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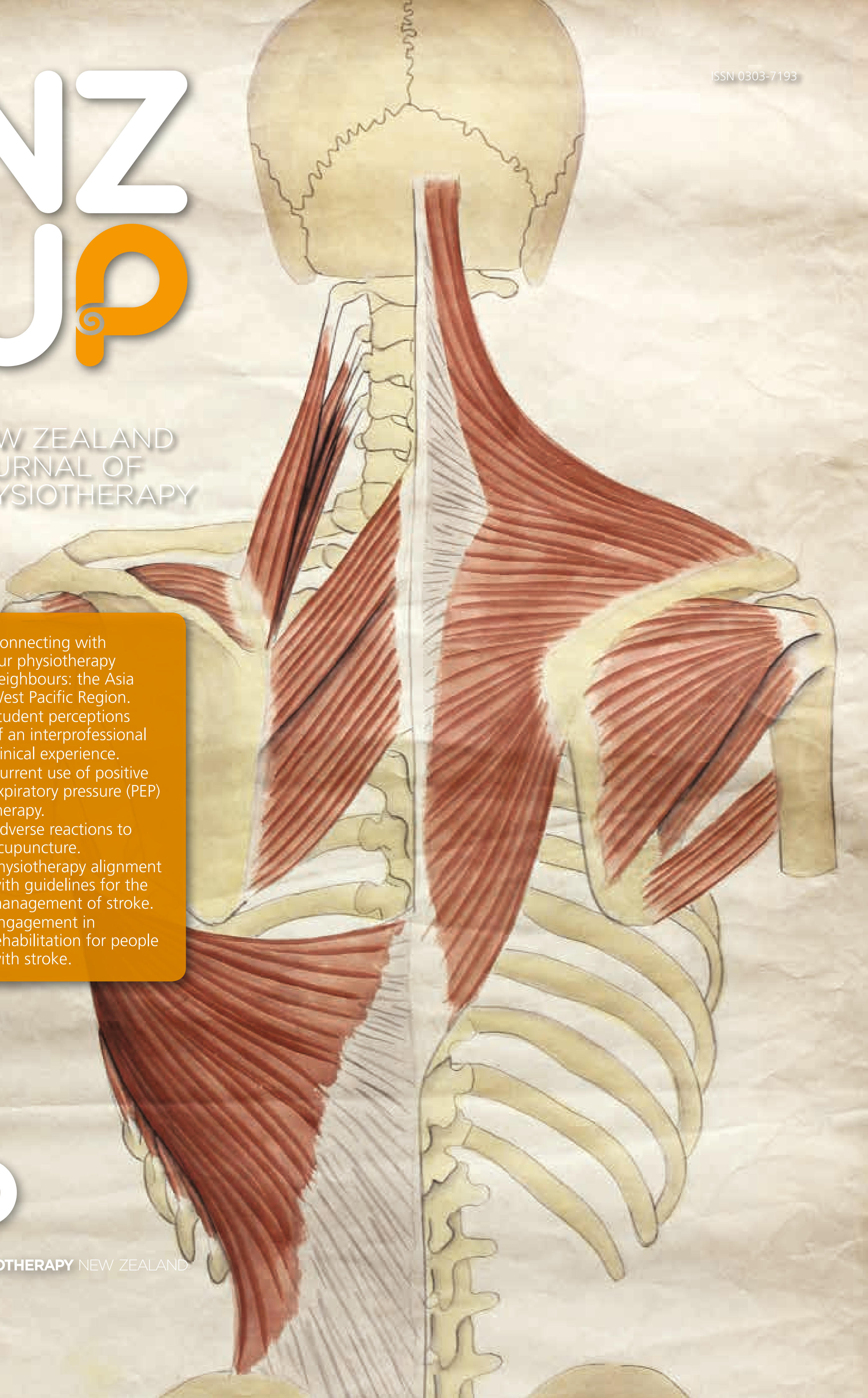
# NEW ZEALAND JOURNAL OF PHYSIOTHERAPY



- Connecting with our physiotherapy neighbours: the Asia West Pacific Region.
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- Engagement in rehabilitation for people with stroke.

**PHYSIOTHERAPY** NEW ZEALAND

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PO Box 27386
Marion Square
Wellington 6141
New Zealand

Phone: +64 4 801 6500
Fax: +64 4 801 5571
pnz@physiotherapy.org.nz
www.physiotherapy.org.nz

# Connecting with our physiotherapy neighbours: the Asia West Pacific Region

**Gill Stotter, Greg Knight, Janet Copeland**

Over the past 20 years the focus in New Zealand has changed from working with our traditional trading partners in Europe and North America to Asia and the Pacific. The same shift has occurred within the physiotherapy profession. Physiotherapy New Zealand is one of the 26 countries that form the Asia West Pacific (AWP) region of the World Confederation for Physical Therapy (WCPT). The sixth conference and 16th General Meeting for the region were recently held in Taiwan.
As part of the General Meeting member organisations had the opportunity to present reports that identified some of the key issues relevant to physiotherapy in their country. While some issues were particular to countries many were remarkably similar despite the fact that we have such a wide geographic spread and diverse region.

In keeping with the theme of the conference, 'Health Promotion through Physical Therapy' global health issues and their impact on the region were a key focus for delegates. The WCPT President Dr Marilyn Moffat put forward the organisation's clear vision for the profession:

> "Move physical therapy forward so the profession is recognised globally for its significant role in improving health and wellbeing."

It is recognised there are steps we need to take on the way.

Non-communicable diseases were identified as one of the main health priorities throughout the region. The World Health Report (Murray 2012) looked at trends in health patterns during the time period 1999 – 2010. Diabetes has increased dramatically in Oceania as people in the region struggle with the impact of changes from their traditional diet and decreased levels of physical activity. In the broader Asia/Pacific region, and the Middle East (most of whose national organisations are members of the AWP region) stroke and ischaemic heart disease are increasing in prevalence whilst infectious diseases are decreasing. In Australasia the pattern is slightly different with chronic musculoskeletal diseases rising in prominence along with the cardiovascular diseases. However the gradual increase in body mass index leading to obesity and type 2 diabetes is pervading even the poorer countries in the region, increasing burdens on already stretched health services.

