>Phase 3 Application</th>
<th>Phase 4 Professional Entry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interdisciplinary Phase</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Psychology</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anatomy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physiology</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pathology</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physiotherapy Science (PTS)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clinical Physiotherapy (CPT)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Research Methodology (RM)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Applied Physiotherapy (APT)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physiotherapy Practice (PTP)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
semester in the APT module. The aim was to investigate their approach toward learning at the inception of their involvement in a PBL learning environment and then again at a later date once they had become accustomed to the instructional approach.

Ethical clearance for the study was granted by the Ethics Committee at Stellenbosch University and the Division of Physiotherapy. The students were invited to participate in the study by means of purposive sampling. The study population was the 3rd year class of 2010 at the Division of Physiotherapy. Following the signing of informed consent, each student was given a participant number to ensure anonymity in the data collection and analysis process. The students were assured that they could withdraw their consent at any stage during the research project.

The Revised Study Process Questionnaire (R-SPQ-2F) (Biggs et al 2001) which is a validated tool for determining whether or not a student has a deep or surface approach toward learning was used in this study. The outcome of the 20-item R-SPQ-2F allows the researcher to determine each students approach to learning and the motive and strategy for learning, with regard to that particular pedagogical approach (Biggs et al 2001 and Groves (2005).

Though primarily a descriptive study, the research lent itself to a statistical approach in its analysis of the data. Data from the R-SPQ-2F was entered into Microsoft Excel by the researcher and handed over to a statistician. The R-SPQ-2F data was then analyzed by the statistician who used the term “strategy” to describe the approaches toward learning in his analysis of the data. Deep and surface approaches, along with their sub-categories, were compared over the two time points using repeated measures mixed model ANOVA. Post hoc tests were conducted using Fisher least significant difference (LSD). Significant effects were judged on a 5% (p<0.05) level.

RESULTS
The responses of the R-SPQ-2F were scored and identified those students who could be classified as having a deep or surface approach to learning. A response rate of 100% (n=38) was achieved for the R-SPQ-2F for both the beginning and end of the semester administration of the questionnaire. Table 2 identifies the percentage scores at the two time periods.

Table 2: Approaches toward learning at the beginning (February) and middle of the year (July)

<table>
<thead>
<tr>
<th>Approach to learning</th>
<th>R-SPQ-2F February</th>
<th>R-SPQ-2F July</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>Percent</td>
<td>Number</td>
</tr>
<tr>
<td>Surface Approach</td>
<td>12 31.58</td>
<td>10 26.32</td>
</tr>
<tr>
<td>Deep Approach</td>
<td>26 68.42</td>
<td>27 71.05</td>
</tr>
<tr>
<td>Equal scores</td>
<td>0 0</td>
<td>1 2.63</td>
</tr>
</tbody>
</table>

With a Cronbach alpha for the deep and surface approach were 0.85 and 0.79 respectively, the use of this instrument demonstrated acceptable reliability in this study.

At the first administration of the questionnaire there was a statistically significant difference in the number of students scoring higher in favour of the deep approach toward learning (p-value:<0.0078). The results of the questionnaire mid-way in the year continued to classify more students as having a deep approach toward learning than a surface approach (p-value: <0.01). However, the comparison of the participants’ scores at these two time intervals reveal no significant change in overall approach toward learning by the students from the start of their PBL environment experience to mid-way through that year. Figure 1 illustrates the comparative analysis of deep versus surface approach toward learning over the time period described above, with a no shift over time (p-value: 0.75).

The R-SPQ-2F identifies motives and strategies behind students approaches to learning. A distinction is made between having a deep or surface motive, as well as having either a deep or surface strategy to learning. The analyses of the results showed a trend toward a deep strategy being adopted by students participating in the study over the time period during which the study was conducted (Figure 2). This trend was, however, not significant, with a p-value of 0.05. This trend was not seen in the results pertaining to the Deep versus Surface motives, with no shift seen at either the first or second administration of the R-SPQ-2F for both deep and surface motives (Figure 3).
Deep motive, however, measured significantly higher than surface motive, p-value <0.1. These results are discussed further on in this article.

**DISCUSSION**

It was the intention of this study to investigate the approaches toward learning of 3rd year students at a relatively early stage in their transition to a learning environment which forced them to take a greater responsibility for their own learning. This investigation would then allow academic staff to use the information for facilitation of learning.

Apart from identifying the students’ approach to learning, the R-SPQ-2F identifies motives and strategies behind students approaches to learning. A student who has an intrinsic interest in the learning environment and materials is said to have a deep motive. Those who have a surface motive influencing their approach to learning are said to have a fear of failure (Kember et al 2004). These motives cannot, however, be viewed on a solely independent basis as the specific structure of the R-SPQ-2F requires a concurrent analyses of the strategies employed by students along with their motives. The strategies either related to a student’s tendency to have a narrow target approach to learning materials and rote learning, or those who tend to approach a learning environment with a need to maximize meaning in that environment (Kember et al 2004).

Groves (2005) found that the learning environment is likely determine a student’s approach toward learning more than the inherent traits of that student. The findings of this study indicate that students responded to the learning environment by starting to shift their focus from having a narrow target approach (focusing on lists of facts), in an attempt to maximize meaning of their experiences and learning in the module.

The inclination toward their motive being driven by fear of failure as opposed to an intrinsic interest in the learning material at the middle of the year, is cause for concern. The inherent approach to learning that students have at the beginning of the module, should however encourage staff to ensure that these students are maintaining their deep approach throughout the module. It is necessary to remember that students easily change from deep to surface or surface to deep approach depending on the assessment, learning outcomes or facilitator, among others (Kember et al 2004); (Groves 2005); (Greasley et al 2007); (Dolmans et al 2010).

Using the results optimally for the facilitation of student learning, will require the academic staff to make changes to the curriculum. It will also be necessary to conduct further research to ensure that these results are not specific to this particular cohort of students, but rather, transferrable to other groups of students in PBL environments.

To ensure that students continue to internalize information they come into contact with through the PBL sessions, in-depth discussion during feedback sessions should be encouraged and facilitated by staff members involved in cases. A recommendation for improving the feedback sessions, is to change the format in a way where student-initiated videos can be used. This can be done in combination with written descriptions allowing for role-playing with associated self-reflection on information for-

**Figure 2 Deep versus Surface strategies over time**

**Figure 3 Deep versus Surface motives over time**
mulated by students. This in turn could potentially facilitate a shift toward a deep approach to learning, as opposed to PBL cases in which students are simply reliant on group members to provide them with the information.