Support to raise the standard of education and lobbying to obtain a system of national registration for physiotherapists were pressing concerns expressed by many member organisations. Australia and New Zealand are in the fortunate position of having our schools of physiotherapy committed to high quality entry level degree programmes, and registration authorities that require entry level competencies to be met for registration. Not only does every physiotherapist require an annual practising certificate but also they need to demonstrate ongoing learning as a requirement for an annual practicing certificate.

Some countries in the region are not so fortunate with standards of education being variable and many still struggling to meet the minimum standards published by the WCPT. Some countries in the region still do not have a recognised registration process and there is no legal requirement to obtain an annual practicing certificate or participate in any professional development. There is also the issue of shortages of physiotherapists and other health professionals as well as a lack of physiotherapists with higher qualifications who are able to teach on the four year bachelor degree programmes.

When looking at our education programmes we need to make certain they are fit for purpose in the 21st century. A major study looking at the training of health professionals (Frenk et al 2010) acknowledged that medical education in the 20th century equipped health professionals to make enormous changes in public health through the treatment of infectious diseases leading to a doubling of life expectancy over the century. We are now faced with new challenges with the rise in non-communicable diseases. Education for health professionals needs to change quickly to ensure practitioners have the skills needed to meet these challenges. Health professionals will need to work far more in interprofessional teams and across old professional boundaries, in order to integrate new models of ongoing care, more community based rehabilitation and wellness programmes for an ageing population.

At the Congress Dr Margot Skinner presented a New Zealand model of inter-professional education. The Tairāwhiti model, where physiotherapy students join other students from different health disciplines at the University of Otago, and the Eastern Institute of Technology in a rural environment with a high Māori population. The model helps the students gain a greater understanding of rural health needs, Hauora Māori objectives, chronic condition management and importantly the role of other health professionals thus leading to more collaborative practice and effective teamwork.

It is important that our practice is supported by robust research. We need to ensure the research is communicated through the profession by events such as the AWP conference and journals of member organisations. But we also need to publicise our research so other health professionals and government organisations are aware of the evidence we have supporting physical activity interventions in the prevention and treatment of non-communicable diseases.

Consequently to be recognised on the global scene and have an impact on improving global health issues the WCPT has recognised it is essential we collaborate with national and international organisations. The WCPT has been in official relations with the World Health Organisation (WHO) since 1952. One example of this relationship is the WCPT's active promotion of the use of the WHO's International Classification of Functioning Disability and Health (ICF), as a strong framework for physiotherapy services.

Another important organisation WCPT is a partner in is the World Health Professions Alliance (WHPA). This an alliance of international bodies representing the world's international professional organisations for doctors, dentists, nurses, pharmacists, and physical therapists representing more than 26 million health professionals. The objectives of the alliance fit well with physiotherapy objectives:

- Treatment and preventions of non-communicable diseases and the recognition of the link between these and the social determinants of health
- Increasing human resources for the provision of health services
- Embracing collaborative practice
- Supporting regulation of health professions

The General Meeting brought a diverse region closer together and increased everyone's understanding of the issues individual countries face. There is still a big gap in the region, for example China is just establishing the physiotherapy profession and is not yet a member of WCPT.  However the profession is beginning to get recognised in some communities in China and schools working towards the WCPT standards are being established.

At the conference there was a positive endorsement of the profession and its role in the prevention and treatment of non-communicable diseases and a strong desire to work together, building on the existing strengths each country has.  In keeping with the direction of New Zealand's overseas policies and trade links, closer relations with the Asia Pacific region are a priority for physiotherapy.

Gill Stotter
*President, Physiotherapy New Zealand*

Greg Knight
*Vice President Physiotherapy New Zealand*

Janet Copeland
*Senior Policy and Research Advisor, Physiotherapy New Zealand*

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# Student perceptions of an interprofessional clinical experience at a university clinic

**Daniel O'Brien** *MHSc (Hons)*
*Lecturer, Physiotherapy Department, AUT University*
**Antoinette McCallin** *PhD*
*Associate Professor, School of Health Care Practice, AUT University*
**Sandra Bassett** *PhD*
*Senior Lecturer, Physiotherapy Department, AUT University*

## ABSTRACT

Evidence suggests that interprofessional collaborative practice (IPCP) leads to better patient care and staff satisfaction. Interprofessional education (IPE) encourages those studying to be health professionals to develop the skills required to practise in this manner. Few studies have explored students' beliefs and attitudes regarding clinical placements that aim to develop IPCP. This study explored students' perceptions of the placement and the utility of an interprofessional education questionnaire. Student beliefs were measured by the IPE Student Questionnaire, which included the Interprofessional Socialization and Valuing Scale (ISVS) consisting of three subscales (self-perceived ability to work with others, value in working with others, and comfort with working with others), a short-answer section with closed- and open-ended questions about student placement perceptions, and a demographic questionnaire. Quantitative data were analysed descriptively. Qualitative data were analysed using content analysis. Thirty-seven students completed the questionnaire. The Cronbach alpha for ISVS was acceptable (0.91). The ISVS subscale scores were high (4.92, 4.70, 4.47), and their respective Cronbach alpha scores were acceptable (0.77, 0.85, 0.74). Short-answer question results suggest that 83% of students had a good experience; 91% stated it changed how they related to other health professionals; and 78% gained a better understanding of what other health professionals did. Results suggest that students' inter-professional experience is valuable. Limitations with the IPE Student Questionnaire were identified.

***O'Brien D, McCallin A, Bassett S (2013) Student perceptions of an interprofessional clinical experience at a university clinic New Zealand Journal of Physiotherapy 41(3): 81-87.***

*Keywords: Mixed methods, interprofessional education, interprofessional learning, interprofessional socialisation, collaborative practice, student clinic.*

## INTRODUCTION

The implementation of interprofessional collaborative practice (IPCP) in health care has been proposed as a potential strategy to address patient safety issues, improve quality care and health outcomes for patients, and reduce workforce shortages (Garling 2008, WHO 2010). IPCP occurs when "multiple health workers from different professional backgrounds provide comprehensive services by working with patients, their families, carers, and communities to deliver the highest quality of care across settings" (WHO 2010, p. 13). It does not occur automatically. Though collaboration may develop informally through learning by trial and error (Freeth 2010). However it is more efficient if promoted through a formal interprofessional education (IPE) programme. IPE is defined as occurring "when two or more professions learn with, from, and about each other to improve collaboration and the quality of care" (Barr 2002, p. 17). Nonetheless for many years there has been international debate about the promotion of interprofessional education, when it should take place, how it should be managed, who will be involved, and what should be taught (Thistlethwaite 2012).

Traditionally, professionals are socialised in their own professions where they develop a professional identity. They become familiar with the values, attitudes, beliefs, and behaviours that are inherent in their profession. It is not until these professionals join the workforce that some may branch out to develop collaborative working skills (Trede 2012). Teamwork and interprofessional communication are key interprofessional competencies, as are patient centred care, role clarification, collaborative leadership, and interprofessional conflict resolution (Canadian Interprofessional Health Collaborative 2010). If health professionals are to collaborate in practice they need interprofessional socialisation experiences as undergraduates. This type of experience is thought to improve understandings of interprofessional roles and team communication (Abu-Rish et al 2012, McCallin and McCallin 2009).

The evidence base however is variable. Curran et al (2010) argue that general health science students have positive attitudes about IPE, although negative attitudes are evident in medical student groups. In contrast, an evaluation of a long-term interprofessional training ward in Sweden found that doctors exiting the programme had developed interprofessional skills over their six-year training (Wilhemsson et al 2009). Similarly, Anderson et al (2011) report there is some evidence that students engaging in formal IPE experiences are more likely to have constructive attitudes towards colleagues from other professions. Therefore, the earlier students engage in IPCP the better.

There have been numerous IPE initiatives in pre-registration health professional education programmes internationally (Abu-Rish et al 2012, Kenaszchuk et al 2012, Reeves et al 2011), with some development in New Zealand (Horsbugh et al 2006, Pullon et al 2013). While there is support for IPE programmes (Ministry of Science and Technology 2009), there are considerable costs and challenges associated with developing and sustaining such programmes (Clark 2004, Rees and Johnson 2007). The promotion of IPCP is important in New Zealand, which faces a significant challenge in meeting the health needs of an ageing, ethnically diverse population (Paterson 2012). AUT University is responding to that challenge by helping create a health workforce which collaborates across multifaceted disciplines and sectors. There is limited research in this area in New Zealand (Horsbugh et al 2006, Pullon et al 2013). This paper adds to the very limited body of knowledge, and provides feedback to aid the development of IPE and IPCP taking place at a University Clinic.

### The University Clinic

The University Clinic (Akoranga Integrated Health) is part of the School of Interprofessional Health Studies and is located on AUT University's North Shore Campus in Auckland. The Clinic accommodates many health science students who undertake clinical placements as part of their studies. The students come from a number of different professions including nursing, physiotherapy, podiatry, counselling / psychology, occupational therapy, and oral health. The University Clinic provides opportunities for the students to participate in interprofessional learning and clinical practice. This allows the University Clinic to meet one of its objectives of preparing students for an interprofessional approach to health care delivery. The development of an interprofessional learning and working culture is a complex task that requires work at many levels. For example, final year students within the University Clinic need to be organised to attend weekly interprofessional in-services, regularly participate in interprofessional tutorials, and participate in combined treatment sessions with patients requiring input from two or more professions. The University Clinic has been developing and running these sessions since 2011.

Student placement structure and duration vary between professions. Some placements are short observational placements (one to two days), whereas others extend for the entire academic year and are the foundation for the development of the students' clinical skills. While on placement the students participate in the regular interprofessional learning activities that occur. The main interprofessional learning activities include in-services, which are weekly sessions that run for 45 minutes at the start of a clinical day. Attendance at the sessions is compulsory for students on placement in the clinic, and the sessions are presented by a number of different people ranging from those with teaching, clinical, and community health care backgrounds. The sessions cover topics such as chronic pain, interprofessional communication, managing conflict in the clinic, and role clarification. The interprofessional tutorials involve students working on and presenting their management strategy for a case based scenario in small mixed professional groups. These sessions have typically included students from two professions (i.e. physiotherapy and podiatry students) and are two hours in length. The combined care sessions involve students from two of more professions working together to provide a single treatment session for a patient. These are scheduled where it is felt a patient would benefit from the input of more than one profession (i.e. physiotherapy and psychology in the case of the patient with hyperventilation syndrome).

The University Clinic provides clinical services for staff, students, and the local community. Therefore the clientele includes a wide range of different people, with a great variety of different presentations both acute and chronic. The University Clinic's 'staff' includes the students, as well as a mix of Clinical Educators (Clinical Supervisors) and academic staff. The University Clinic management has spent considerable time and energy developing the skills of the Clinical Educators and academic staff so that there is a consistent understanding of IPE and IPCP held by all. Furthermore, regular workshops have been run to develop the skills and confidence to supervisor across professions.

AUT University has adopted and developed The University of British Columbia model of IPE (Charles et al 2010) in its undergraduate health programmes over the last ten years. The model involves three phases of learning; *exposure, immersion,* and *integration*. *Exposure* occurs in the first year of the students study and involves an introduction to the concept and the key interprofessional competencies (interprofessional communication, role clarification,and client centred care). *Immersion* occurs in the second and third years of the students' study and involves the application of their knowledge. This phase also includes education on and application of more advanced interprofessional competencies (team functioning, interprofessional conflict, and collaborative leadership). *Integration* is the third and final phase and involves the integration of the skills and competencies into clinical practice. The purpose of the University Clinic is to provide a place where health science students can integrate IPCP into their practice and have opportunities for IPE in clinical situations. The students' feedback provides insight as to whether the University Clinic meets its objectives to prepare students for IPCP when they graduate. The feedback allows for further development of the University Clinic and may also identify if the various professions view and value IPCP in different ways.

### Aims of the Study

The aims of this investigative study were to (1) explore the students' perceptions of their interprofessional clinical experience; and (2) evaluate the utility of an interprofessional education questionnaire with a group of New Zealand health science students who had completed an interprofessional clinical placement.

## METHODS

### Participants

Health science students who had completed a clinical placement at the University Clinic during 2012 were eligible to complete the Interprofessional Education (IPE) Student Questionnaire. There were no exclusion criteria. Approximately 100 students were eligible for the study. The student mix was approximately

30 physiotherapy, 30 podiatry, 30 oral health, and 10 other (nursing, occupational therapy and counselling psychology students).