Understanding why and how students can have an inclination toward a deep approach toward learning and yet not significantly change their approach from surface to deep, could furthermore be clarified if a questionnaire such as the PBL-R-SPQ (a modified version) could be used (Dolmans et al 2010). This will be useful for module refinement and curriculum planning. An addition to the current study, for future research, could be to investigate the assessment outcomes with the approaches toward learning of students in the APT module in order to identify any correlation between these factors and academic achievement. The results of which, over an extended period of time, would ensure enhanced facilitation of learning.

CONCLUSION

Within the profession of Physiotherapy, PBL remains a viable curricular option which needs to be further studied and debated Solomon (2005). As the Physiotherapy Division of SU decided on this approach for the APT module in 2007 as one which would help to develop the skills needed by students to be competent when working in the community (Statham et al 2008), the need to evaluate the module on various levels, including the transfer of knowledge between the classroom and community, remains pertinent to the continued refinement of the module. The concept of studying approaches to learning can guide the assessment and teaching styles in a direction to encourage students to adopt more effective approaches (Greasley et al 2007).

Though there was no significant change in approach toward learning in these students, alignment of assessment, learning outcomes, and teaching and learning activities is important to positively influence approaches toward learning in a PBL environment (Dolmans et al 2010). Therefore, further research in this environment is needed to ensure this alignment. Approaches toward learning are not necessarily a static phenomenon; rather, it varies as the learner is faced with different situations and expectations in a module. With this in mind, the Physiotherapy Division at SU are now able to build on this research to inform further curriculum refinement and development.

ACKNOWLEDGEMENTS

Alwyn Louw, Ph.D, M.Ed is the Extended Degree Program Coordinator at the Centre for Health Sciences Education in the Faculty of Health Sciences at Stellenbosch University. Dr. Louw is also a FAIMER fellow-2008.

REFERENCES


Biggs J, Kember D, Leung DYP 2001 The revised two-factor study process questionnaire: R-SPQ-2F. British Journal of Educational Psychology 71: 133-149


Ellis RA, Goodyear P, Brilliant M, Prosser M 2008 Student experiences of problem-based learning in pharmacy: conceptions of learning, approaches to learning and the integration of face-to-face and on-line activities. Advances in Health Sciences Education 13:675-692


Groves M 2005 Problem-Based Learning and Learning Approach: Is There a Relationship? Advances in Health Sciences Education 10: 315-326

Kember D, Biggs J, Leung DYP 2004 Examining the multidimensionality of approaches to learning through the development of a revised version of the learning process questionnaire. British Journal of Educational Psychology 74:261-280


Moust JHC, Van Berkel HJM, Schmidt HG 2005 Signs of erosion: Reflections on three decades of problem-based learning at Maastricht University, Higher Education 50:665-683


Papinczak T 2009 Are deep strategic learners better suited to PBL? A preliminary study. Advances in Health Sciences Education 14: 337-353


CHANGES IN ACTIVITY LIMITATIONS AND PREDICTORS OF FUNCTIONAL OUTCOME OF PATIENTS WITH SPINAL CORD INJURY FOLLOWING IN-PATIENT REHABILITATION

ABSTRACT: The purpose of this study was to investigate the changes in the activity limitations of patients following in-patient rehabilitation and the factors influencing functional ability as measured by the Spinal Cord Independence Measure III (SCIM III).

A longitudinal study design was utilised to study the change in functional abilities of patients with spinal cord injury between admission and discharge. A convenient sampling strategy was employed, in which every consecutive patient admitted to the rehabilitation centre within a three month period was eligible for the study.

Demographic-, medical, and process of rehabilitation data were collected and collated from the patients’ medical records using a data gathering sheet that was validated and tested for reliability. Functional abilities were measured by the SCIM III.

Seventy-six patients met the inclusion criteria, consisting of 58 paraplegics and 18 tetraplegics. The mean age of this cohort was 34.14 years. A significant difference (p<0.001) in functional ability was detected for the total sample, with only 12.5% of patients independent in walking ability and 28.12% in stair management. Four (4) factors were found to be predictors of functional outcomes on bivariate analysis, but when considered together in a multiple regression model, only functional status on admission remained correlated to functional outcomes.

Conclusion and implication for practice: Significant improvement in functional abilities of persons with spinal cord injury following in-patient rehabilitation was observed. However, mobility and stair-management limitations were the most prevalent at discharge. Lastly, a lower functional status should be better targeted to optimise functional ability in the future. Future research should be directed towards illuminating whether personal factors or rehabilitation inefficiencies are responsible for the limitations observed at discharge.

KEY WORDS: SPINAL CORD INJURY, ACTIVITY LIMITATIONS, FACTORS INFLUENCING OUTCOME.

INTRODUCTION

Spinal cord injury (SCI) is a condition that has the potential to result in severe impairments, difficulties to perform functional tasks and a compromise in quality of life (De Vivo et al, 1999). Prior to the 1940’s, physicians perceived a spinal cord injury as “...an ailment not to be treated” (Hughes, 1988). Since the First World War, there has been a dramatic improvement in the management of patients with SCI in both the medical and rehabilitation spheres. However, to date, there is still no good scientific evidence for treatments conducted on patients showing an improvement in neurological impairment after acute SCI (Anderberg et al, 2007). On the contrary, there is high level evidence indicating that rehabilitation strategies could result in optimal functional outcomes (Foy et al, 2011). Despite these advancements centred towards longevity, the functioning of persons with spinal cord injury is still significantly lower than that of the rest of the population (Post et al, 1995).

Rehabilitation has become an integral part of the health care needs (Stucki et al, 2002) of persons living with spinal cord injury, with its core focus on reducing the negative consequences of the injuring event (Staines et al, 2009). From an operational perspective, the goal of rehabilitation is to establish effective and efficient practices meeting the needs of the service user and provider (Kaplan, 2007). One of the means of determining the efficacy of rehabilitation is by investigating the outcomes of...
patients, secondly by determining the factors influencing outcome and finally by aligning the process of rehabilitation (Kaplan, 2007; Hoenig et al, 1999) to address the unique human characteristics that were altered by the spinal cord injury.