## Measures

Data were collected using the IPE Student Questionnaire (Brewer et al 2010). The questionnaire has a mixed measures structure, as it contains components that require either quantitative or qualitative analysis. The questionnaire was selected because it includes a combination of data types that are more likely to provide an in-depth understanding of the students' experiences. The questionnaire is sub-divided into three separate questionnaires. The first questionnaire collected data about the students' interprofessional clinical experience using the Interprofessional Socialization and Valuing Scale (ISVS). The second questionnaire, the Clinical Placement Short Responses Questionnaire, collected data about personal experiences. The third questionnaire collected information about the students' demographic characteristics, and previous educational and health care work experiences.

## Interprofessional Socialization and Valuing Scale

The ISVS was developed by King et al (2010), and consists of 24 items that measure the students' perceptions of their attitudes, beliefs, and behaviours acquired as a consequence of working with health professionals and students from other disciplines in an interprofessional health care environment. Students are asked to respond to each item using a six point Likert scale (1 = *not at all* to 6 = *to a very great extent*). King et al (2010) undertook a factor analysis of the ISVS, and found that the 24 items load onto three subscales which had acceptable Cronbach alphas: self-perceived ability to work with others (9 items, $\alpha = 0.89$); value in working with others (9 items, $\alpha = 0.82$); and comfort with working with others (6 items, $\alpha = 0.79$). In addition, the Cronbach alpha for the entire scale was found to be 0.90 (King et al 2010). Examples of items include: *I feel comfortable in accepting responsibility delegated to me within a team* (self-perceived ability to work with others); *I feel able to act as a fully collaborative member of the team* (value in working with others); and *I feel comfortable about initiating discussions about sharing responsibility for client care* (comfort with working with others).

## Personal Experiences about the Clinical Placement

Participants were required to report their personal experiences about the clinical placement using a combination of written closed- and open-ended questions, with the latter being in the form of short responses. This questionnaire was developed by Brewer et al (2010). Examples of the items in this questionnaire provide an overall rating of the student experience of the placement using a five-point Likert Scale (1 = *very poor* to 5 = *very good*); whether the placement experience had changed their understanding of other health professionals (*yes/no*) and how attitudes had changed; the beneficial and challenging aspects of the placement; how the learning experiences might impact on future work plans; and which professions they interacted the most with during the placement.

## Design and Procedure

This study was an exploratory cross-sectional design in which the students completed the IPE student questionnaire at the end of their clinical placement. The mixed measures approach was seen to be useful, as it gives access to wide-ranging information and provides 'multiple ways of seeing and hearing' the data (Greene 2007). Ethical approval was granted by the Institutional Ethics Committee (AUTEC: #12/7). Permission to conduct the study and access students was obtained via the Clinic Manager, who invited the students to participate but was otherwise not involved in the study. Towards the end of the clinical placement students were asked to complete the questionnaires either at the final weekly clinic in-service, or in their own time away from the clinic. Participation was voluntary. Those who completed the questionnaire in their own time were supplied with a postage paid addressed envelop to return the completed questionnaire. Students were reminded about the questionnaire by their clinical supervisors two to three days after it was given out.

## Data Analysis

The ISVS and the closed ended reponses from the Personal Experiences about the Clinical Placement questionnaire were analysed using SPSS (version 20) with the alpha level set at .05. Data from the ISVS and its three subscales, the closed ended Personal Experiences about the Clinical Placement Questionnaire, and the demographic and previous tertiary education experiences, were analysed descriptively. Cronbach alphas were used to analyse the internal consistency of the ISVS and its subscales. As the ISVS response mode was a Likert scale, data were treated as non-parametric for the subsequent analyses. Spearman correlations were used to analyse the relationships between the ISVS and its subscales. Comparisons of the professional groups' scores on the ISVS and its subscales were analysed using the Kruskal-Wallis test. Because there were small numbers of oral health and other affiliation groups (four and three respectively), the two groups were collapsed into a new group (oral health and others) that provided feasible numbers for statistical comparisons. Kruskal-Wallis and Chi-square tests were used to compare perceptions of students from the three professional groups' perceptions of the overall experience of the placement, and whether their understanding of other health care professionals had changed as a consequence of the placement.

Qualitative data were analysed using content analysis. The short response questions were evaluated for frequently occurring concepts (Holloway 1997). Concept frequency was counted. For example the concept *referral* occurred in the data 10 times. Other concepts such as *understanding, awareness, roles, knowledge, appreciation, professional thinking, and other professions,* were collapsed into a category labelled as *interprofessional understanding*. The frequency identified the significance of the concept. Concepts that were mentioned in less than half the responses were omitted from the analysis.

## RESULTS

### Participants

Forty-two students (n=42) completed the questionnaire; however, five questionnaires had to be removed due to incomplete data. Table 1 outlines the descriptive analysis of the demographic, professional affiliation, and previous educational qualifications and health care experience. The majority of respondents were female, in the youngest age bracket, and were studying either podiatry or physiotherapy. Most respondents did not have a prior tertiary qualification; very few had health qualifications; and a few had previous health care work experience as a health care assistant in either oral health or rehabilitation. No data were available for students who chose not to participate in the study.

**Table 1: Participants' demographic characteristics, professional affiliation, and previous educational and health work experience**

| | Frequency | Percentage |
|---|---|---|
| Gender | | |
| Male | 12 | 29 |
| Female | 27 | 64 |
| Unspecified | 3 | 7 |
| Age | | |
| 20 to 25 years | 25 | 60 |
| 26 to 30 years | 6 | 14 |
| 31 to 35 years | 4 | 10 |
| 36 to 40 years | 2 | 5 |
| 41 years and older | 1 | 2 |
| Unspecified | 4 | 10 |
| Professional Affiliation | | |
| Oral Health | 4 | 10 |
| Physiotherapy | 14 | 36 |
| Podiatry | 18 | 46 |
| Other | 3 | 8 |
| Previous Tertiary Qualification | | |
| Yes | 16 | 41 |
| No | 23 | 55 |
| Unspecified | 3 | 7 |
| Previous Tertiary Health Qualification | | |
| Yes | 6 | 14 |
| No | 15 | 36 |
| Unspecified | 21 | 50 |
| Previous Work Experience in Health Care | | |
| Yes | 8 | 19 |
| No | 30 | 71 |
| Unspecified | 4 | 10 |

## ISVS ANALYSIS

The internal consistency of the ISVS was $\alpha = 0.91$, and for the three subscales it was $\alpha = 0.77$ for self-perceived ability to work with others, $\alpha = 0.85$ for value in working with others and $\alpha = .61$ for comfort with working with others. With the deletion of one item (*I believe that interprofessional practice is difficult to implement*) from the comfort with working with others subscale the Cronbach alpha increased to an acceptable level (0.74). Therefore this item was omitted from the remainder of the analyses of the ISVS and the comfort of working with others subscale. The means of the ISVS and the three subscales were relatively high ranging from 4.47 to 4.92 out of a possible maximum score of 6. The correlations showed that there were moderate to strong associations between ISVS and the three subscales. See Table 2 for the means, standard deviations, and correlations of the ISVS and its subscales.