With the acceptance of the International Classification of Functioning, Disability and Health (ICF) as the preferred conceptual model of describing and understanding disability, the purpose of rehabilitation has been centred towards optimising function in all dimensions of human functioning, within the categories of impairments, activity limitations and participation restrictions (Stucki et al, 2002, WHO, 2001). Within this framework, the term “activity” is defined as the difficulty an individual encounters with the execution of a task or action (WHO, 2001). A study by Dahlberg and colleagues on a cohort of patients with spinal cord injury in Helsinki found that the prevalence of activity limitations was greatest for activities related to stair management and bathing (Dahlberg et al, 2003). Literature found that prevalence data on the activity limitations of persons with SCI as essential evidence to authorities, and may assist in the planning and coordination of rehabilitation to compliment the day-to-day functional needs of the patient (Dahlberg et al, 2003).

The investigation of activity limitations could be seen as an iterative process, which could lead to the adaptation of the rehabilitation experience for specific cohorts of patients. Since an activity occurs in a context, one can infer that the execution of similar complexity of tasks within a social environment might present considerable difficulty to the patient because very few rehabilitation strategies take into account the unique context of the patient.

Kaplan considered the constituents of achieving the desired level of functioning and found that the identification of factors that may predict outcome is a critical aspect that should be determined and incorporated in appropriate health services or processes (Kaplan, 2007). Literature concerning the factors influencing outcome in patients with spinal cord injury highlights factors such as age, gender, severity and aetiology of injury to be predictive of functional recovery (Scivoletto et al, 2003). Apart from personal factors influencing outcome, studies reported the use of certain protocols, service- and process issues to account for much of the variance in functional outcome (Foy et al, 2011). Van Hedel and colleagues compared rehabilitation and the outcomes to a “black box”, explaining that very little is known about the rehabilitation processes responsible for the changes in outcome (Van Hedel et al, 2012). This finding highlights the need for evaluative studies that allows us to determine factors responsible for much variance of the primary outcomes often used in rehabilitation.

Since the ICF framework provides the baseline against which pertinent outcomes should be measured, and takes into account the role of contextual factors of an individual, it is imperative to have insight into the factors predictive of functional outcome of individuals between different rehabilitation settings and patients from distinct geographical areas. In addition, the high prevalence of limitations associated with certain functional tasks will highlight the need to investigate the process and content of rehabilitation currently operational in managing those limitations. This study sets out to determine the changes in functional activity between admission and discharge, identify activity limitations at discharge and investigate the factors influencing functional outcomes of patients with a spinal cord injury following specialised inpatient rehabilitation.

METHODS

Research design
The study design was longitudinal and observational in nature, in which individuals with SCI were followed for data collection purposes for the duration of the in-patient rehabilitation, with data collected on admission and discharge. A fundamental principle of the observational approach is that it does not allow for the rehabilitation process to be influenced in any way (Smith and Smith, 2003).

Research setting
The study was conducted at a specialised rehabilitation facility in the Western Cape, South Africa. The centre admits patients with various neurological-and surgical health conditions, however this study population was limited to individuals with spinal cord injuries. Team members at this facility function within the inter-disciplinary approach. One feature of this approach is the regular (weekly) discussions regarding the patient’s progress and the collective and collaborative goal-setting of individuals. In addition to the structural aspect of interdisciplinary rehabilitation at the centre, the use of the rehabilitation outcome levels (ROL’s) has been regarded as standard practise and as a predictive measure of functioning along the continuum of the health condition. In short, ROL’s are groupings (from level 0 to level 5) of patient problems that occur because of the consequences of the health condition along a continuum, i.e. from the acute through to the chronic phase.

Population and sampling
A sample of convenience was used to select the participants. Every consecutive patient meeting the inclusion criteria for a three month period was eligible for participation. Based on retrospective data (from the year 2010), the centre admitted more or less 320 patients with spinal cord injuries for one calendar year (personal communication, Hendry, JA). Therefore, an estimation of the desired sample size was considered for a three month period which started in November 2010 to February 2011. Eligible participants were those presenting with a spinal cord injury, aged 18 years and above, who consented in writing to participate and were proficient in English, Afrikaans or Isi-xhosa. Exclusion criteria included patients presenting with a mental disability, which was confirmed with the inability to perform a three step command test prior to the commencement of data collection. The three-month time-frame allowed for the desired sample size to be reached in order to measure the six pre-determined factors influencing functional independence of patients with spinal cord injury.
at discharge. The literature recommends that for every independent variable entered at least ten respondents should be included. Thus, the three month period allowed for a minimum of 60 participants to be included (Munro, 2001).

INSTRUMENTS

Data gathering sheet
The demographic-, medical data as well as the information relating to the process of rehabilitation and rehabilitation outcome levels were collated from the medical records of the patients at discharge. The items for the demographic- and medical profile included: age, gender, marital status, diagnosis, classification of spinal cord injury. Certain items were also related to impairments following the spinal cord injury, thus muscle weakness and bladder- and bowel function were captured as either “impaired”, “not impaired” or “undocumented”. The documentation of the impairments was only retrieved by the doctors-, physiotherapist- or occupational therapists assessment notes on admission. Also, the variable pertaining to educational level was recorded as either primary-, secondary-or tertiary education. The items related to the process of rehabilitation and rehabilitation outcome levels were limited to the length of hospital stay (LOHS), discharge destination, health professionals involved in the management of the patients, participation in the learn-to-swim programme and outcome levels achieved on admission and at discharge.

The data gathering sheet was validated for content by two experts in the field of rehabilitation and was also found to be reliable (inter-rater) with ICC scores ranging between 0.74-1.00 for the completed sheet. Thus, the data gathering sheet presented with excellent reliability in the instance where documents were reviewed by two independent raters.