**Table 2: Descriptive data and correlations of the ISVS and its subscales for all respondents**

| | Mean (SD) | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| 1. ISVS (23 items) | 4.66 (.56) | | .91** | .93** | .74** |
| 2. Ability to work with others. (9 items) | 4.92 (.57) | | | .79** | .58** |
| 3. Value working with others. (9 items) | 4.70 (.67) | | | | .55** |
| 4. Comfort working with others. (5 items) | 4.47 (.74) | | | | |

*Note*: The ISVS is measured on a six point likert scale where items are rated from 1 to 6, 1 = 'not at all' and 6 = 'to a very great extent', ** = $p < .01$, SD = standard deviation

### Comparisons of Professional Groups' ISVS and its Subscales Scores

There were 37 complete sets of data for the analysis of the three professional groups' mean scores on the ISVS, and its subscales. As can be seen in Table 3, the mean scores for all the analyses were high. There were no significant differences between the groups on any of the comparisons.

### Personal Experiences of the Clinical Placement

There were no significant differences between the ratings for the three professional student groups regarding their overall experience of the placement (physiotherapy mean = 3.81(SD 0.75), podiatry mean = 3.90 (SD 0.54) and oral health and other mean = 3.84 (SD 0.41), Kruskal-Wallis statistic $\chi^2(2) = 0.59$, $p = .743$). As a consequence of the placement, thirty five students indicated that their understanding of other health professionals had changed, whereas two students (one each from physiotherapy and podiatry) stated there was no change in this understanding. A Chi-square test showed that there were no significant differences between the groups on their level of change in understanding of the other health professions ($\chi^2(2) = 0.64$, $p = .726$).

### Short Response Questions

Data from 37 questionnaire responses were collated and analysed. Five of the questionnaires had insufficient data to analyse. The results of the short answer questions are presented in Table 4. The data indicated that most of the students who completed the questionnaire viewed the interprofessional clinical placement positively with regards to their overall experience,

**Table 3: Three professional student groups' descriptive data and comparative analysis of the ISVS, and its three subscale scores**

| | Physiotherapy<br>(n = 11) | Podiatry<br>(n = 21) | Oral Health and Other<br>(n = 5) | Kruskal-Wallis Statistic $\chi^2(2)$ = | p = |
|---|---|---|---|---|---|
| ISVS | 4.47<br>(SD .91) | 4.84<br>(SD .38) | 4.41<br>(SD .91) | 4.44 | .109 |
| Ability to work with others | 4.69<br>(SD .56) | 5.08<br>(SD .42) | 4.77<br>(SD 1.03) | 4.19 | .123 |
| Value working with others | 4.54<br>(SD .59) | 4.86<br>(SD .42) | 4.38<br>(SD 1.40) | 2.84 | .241 |
| Comfort working with others | 4.27<br>(SD .54) | 4.70<br>(SD .54) | 4.09<br>(SD 1.04) | 3.07 | .215 |

*Note:* The ISVS is measured on a six point Likert scale where items are rated from 1 to 6, 1 = 'not at all' and 6 = 'to a very great extent'

**Table 4: Short response question results regard participants beliefs of IPE and IPCP**

| Key Student Responses |
|---|
| 83% of students reported that their overall experience of the interprofessional clinical placement was good |
| 91% of students stated that the placement had changed how they related to and understood other healthcare professionals |
| 78% of students stated that they had an increased understanding of what other health professional students did. Understanding included reference to awareness, appreciation, insight, knowledge, roles, learning about, and professional thinking |
| 59% of students reported that they found the interprofessional approaches to treatment most beneficial. In this instance knowledge about approaches was gained from interprofessional discussions, tutorials, lectures, and from working together |
| The question inviting feedback on the challenges of the placement had wide-ranging answers from getting up in the morning to information overload. The breadth of responses was such that these were not counted |
| The final question about the effect of the interprofessional placement on future work plans identified that 27% of students thought they would seek an interprofessional working environment if they could once they graduated |

their understanding of other professions, and the perceived benefit to patients receiving the service.

## DISCUSSION

The two aims of this study were fulfilled. Firstly, the students' perceptions of their interprofessional clinical experience were identified. Findings suggest that the majority of the students in the survey viewed the interprofessional clinical experience positively. Secondly, the results indicate that the IPE Student Questionnaire does capture the perceptions of health science students who had completed an interprofessional clinical placement. However some limitations of the tool were identified.

The results of the ISVS suggest that those final year students who responded (42% of the students placed in the clinic) valued the interprofessional clinical placement highly and had positive attitudes towards IPCP. Additionally as there were no significant differences between professional student groups on their ISVS scores and the closed ended questions about their personal experiences it appears that each professional group valued the placement in a similar manner. These findings are similar to those of De Vries (2012), who also used the ISVS as a measure of allied health professionals' beliefs and the value of interprofessional practice. Our results point to the placement being successful in improving interprofessional socialisation, which is one of the desired outcomes of such clinical placements (Abu-Rish et al 2012, McCallin and McCallin 2009). On the whole the responses of the short answer questions back up these findings with the majority of students indicating that they have a better understanding of the other professions' clinical roles. However, only 27% of this group of students envisage seeking employment in an interprofessional workplace. In light of this finding it appears that this clinical placement provides a starting point for the development of positive interprofessional attitudes in a clinical setting, but students require further exposure to interprofessional clinical placements. A true appreciation of the value of undergraduate interprofessional clinical placements may only be realised once the students have graduated, and are working collaboratively to achieve optimal patient treatment outcomes (Pollard et al 2012).