Measure for functional independence and translations
The Spinal Cord Independence Measure (SCIM) III was used to assess functional ability in this cohort of patients with spinal cord injury. This valid and reliable tool was chosen as it is the first spinal cord injury- specific measure developed for measuring functional outcomes in this particular health condition (Catz and Itzkovich, 2007). Also, all items of this measure can be mapped to the domains of the ICF, which is the conceptual model used to define activity and that was used to underpin the research findings. The SCIM III consists of 19 items, which are divided into four areas namely, self-care, respiration, sphincter management and mobility. The outcome measure is scored on an ordinal scale, with the cumulative score ranging between 0-100. Since this measure was developed with the European context in mind, it is deemed imperative to test the psychometric properties within a different context and that of the translated versions. The languages spoken by people in Cape Town are English, Afrikaans and IsiXhosa, thus the SCIM III was translated into Afrikaans and IsiXhosa. All the questionnaires were forward translated from English to Afrikaans and English to IsiXhosa respectively by one translator, thereafter the translated questionnaires were backward translation into the original language (English) by a another translator. Both translators were independent to the research project and not familiar with the medical or rehabilitation field. The SCIM III was scrutinised by the researcher and study supervisor for correctness and whether the content of each item remained the same irrespective of the translation by mapping the main construct of each item back to domains of the ICF. The reason for this process is that it is often found than when an outcome measure is translated into a different language, the translated language may express and interpret the items differently than the original version (Chang-Hoon, Dong-Jae, Se-Kang, Dong-Jun, Hwan-Mo & Heui-Jeon, 2006; Mkoka, Vaughan, Wylie, Yelland & Jelsma, 2003). Therefore, based on consensus among the researcher and both translators the following changes were made to the SCIM III. The IsiXhosa translation of the SCIM III presented with the following changes. The word “oksijini” meaning oxygen from the natural environment/ atmosphere was changed to “umoya omncedisaya” which refers to artificial oxygen produced by a mechanical ventilator. This change was imperative as this would have influenced the results of respiratory function among spinal cord injuries as the aforementioned words have contrasting meanings. The word “oksijsini” has an active component to breathing, whereas the desired word “umoya omncedisaya” has a passive or assisted component to respiration. The IsiXhosa word describing mobility was changed from “intshukumo”, meaning shaking, to “ukuhlusenyuuka”, which refers to walking as a higher functional task. Thus, the word was originally used to describe a patient’s ability to walk as a means of mobilisation. The measure can be administered in different formats while maintaining good to excellent reliability, but for the purpose of this study the administration was via interview (the lead author and a trained research assistant who is proficient in English and Isi-Xhosa) which was self reported (Itzkovick et al, 2003). A recent study reported on the high correlation between the SCIM III and the SCIM self reported version (Fekete et al, 2013).

Procedure and ethical statement
All patients meeting the inclusion criteria were invited to participate in the study. After obtaining written informed consent from the patients, the medical records of the patients were perused, and a time slot was decided on for the completion of the functional outcome measure via interview. The data gathering sheet was completed on admission with the functional assessment done on admission and discharge via interview. All patients consenting to participate in the study were interviewed within two days of admission (the first two days are usually focused on the evaluation of the patient, with little to no rehabilitation input) and within the last two days prior to their discharge. All interviews lasted between 30-45 minutes. The methodology for this study had been ethically approved by the University of the Western Cape’s Senate Research Committee (10/3/24), and permission was granted by the Department of Health and the Deputy Director at the Western Cape Rehabilitation Centre.
Statistical methods
All data elements were coded and captured twice in Windows Excel 2007, and imported to SAS for analysis. The Shapiro Wilk W test was used to determine the normality of data elements. With reference to the measurement of outcome on admission and discharge, the outcome variable which was the difference in score was found to be normally distributed. Thus, the paired t-test was used to determine the significant difference in functional outcome of patients between admission and discharge, with the use of the independent t-test for the calculated mean differences between sub-classifications of the spinal cord injured population. A 5% significant level was used for all inferential statistics, which translates to an alpha level of 0.5 (Domholdt, 2000). Data related to the functional ability of patients with spinal cord injury were collected according to completeness of injury and each level of lesion. However, due to the small sample sizes (<10) for each level, inferential statistics were not advised, due to limited power of analysis.

In response to one of the aims of the study which was to determine the factors influencing functional outcome, both linear and multiple regression models were considered to determine the relationships between independent variables and the dependent variable (functional outcome score as measured by the SCIM III). Based on the study of mean outcome scores for different categories, data were found to be abnormally distributed, thus non-parametric statistics were used. For dichotomous predictors (e.g. gender) a Wilcoxon Rank sum test was used to compare the mean outcome scores between dichotomous categories, and the Spearman’s rank order correlation co-efficient was used for continuous independent variables such as length of hospital stay, age, functional outcome score on admission (0-100). A multiple regression model was fitted for four individual independent variables which were found to be associated with the functional outcome score of patients with spinal cord injury as measured by the SCIM III. The four independent variables were considered together and the final model was established through the backward elimination process.

RESULTS
Recruitment of participants
Patients with spinal cord injury accounted for 40% of the total admissions to the WCRC for the period of November 01, 2010 to January 31, 2011. Of the 93 patients with spinal cord injury, nine patients were under the age of 18 years old, two declined consent, five subjects presented with missing data and one presented with a mental illness as co-morbidities, which was considered as part of the exclusion criteria. Thus, the sample meeting the inclusion criteria was 76 patients with spinal cord injury. For the study of difference in functional outcome between admission and discharge, the sample size was reduced to 64. The reasons include the unexpected discharge of patients outside the Cape Metropole area (5 patients), suspension of patients following their weekend-pass to their residence (2 patients), death while hospitalised (2 patients) and the referral of patients to tertiary hospitals due to secondary complications.

Profile of the participants
The demographic data are presented in Table 1. The mean age of the patients was 34.14 years (SD: 12.42), with more paraplegic patients (76.3%) following injury to the spinal cord. The age of patients ranged from as young as 18 to 81 years of age. Most of the patients were single at the time of injury.

<table>
<thead>
<tr>
<th>Classification of Spinal cord injury (n; %)</th>
<th>Tetraplegia</th>
<th>Paraplegia</th>
</tr>
</thead>
<tbody>
<tr>
<td>58 (76.3)</td>
<td>18 (23.7)</td>
<td></td>
</tr>
</tbody>
</table>

**Table 3** illustrates the statistical difference in functional outcome between admission and discharge, and provides the level of significance for the total sample as well as the sub-classifications of SCI. The sum score on the SCIM III at discharge, for both the total sample and sub-classifications, was significantly larger than that on admission as determined by the paired t-test. The significant difference between the means scores of those with paraplegia and tetraplegia indicated that the mean score of the paraplegic population, on both admission and discharge, was significantly higher than the tetraplegic group with p=0.023 and p=0.007 respectively.

**Table 1: Demographic data of the participants with spinal cord injury (n=76)**

<table>
<thead>
<tr>
<th>Demographic and admission data</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age (SD) with min and max</td>
<td>34.14 (12.4); min=18, max=81</td>
<td></td>
</tr>
<tr>
<td>Spinal cord injury</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender: Male to female (n; %)</td>
<td>56 (73.7); 20 (26.3)</td>
<td></td>
</tr>
<tr>
<td>Spinal cord injury</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marital status: married (n; %)</td>
<td>14 (18.4)</td>
<td></td>
</tr>
<tr>
<td>Spinal cord injury</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Classification: Paraplegia (n; %)</td>
<td>58 (76.3)</td>
<td></td>
</tr>
<tr>
<td>Tetraplegia (n; %)</td>
<td>18 (23.7)</td>
<td></td>
</tr>
</tbody>
</table>

Process of rehabilitation
All patients with spinal cord injury were managed by the nurse and physiotherapist, with most of them also managed by the doctor, occupational therapist and social worker. The length of hospital stay in days was longer for the cohort with tetraplegia (85.6), with the majority of patients discharged to their long-term residence. Furthermore, less than 20% of the sample was referred for follow-up medical intervention at either the institution’s out-patient department or another health care facility. Several of the patients (40.8%) were admitted with a health status corresponding to outcome level two, and 69.7% of patients were discharged with an outcome level greater than three (Table 2).
Independent execution of tasks as derived from the SCIM III on admission and at discharge

Figure 1 shows the degree of independent execution of tasks on admission was greatest for respiration, feeding and grooming with 98.7%, 79.0% and 76.3% of patients fully functional with the respective tasks. The tasks in which most patients were still dependent on and needed assistance with, were related to mobility (indoors, along moderate distances and mobility outdoors), stair management and transfer from floor to wheelchair. The greatest increases in the independent execution of tasks between admission and discharge were found for bathing of the lower limbs, transfer from the wheelchair to the car, and toileting with 43.7%, 43.3% and 43.0% of additional patients who were not independent with the execution of the respective tasks on admission.

Factors predictive of outcome for patients with spinal cord injuries

The SCIM III was used to measure functional abilities in the cohort of patients with spinal cord injuries. This measure was considered as an ordinal scale with the score ranging between 0-100 in increments of 5 points. The list of independent variables (which was both continuous and categorical) that was considered for the bivariate analysis is summarised below in table 4.

The results indicate that higher activity scores on admission, younger age, and shorter length of hospital stay were found to be correlated with better functional abilities, as measured by the SCIM III, at discharge. The inverse relationship between age and length of hospital stay and the functional outcome score at discharge is evident in the Spearman’s correlations of -0.30 and -0.28 respectively. The only categorical variable that was found to be correlated with functional ability were the absence of participation in the learn-to-swim programme offered at the centre, as this was confirmed by a p=0.013. The relationship was strong between the activity levels on admission as measured by the SCIM III compared to the activity level at discharge. This relationship was confirmed by Spearman’s r=0.66 and a p<0.001.

Table 2: The process of rehabilitation of patients with spinal cord injury

<table>
<thead>
<tr>
<th>Process of rehabilitation</th>
<th>Health professionals seen by patients (n; %)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Psychologist 6 (9.4)</td>
</tr>
<tr>
<td></td>
<td>• Doctor 63 (98.4)</td>
</tr>
<tr>
<td></td>
<td>• Nurse 64 (100.0)</td>
</tr>
<tr>
<td></td>
<td>• Occupational therapist 62 (96.9)</td>
</tr>
<tr>
<td></td>
<td>• Physiotherapist 64 (100.0)</td>
</tr>
<tr>
<td></td>
<td>• Speech therapist 4 (6.3)</td>
</tr>
<tr>
<td></td>
<td>• Social worker 60 (93.8)</td>
</tr>
<tr>
<td></td>
<td>• Dietician 10 (15.6)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Length of hospital stay (days; SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCI population 73.11 (43.7)</td>
</tr>
<tr>
<td>Paraplegia 68.32 (40.1)</td>
</tr>
<tr>
<td>Tetraplegia 85.65 (50.4)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Discharge destination with referral (n; %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home 61 (80.3)</td>
</tr>
<tr>
<td>Health care facility 4 (5.3)</td>
</tr>
<tr>
<td>WCRC OPD 9 (11.8)</td>
</tr>
<tr>
<td>Other 2 (2.61)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Rehabilitation outcome levels (% admission; discharge)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Level 0 1.32 (0.0)</td>
</tr>
<tr>
<td>• Level 1 30.26 (0.0)</td>
</tr>
<tr>
<td>• Level 2 40.79 (1.3)</td>
</tr>
<tr>
<td>• Level 3 9.21 (17.1)</td>
</tr>
<tr>
<td>• Level 4 13.16 (60.5)</td>
</tr>
<tr>
<td>• Level 5 2.63 (9.2)</td>
</tr>
</tbody>
</table>

Table 3: SCIM III mean scores, standard deviation and mean difference of the total sample- and sub-classification of SCI

<table>
<thead>
<tr>
<th>Variable</th>
<th>Admission Mean (SD)</th>
<th>Discharge Mean (SD)</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCIM score III of total sample</td>
<td>48.0 (24.3)</td>
<td>67.1 (23.0)</td>
<td>p&lt;0.001</td>
</tr>
<tr>
<td>SCIM III score of paraplegics¹</td>
<td>53.7 (22.2)</td>
<td>73.2 (18.2)</td>
<td>p=0.006</td>
</tr>
<tr>
<td>SCIM III score of tetraplegics²</td>
<td>41.6 (30.6)</td>
<td>53.0 (33.3)</td>
<td>p=0.033</td>
</tr>
</tbody>
</table>

¹ The sample (n) of those with paraplegia was n=58 and =52 on admission and discharge respectively.
² The sample (n) of those with tetraplegia was n=18 and =15 on admission and discharge respectively.