As our study was cross-sectional it did not investigate change over time, and therefore caution is needed in interpreting the findings. We have no way of knowing whether these attitudes are enduring in this group of students. Other literature has suggested that healthcare students with well-defined stereotypical views (both negative and positive) about each other may influence, if not compromise, future interprofessional interactions (Curran et al 2010, Hean et al 2006, Hind et al 2003, Horsburgh et al 2006, Nisbett et al 2008, Tunstall-Pedoe et al 2003, Wood 2004). Further a longitudinal survey by Coster et al (2008) suggested that "some interprofessional education courses may have little impact on attitudes and cause a minority of students to develop more negative attitudes" (p. 1668). This may have been the case in our study with two students indicating that the placement did not change their beliefs, but it is not known whether these students had positive or negative attitudes at the beginning of the placement.

There are some methodological aspects of the IPE questionnaire that warrant discussion. While the internal consistency of the entire ISVS scale, and the self-perceived ability to work with others and value in working with others subscales were acceptable, the comfort of working with others subscale was not adequate (0.61). This subscale's internal consistency reached an adequate level with the deletion of the item *I believe that interprofessional practice is difficult to implement.* It is not surprising that this item did not fit with the other items in the scale, as it differed from them temporally and conceptually. Students were required to envisage implementing IPCP in the future, and it did not contain any sentiments about interacting with other health professionals, whereas the remaining items in the comfort of working with others scale measured how comfortable the students felt during this clinical placement with their communication and clinical work with the other professional students. The moderate to strong correlations amongst the subscales of the ISVS suggest that they are measuring similar yet slightly different aspects of a similar underlying construct, namely interacting with other health professions in the workplace (Field 2009). Similar limitations of the ISVS have been highlighted in other research (De Vries 2012).

Students reported that the short answer items in the the Personal Experiences about the Clinical Placement Short Responses Questionnaire took too long to answer. To some extent this may have been due to the ambiguity of some items. For example one question asked whether the placement had changed how the students related to and understood the other healthcare professionals? Yes/No. If so how? Confusion occurred because the direction of the influence, positive or negative was unclear. Like the item deleted from the comfort of working with others scale two of the open ended questions requested information about which of the learning experiences the students were likely to use in the future and how the placement would affect the students' future professional plans. Questions about future expectations are known to cause confusion and false reporting (Hoerger et al 2010). At the time of answering the questionnaire the final year students were at an undergraduate level and had little or no work experience in their chosen profession, and hence it is conceivable that their beliefs about their work in the future would be unclear. There were some inconsistencies in the demographic section of the IPE. For example the age range categories were not uniform. Since the inception of this study, another tool has been identified which overcomes some of the limitations presented with the IPE Student Questionnaire. The University of West England Interprofessional Questionnaire (Pollard et al 2004, 2005), has fewer short answer questions, is valid and reliable, and is currently being used internationally as well as with other projects at other AUT University interprofessional clinics (The Wellsford IPE Programme: Boyd and Horne 2008).

Four strengths of the study include the use the mixed methods design of the tool, which provided both qualitative and quantitative data that supported each other, suggesting that the responses were trustworthy. Other strengths were the fact that this study adds to the limited body of literature in New Zealand on this topic, and that the sample size and questionnaire return rate (42%) were acceptable. The main limitations were the relatively small representation of some of the professional groups and the study's cross-sectional design, which only revealed the students' attitudes at that time point, and was unable to show change over time. Future studies would benefit from employing a longitudinal design that would give insight into potential changes in IPCP attitudes over time.

## CONCLUSIONS

The results of the study would indicate that on completion of the clinical placement at the University Clinic, students view inter-professional experiences as valuable and beneficial. The results suggest the ISVS is a reliable tool but would benefit from with some modification. There are limitations with the other two sections of the IPE Student Questionnaire. What remains to be shown is whether interprofessional education translates into interprofessional collaborative practice and in turn, if this practice translates into better patient care.

## KEY POINTS

On completion of an IP clinical placement at the University Clinic:

- Graduates indicated that they have a better understanding of what other professions do and how they could work together on graduation to provide patient centred care.
- Graduates appeared to equally see merit in IPE regardless of their professional background.
- The long term expectation is that the graduates will be better prepared for the working in more complex collaborative environments but this expectation still needs to be investigated.

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## CORRESPONDING AUTHOR

Daniel O'Brien, Physiotherapy Clinic , Akoranga Integrated Health Clinic, AUT University, Private Bag 92006, Auckland 1142
Email: dobrien@aut.ac.nz

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# The current use of positive expiratory pressure (PEP) therapy by public hospital physiotherapists in New South Wales

**Catherine L Johnston** *MAppSc (Cardiopulmon Physiotherapy), BAppSc (Physiotherapy)*
*Lecturer, Discipline of Physiotherapy, School of Health Sciences, The University of Newcastle, Callaghan 2308, NSW, Australia*
**Rowan James** *(BPhysio(Hons))*
*Physiotherapist, Flinders Medical Centre, Flinders Drive, South Australia, Australia*
**Jennifer H Mackney** *MClinEd, BAppSc(Physiotherapy)*
*Lecturer, Discipline of Physiotherapy, School of Health Sciences, The University of Newcastle, NSW, Australia*

## ABSTRACT

Positive expiratory pressure (PEP) therapy involves the application of a resistance to expiration to produce positive airway pressure. PEP therapy is an effective treatment strategy; however, little is known about its current clinical use. The purpose of this study was to describe the clinical use of PEP therapy. The study was a cross sectional design using a written survey. Participants were physiotherapists from public hospitals in New South Wales, Australia (n=149). The response rate was 60% (n=89). PEP therapy was regularly used in the clinical practice of 68 (76%) respondents. The patient group most frequently treated with PEP therapy were those with respiratory medical conditions (n=59, 87%) and the most commonly selected indication for use was excessive respiratory secretions (n=60, 88%). Improvised devices such as bubble (or bottle) PEP were used by more respondents (n=61, 90%) than commercially-available devices (n=30, 44%) and were constructed using a variety of methods, often non-standardised. PEP therapy (particularly variably constructed bubble-PEP) was regularly employed for the treatment of patients with cardiorespiratory conditions. Further research into the effectiveness of PEP delivered with improvised devices and more specific training of healthcare practitioners regarding optimal design parameters for PEP therapy may be beneficial.