1 The sample (n) of those with paraplegia was n=58 and =52 on admission and discharge respectively.
2 The sample (n) of those with tetraplegia was n=18 and =15 on admission and discharge respectively.
Table 4: Bivariate testing of variables that could influence activity as measured by the SCIM III at discharge (n=64)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Nature of variable</th>
<th>Measurement</th>
<th>Test</th>
<th>Spearman’s correlation value</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Categorical</td>
<td>Male; Female</td>
<td>Wilcoxon Rank</td>
<td>N/A</td>
<td>p=0.97</td>
</tr>
<tr>
<td>Age</td>
<td>Continuous</td>
<td>Years</td>
<td>Spearman’s rho</td>
<td>r=(-)0.30</td>
<td>p=0.018</td>
</tr>
<tr>
<td>LOHS</td>
<td>Continuous</td>
<td>Days</td>
<td>Spearman’s rho</td>
<td>r=(-)0.28</td>
<td>p=0.034</td>
</tr>
<tr>
<td>SCIMIII (Admission)</td>
<td>Continuous</td>
<td>0-100</td>
<td>Spearman’s rho</td>
<td>r=0.66</td>
<td>P&lt;0.001</td>
</tr>
<tr>
<td>Learn to swim</td>
<td>Categorical</td>
<td>Yes; No</td>
<td>Wilcoxon Rank</td>
<td>N/A</td>
<td>p=0.013</td>
</tr>
<tr>
<td>Muscle weakness</td>
<td>Categorical</td>
<td>Yes; No</td>
<td>Wilcoxon Rank</td>
<td>N/A</td>
<td>p=0.62</td>
</tr>
<tr>
<td>Education</td>
<td>Categorical</td>
<td>Low; High</td>
<td>Wilcoxon Rank</td>
<td>N/A</td>
<td>p=0.10</td>
</tr>
</tbody>
</table>

* Key: LOHS-length of hospital stay; SCIM III-Spinal Cord Independence Measure version III on admission; N/A- Not applicable

Table 5: Summary of remaining variable in the Multiple predictor model

<table>
<thead>
<tr>
<th>Variable</th>
<th>Parameter Estimate</th>
<th>Standard Error</th>
<th>F Value</th>
<th>Pr &gt; F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interception</td>
<td>51.158391</td>
<td>8.17371</td>
<td>39.17</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Outcome score</td>
<td>0.57208</td>
<td>0.09795</td>
<td>34.11</td>
<td>&lt;.0001</td>
</tr>
</tbody>
</table>
Multiple predictor model considered for spinal cord injury
Since there were two variables that showed a relatively strong relationship to outcome level scores (as measured by the SCIM III) and two other variables showing a slightly weaker relationship, but yet significant, these variables were considered together in a multiple regression model. (See Table 5).

During the backward elimination process age, participation in the learn-to-swim programme and length of hospital stay were insignificant predictors when considered with only the outcome score on admission. With regards to the parameter estimate of the outcome score on admission, the analysis indicates that for every one point (as achieved on the SCIM III) on admission, the predicted value of the outcome score at discharge (as measured by the SCIM III) will have an additional 0.57 points.

DISCUSSION
The aim of this study was twofold; firstly to determine the activity limitations and secondly to identify the predictors of functional outcome as measured by the SCIM III. The mean intake SCIM III score for this cohort of patients was 48.03, which clearly shows that participants in the present study had a much higher level of functioning than patients with SCI in Europe, with a mean intake SCIM II score of 32.00 (Wirth et al, 2008). The latter reported study demonstrated change in functional status at three- and six months with median SCIM II scores of 60 and 71 respectively. It is important to note that the mean LOHS of patients with spinal cord injury in the current study was 73.11, which loosely converts to more or less two and a half months of hospitalisation, but with a mean SCIM III score of 67.07 (SD: 23.0), which was higher than the score obtained after three months in the study conducted by Wirth et al (Wirth et al, 2008). A possible explanation for this difference in functional status between the current study and the study by Wirth and colleagues could be that the sample in the latter study comprised of more complete tetraplegics (42% of sample), whereas the current study included more paraplegics (76.3%), or the criteria for admission to the centre could have accounted for this difference in which only persons with no complications or secondary complications are admitted and those who could benefit from inpatient rehabilitation.

The highest levels of independence were for the items respiration, feeding and grooming. These findings are consistent with the results from a study conducted in eight rehabilitation centres in the Netherlands (Post et al, 2005), except for the item relating to respiration. The reason for this being that the latter study utilised the FIM, which omits items related to respiratory function. Looking at individual items, the majority of the patients with spinal cord injury in the current study experienced high levels of limitation with mobility (walking) and stair management at discharge, nevertheless the difference was statistically significant between the points of data collection. Similar findings were found elsewhere (Wirth et al, 2008; Chan and Chan, 2005). Optimal outcome levels have not yet been achieved at the time of discharge from rehabilitation for this cohort of patients. The tacit knowledge as derived from the items of the standardised outcome measure and the global rating score of the rehabilitation outcome levels suggests that there are limitations that could be addressed. However, the authors are in agreement that a qualitative inquire would yield considerably more trustworthy data of the nature of the participants’ problems and the barriers to their achievement of certain activities or engagement in certain life situations.

The high level of disability associated with mobility (specifically relating to walking ability) is slightly ambiguous as the nature and extent of the spinal cord injury were not taken into account, irrespective of the independent execution of mobility tasks using a wheelchair. Despite the recognition of the SCIM III as the gold standard measure in the evaluation of the functional ability of persons with SCI, the measure lacks responsiveness. For example, if a patient is capable of being mobile in a wheelchair, without physical assistance, the outcome measure will continue to indicate an inferior score compared to someone walking with assistance and personal support. Despite this limitation, the need for follow up rehabilitation post discharge is implied since studies found significant improvement in mobility, particularly within the mobility construct, for up to six months after injury (Wirth et al, 2008). Since patient with spinal cord injuries are inherently limited in mobility tasks, the author and other published authors (Ullrich et al, 2012) are concerned about current measuring tools, such as the Functional Independence Measure and SCIM III that do not consider the level of lesion as a legitimate level of functioning with predefined capabilities for that specific individual. Therefore, floor- and ceiling effects of outcome measures are almost always present. The recommendation of a recent study by Ullrich and colleagues advocate for the inclusion of patients with spinal cord injuries in the decision-making process of which constructs of functioning should be included for the evaluation of the holistic impact of such an injury on the individual (Ullrich et al 2012).