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Key words: Physiotherapy, Respiratory Therapy, Positive expiratory pressure (PEP) therapy

## INTRODUCTION

Positive Expiratory Pressure (PEP) therapy involves the application of a resistance to expiration in order to produce positive airway pressure (Darbee et al 2004). Positive expiratory airway pressure is thought to stabilise airways, prevent premature airway closure, improve ventilation and reduce gas trapping (Darbee et al 2004, Lannefors et al 1992, McIlwaine et al 2001, O'Neill et al 2002). PEP therapy has been used, and is recommended, as a component of respiratory physiotherapy management for varying adult and paediatric patient groups including those with cystic fibrosis (Lagerkvist et al 2006, McIlwaine 1997, McIlwaine 2001), acute and chronic respiratory disease (Bjorkqvist et al 1997, Brooks et al 2003, Hill et al 2010, Langer et al 2009, Lee et al 2008, Tang et al 2010), and in the post-operative setting (Campbell et al 1986, Orman and Westerdahl 2010, Urell et al 2011). Improvements in secretion clearance, functional residual capacity and oxygenation have been demonstrated with the use of PEP therapy (Darbee et al 2004, Mortensen et al 1991, Urell et al 2011). PEP therapy has been positively compared with conventional chest physiotherapy; however, there is currently inadequate evidence to indicate whether it is any more effective than other forms of treatment such as postural drainage and percussion, particularly in terms of secretion clearance (Elkins et al 2006, Olsen and Westerdahl 2009).

There are a variety of devices available for the provision of PEP therapy including several commercial systems. Other PEP therapy options include simple improvised devices (including "bottle/bubble"-PEP) which can be constructed from accessible, low-cost materials and are an inexpensive alternative to commercial appliances (Bjorkqvist et al 1997, Fiore et al 2010, Mestriner et al 2009). Both commercial and improvised devices enable the creation of positive pressure on expiration, with optimal settings recommended between 10-20cm$H_2O$ (McCool and Rosen 2006, Myers 2007). PEP devices are either flow-resistor or threshold-resistor in type (Mestriner et al 2009). Many commercial PEP devices are flow-resistors with expiration occurring through a fixed orifice and the positive pressure generated varying with the expiratory airflow (Mestriner et al 2009). Bottle or bubble-PEP devices are examples of threshold-resistors, where the expiratory positive pressure remains constant if tubing diameter and length are adequate (Mestriner et al 2009). Improvised devices are commonly used clinically (Bjorkvist et al 1997, Lee et al 2008, Sehlin et al 2007) and parameters have been published for the construction of these devices to enable them to function as threshold-resistors and achieve an adequate level of positive pressure (Mestriner et al 2009).

PEP therapy is a recommended and effective component of the management of people with respiratory pathology; however, there is little information about the actual clinical usage of the technique, particularly the use of improvised PEP devices. There is little definition of the patient groups most commonly prescribed PEP therapy, the methods of administration, the systems used and the means of construction of improvised devices, including adherence to appropriate design parameters. The aim of this project was therefore to describe the current clinical use of PEP therapy (in particular the use of improvised PEP devices) by public hospital physiotherapists in New South Wales.

## METHODS

### Study Design

The study was a cross sectional design using a custom designed anonymous written survey.

### Survey Instrument

As no published or validated tool existed with which to determine the clinical practice of PEP therapy, a written survey was custom designed. The survey contained 35 questions in four sections: demographics, current clinical use of PEP therapy, equipment used and background rationale. The majority of questions were in closed categorical form with some open-ended written questions included to allow for answer clarification. Improvised devices consisting of a tube and a liquid container were designated "bubble" rather than "bottle"-PEP as this terminology is more commonly used in Australia.

### Participants

Participants were physiotherapists working in New South Wales (NSW) public hospitals. The public listings of hospitals on the NSW Department of Health website (www.health.nsw.gov.au) were reviewed. Of the 228 public hospitals identified, 149 were noted to have a physiotherapy department. A single representative from each of these sites was invited to participate. Packages were addressed to the "senior respiratory physiotherapist" for metropolitan/large regional hospitals and to the "senior inpatient physiotherapist" for smaller regional/rural hospitals. Apart from stipulating who should complete the survey, no other selection criteria were applied and there were no exclusion criteria.

### Procedure

Each identified site was sent a package containing a participant information letter (including completion instructions), a copy of the survey, a postage-paid site identification card and a reply-paid envelope. The participants were requested to return both the survey and site-identification card (even if they chose not to complete the survey). Return of the survey was taken to constitute informed consent. The site-identification cards were used to track returns and maximise response rate. A reminder letter and a second package were sent one month after the original mail out to all who had not returned site identification cards.

### Data Analysis

All data were collated and analysed using the SPSS statistics package (version 19, SPSS Inc Chicago Il.). All closed categorical responses were analysed using frequencies and percentages. Categorical demographic variables of PEP and non-PEP users were compared using contingency tables, chi-squared analysis or Fisher's exact test when cell counts were small.

## RESULTS

### Response Rate, Participant and Site Demographics

There were 89 completed surveys returned, a response rate of 60%. Respondent and site demographics are displayed in Table 1.

**Table 1: Site and respondent demographics for PEP Therapy (n=68, 76%) and non-PEP Therapy users (n=21, 24%). Total respondents n=89.**

| | PEP users | Non PEP users | Total |
|---|---|---|---|
| Highest qualification | n (%) | n (%) | n (%) |
| Diploma | 9 (13) | 4 (19) | 13 (15) |
| Bachelor's degree | 50 (74) | 14 (67) | 64 (72) |
| Master's degree | 8 (12) | 3 (14) | 11 (12) |
| Doctorate | 1 (2) | 0 (0) | 1 (1) |
| Years of clinical experience | | | |
| < 1 | 1 (2) | 0 (0) | 1 (1) |
| 1 - 5 | 14 (21) | 1 (5) | 15 (17) |
| 5 - 10 | 12 (18) | 2 (10) | 14 (16) |
| > 10 | 41 (60) | 18 (86) | 59 (66) |
| Years of experience in cardiorespiratory physiotherapy | | | |
| < 1 | 3 (4) | 0 (0) | 3 (4) |
| 1 - 5 | 14 (21) | 7 (33) | 21 (24) |
| 5 - 10 years | 22 (32) | 3 (14) | 25 (28) |
| > 10 years | 29 (43) | 11 (52) | 40 (45) |
| Hospital size (beds)* | | | |
| < 50 | 25 (37) | 14 (67) | 39 (44) |
| 50 - 100 | 12 (18) | 6 (28) | 18 (20) |
| 100-200 | 15 (22) | 0 (0) | 15 (17) |
| 200 - 500 | 12 (18) | 1 (5) | 13 (15) |
| >500 | 4 (6) | 0 (0) | 4 (5) |