With the focus on predictors of functional outcome in this cohort of patients, the current study found age to be inversely related to functional outcome. Case controlled studies conducted by Scivoletto et al (2003) and Seel et al (2001) found that independence of daily living measures were significantly greater (p<0.001) for the younger age group and the young to middle age group respectively. The achievement of better functional outcomes in the younger age group could be due to the traumatic nature of the lesions, which have been associated with a higher probability of sustaining complete motor lesions of the thoracic and lumbar levels, whereas non-traumatic lesions are more common in older patients and have higher frequencies of incomplete tetraplegia (Scivoletto et al, 2003). Apart from age, the current study and numerous published reports found length of hospital stay to be a predictor of functional outcome at discharge (Sipski et al, 2004; Scivoletto et al, 2003). The current study found a significant correlation between LOHS and functional outcome at discharge (spearman’s rho-0.28; p=0.035), which in this instance could be the result
of the sample consisting of more paraplegics (76.31%) than tetraplegics (Post et al, 2005). Although the mean length of hospital stay in the current study between those with paraplegia (68.53; SD 50.5) and tetraplegia (85.62; SD 40.6) was statistically insignificant, the difference of 17 days has clinical meaning and relevance as cost of healthcare is usually estimated based on the length of hospital stay in days (Winslow et al, 2002). The inability to detect the significant difference in LOS between those with paraplegia and tetraplegia could be due to the large standard deviation, which could be influenced by the small size that reduces the power of analysis. The shorter length of hospital stay as an indicator for better functional outcomes should be analysed with caution, as it could simply imply that those with paraplegia reach their level-specific outcomes sooner than those with tetraplegia, due to the initial level and severity of the injury and age.

Literature highlights that by combining land-based rehabilitation with aquatic physical therapy, better outcomes may be achieved in recovery of function in adults with acquired neurological impairments (Degano and Geigle, 2009). The current study findings provided evidence of the effect of a learn-to-swim programme/aquatic therapy on the functional outcomes of those patients with spinal cord injury. The bivariate analysis demonstrated that those who attended the learn-to-swim programme had a significantly higher functional outcome (p>0.013) at discharge than those who did not attend, whereas an insignificant difference between the mean functional outcome scores of the two independent samples (those who did attend versus those who did not attend) was found on admission.

Results from the multiple regression model, which used a backwards elimination procedure indicated that only functional outcome to be significant in the model. Similar results are found elsewhere (Burnett et al, 2000). Based on theoretical principles, discharge planning should be guided by functional outcome and not health care cost (Visagie, 2012). On the basis of this investigation, with the author aware of the limitations of this model (small sample size which led to the inclusion of only certain variables), the functional outcomes at discharge could be predicted. This model provides relevant health care professionals and patients to aid in the identification of factors which could impede functional outcomes and the opportunity to aggressively manage and appropriately refer patients to other relevant professionals. Since the functional outcome on admission accounted for almost half 46% of the variance in the overall functional score at discharge, it is recommended that rehabilitation professionals administer the SCIM III on admission, which is an easy tool to use, in order to set realistic goals and to decide on the appropriate rehabilitation services and processes for the patient.

In conclusion, this study clearly highlights the changes in functional abilities and activity limitations in patients with spinal cord injury, following specialised in-patient rehabilitation. Based on the outcomes, limitations in mobility and stair management are still most prevalent at discharge. Since activity limitations influence participation, given that participation restrictions are difficult to be evaluated and addressed outside of the patient’s social milieu, it is essential that rehabilitation services should be available, not necessarily on an in-patient basis, following discharge from the specialised rehabilitation unit. Furthermore, the predictors of functional outcome of this particular study should serve as a basis for targeting and appropriately manage the factors that could negatively impact the functional outcome of patients with spinal cord injury.

LIMITATIONS OF THE STUDY
This study did not determine the completeness of the lesion and failed to capture the neurological classification according to ASIA. Consequently, comparison of data will be negatively influenced. Furthermore, the exclusion of patients under the age of 18 and those with co-morbidities could have influenced the normality of the data.

ACKNOWLEDGEMENT
The authors would like to thank South Africa Netherlands research Programme on Alternatives in Development (SANPAD) for financial support and for the patients for their participation in this study.

REFERENCES
Hughes JT 1988 The Edwin Smith Papyrus; an analysis of the first case reports of spinal cord injuries. Paraplegia 26:71–82. p.72


Kaplan SL 2007 Outcome measurement and Management: First Steps for the Practicing Clinician. ppl 55-63. F.A. Davis Company, United States of America

Munro BH 2001 Statistical methods for health care research. Lippincott, New York, Baltimore


Staines WA, McIlroy WE, Brooks D 2009 Functional impairments following stroke: Implications for rehabilitation. Current Issues in Cardiac Rehabilitation and Prevention 17(1): 5-8


Guidelines for Authors

Contributions to the *South African Journal of Physiotherapy* are invited on any topic related to physiotherapy or rehabilitation. All articles that are submitted to the journal for publication must be accompanied by two questions with the correct answers.

**Types of Manuscripts**
1. Research
2. Case report
3. Clinical report
4. Technical report
5. Literature review
6. Short report

All manuscripts should be accompanied by a reference list.

**Legal Considerations**
Contributions will be considered for publication in the *South African Journal of Physiotherapy* on condition that
- they have not been published previously.
- they have not been submitted for publication elsewhere.
- the Publications Division of the SASP reserves the copyright of all material published.

**Acceptance of manuscripts**
All manuscripts will be reviewed by two appointed referees. Identities of both authors and reviewers will be kept confidential in order to eliminate bias. Most articles require revision, in which case the reviewers’ comments will be returned to the authors for consideration and alteration.

**Preparation and Presentation of Manuscripts**

**Articles**
1. Articles should be restricted to between 2 000 and 2 500 words.
2. The article should be typewritten with double spacing and wide margins.
3. A title page should be supplied as a separate sheet and include the name(s), qualifications and affiliation(s) of the author(s), together with addresses and telephone numbers at home and at work.
4. Each article must be accompanied by an abstract of not more than 200 words. This should be on a separate sheet and should be intelligible without reference to the main text. Up to five key words should be included.
5. All abbreviations should be spelt out when first used.
6. The metric system is to be used throughout.
7. Headings must be presented in upper and lower case. Avoid using capitals only.
8. Authors must provide contact details; telephone numbers and email as well as postal address and institutional affiliation (hospital, University).

**Letters to the editor**
- if a letter is intended for the correspondence column it should be marked “for publication”.
- it should be no longer than 400 words.

**References**
The accuracy and the completeness of references are of the utmost importance, and a maximum of 15 references per paper is required.

1. References in the Text of the Article
When referring to more than one paper, place the names of the principal authors in alphabetical order; eg Armstrong (1990), Jones (1988) and Smith and Jones (1990) refer to similar findings.

When there are two authors of a paper, mention both, eg Smith and Jones (1990), but when there are three or more, mention only the principal author and follow with et al, eg Thomas et al (1980).

When citing an author’s work within a sentence in the main text of your article, follow these examples:
- Smith (1982) refers to the length of time taken for the subject to respond to a stimulus.
- Smith and Jones (1990) refer to similar findings.

If quoting directly from another author, place the words in inverted commas and include the page number on which the quotation appears. For example: The clinical significance of increased tension or interruption of free movement in neural tissues is well recognised ...” (Yaxley and Jull 1990, p.143)


2. Reference list
This should appear at the end of the paper in alphabetical order. The author’s name should be followed by the initials (unpunctuated) and separated from the next author by a comma. The names of all the authors should be cited and et al should not be used in the reference list. Next should follow the date of publication and then the details of the publication.

a) Journal articles. Having stated the authors and the year of publication, the title of the article should be given in full. There should be a full stop after the title. This should be followed by the full title of the journal (abbreviations should not be used), then the volume number (not the part number) followed by a colon and then the first and last pages of the publication. The required format is illustrated in the following example: Erickson M, Upshur C 1989 Caretaking burden and social support: Comparison of mothers of infants with and without disabilities. *American Journal of Mental Retardation* 94:250-258

b) Books. The format as illustrated in the example should be followed. (Note the use of punctuation and capital letters1).


**Illustrations**
- Tables and figures should be kept to a minimum and be on separate sheets.
- Each table should be numbered and have a clear title. Tables should not repeat material stated in the text. All tables and figures must be referenced in the text in sequential order.
- Don’t send photographs as an integral part of a Word document. Send them separately as a Jpeg file.
- All illustrations should be clearly marked on the reverse side with arabic numerals, author’s name and article, and an indication of the top side.
- All legends must be typed on a separate sheet.
- If a figure has been published before, the author must submit written permission from the copyright holder to reproduce the material.

**Manuscript submission**
- A covering letter, which must include the signature of each co-author, should accompany each manuscript.
- Permission to reprint figures, extracts or abstracts from other publications should be included with the manuscript on submission.

**Tick List: Yes No**

<table>
<thead>
<tr>
<th>Covering Letter</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Abstract 200 words</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Article content 2500 – 3000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short Report 1500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>References as indicated in guidelines</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 CPD questions have been attached</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All articles to be submitted</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

electronically to sajp@uw.ac.za
CPD Questions (Vol 69 no 1 - March 2013)

1. Complete questionnaire and insert the correct answers in the spaces provided.
2. Ensure that you have included your full details as requested.
3. Only original questionnaires will be considered therefore please cut out and submit to SASP Head Office at: SASP CPD Questionnaire, P.O Box 752378, Gardenvue, 2047 by 30 June 2013.
4. In order to capture your CPD points at the HPCSA your submission must be accompanied by a proof of payment to the value of R20.00 (NO CASH/POSTAL ORDERS/CHEQUES). Payments can be made by EFT to South African Society of Physiotherapy, FNB, Bedford Gardens, Branch Code: 252155, Account Number: 50371113363. Please use membership number/CPD Journal as reference.

<table>
<thead>
<tr>
<th>Full Name:</th>
<th>SASP Membership No.:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Email:</td>
<td>HPCSA PT No.:</td>
</tr>
</tbody>
</table>

1. Which statements are correct
   a. There is a low prevalence of LBP in school aged children
   b. The aetiology of LBP in adolescents is clear
   c. Adolescent LBP has important consequences for the occurrence of adult LBP
   d. Poor muscle endurance has been identified as a risk factor for adolescent LBP

2. Dysfunctional movement patterns can be caused by:
   a. Change in muscle strength
   b. Poor endurance
   c. Change in flexibility
   d. Abnormal neural control

3. The study on adolescent LBP reported the following findings:
   a. Adolescent and adult LBP show an association between LBP and lumbo-pelvic instability
   b. Trunk muscle endurance shows an association with adolescent LBP
   c. Adolescents with LBP presented with increased extensor muscle endurance and decreased trunk flexor muscle endurance
   d. Adolescents with better trunk muscle endurance results had better lumbo-pelvic global stability

4. Disability Adjusted Life Years (DALYs) describe:
   a. The number of years lived with disability
   b. The number of years lost to morbidity
   c. The number of years lost to mortality
   d. Both a. and b.
   e. Both a. and c.

5. Research shows that exercise has been proven to:
   a. Increase the CD4 count of PLHIV
   b. Decrease the CD4 count of PLHIV
   c. Decrease the body weight of PLHIV
   d. Improve the psychological status of PLHIV
   e. Both a. and c.

6. With regard to the results of the SF-36 Questionnaire, lowest scores were reported in:
   a. General Health and Bodily Pain domains
   b. Role Physical and Role Emotional domains
   c. Mental Health and Social Functioning domains

Indicate whether each of the following statements is true or false:

7. Survivors of trauma experience limitations in HRQOL at six months post ICU discharge
   True / False

8. A deep approach toward learning refers to the students inclination toward studying facts in order to achieve the highest possible mark in the test.
   True / False

   True / False

10. Each university needs to develop its curriculum in isolation of the country’s policy environment, as a curriculum should be purely evidence-based and guided by the scientific body of knowledge.
    True / False

1. _______ 3. _______ 5. _______ 7. _______ 9. _______
2. _______ 4. _______ 6. _______ 8. _______ 10. _______

For any queries regarding submission of questionnaires, email Thuli at membership@saphysio.co.za