$^{*}p<.05$

### Clinical Use of PEP Therapy

PEP therapy was used in the current clinical practice of 68 (76%) of the total respondents (n=89), and was not used clinically by 21 (24%). While those who did not use PEP in their current clinical practice formed a larger proportion of the respondents who worked in smaller rural locations, there were no significant differences found between PEP users and non-PEP users in terms of entry-level qualification, years of experience, years of experience in cardiorespiratory physiotherapy or hospital location. Significant differences were identified between PEP and non-PEP users in regard to number of hospital beds ($p$ = 0.013) with non-PEP users more commonly working in hospitals with smaller bed numbers. No further analysis of the non-PEP users was undertaken.

PEP therapy was used regularly with 41 (60%) respondents using it at least weekly and 17 (25%) daily. The patient group most commonly treated with PEP was classified "respiratory medicine (exclusive of cystic fibrosis)" (n=59, 87%), followed by patients with cystic fibrosis (n=28, 41%) and paediatrics (n=4, 6%). Following initial prescription, 54 (79%) respondents indicated that patients performed PEP therapy either mostly, or fully, independently.

The most commonly selected indication for using PEP was excessive secretions (n=60, 88%), followed by alveolar collapse (n=29, 43%), persistent alveolar collapse (n=20, 29%), prevention of respiratory complications (n=11, 16%) and reduction of shortness of breath (n=8, 12%). Four (6%) respondents stated that PEP was indicated to provide a visual "reminder" for patients to do their prescribed exercises.

The amount of positive pressure most commonly reported was 10-20cm$H_2O$ (n=43, 63%) followed by <10cm$H_2O$ (n=5, 7%). Thirty four respondents (50%) reported that their site had a protocol for the use of PEP and 53 (78%) respondents indicated that their site had stipulated parameters for PEP treatment (Table 2). Almost all (n=60, 88%) respondents reported that they would commonly combine PEP with other cardiorespiratory treatment techniques in a single treatment session (Figure 1).

**Table 2: PEP therapy treatment parameters, specified by those respondents with site stipulated dosage protocols (n=53).**

| Parameter | n (%) |
|---|---|
| Repetitions | |
| 3-5 breaths | 20 (38) |
| 6-10 breaths | 20 (38) |
| >10 breaths | 6 (11) |
| Did not specify | 7 (13) |
| Sets | |
| 1-2 sets | 5 (9) |
| 3-5 sets | 18 (34) |
| 6-10 sets | 9 (17) |
| > 10 sets | 3 (6) |
| Until clear | 2 (4) |
| Did not specify | 16 (30) |
| Times per day | |
| 1-2 times | 4 (8) |
| 3-5 times | 23 (42) |
| Every 2 hours | 4 (8) |
| Every hour | 9 (17) |
| Individual for each case | 4 (8) |
| Did not specify | 9 (17) |

**Figure 1: Other techniques reported to be used in combination with PEP Therapy.**

Other techniques reported to be used in combination with PEP therapy as specified by respondents included: Autogenic Drainage (n=1), cough assist machine (n=1), Flutter (n=1), incentive spirometry (n=1), increase fitness (n=2), manual cough assist (n=1), suction (n=1).

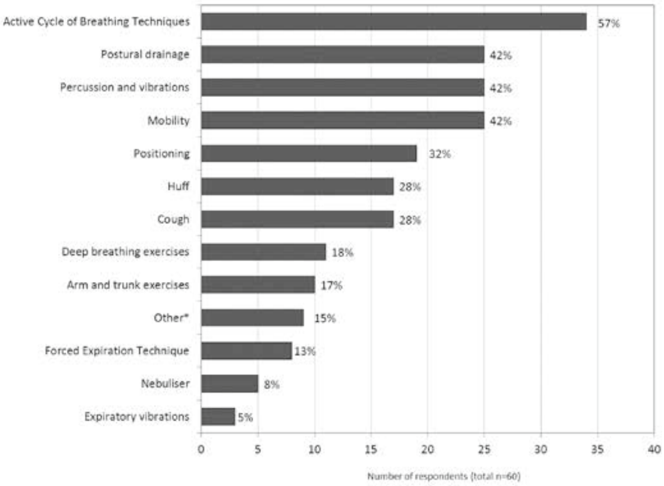

**Table 3: PEP devices reported to be used in clinical practice (n=68)**

| | n (%) |
|---|---|
| Commercially available PEP devices | 15 (22) |
| PARI PEP® | |
| Astra PEP/RMT™ | 9 (13) |
| Therapep® | 4 (6) |
| Other (as specified by respondents) | 15 (22) |
| Threshold®PEP | 8 (12) |
| Non-commercial (self-made) PEP devices | |
| "Bubble-PEP" | 61 (90) |
| "Non-bubble PEP (including PEP tubes)" | 9 (13) |

## Equipment Used for PEP Therapy

Improvised devices were more commonly used in the clinical setting than commercially available devices (Table 3). Twenty two (32%) respondents reported that therapists used both commercial and improvised devices at their site. Details of equipment used for improvised PEP devices are presented in Table 4. Sealed containers were used by 37 (54%) respondents. The routine use of a pressure manometer when prescribing PEP therapy was reported by 13 (19%) respondents.

## DISCUSSION

This is the first study to specifically document the clinical use of PEP therapy, particularly the use of improvised devices. The main findings were that PEP was regularly used by public hospital physiotherapists, was frequently combined with other cardiorespiratory treatment techniques and was most often used in the management of patients with medical respiratory conditions. Improvised PEP devices (such as bubble-PEP) were more commonly used than commercially available devices and the construction of these devices was varied.

Many respondents regularly used PEP therapy as part of their day-to-day clinical practice. Those who reported not using PEP tended to have more years of general experience and were working in smaller hospitals. The reasons for this are unknown as the respondents' rationale for choosing to use or not use PEP was not canvassed in this study. More years of experience would indicate a longer time since completion of entry-level qualifications and possibly the use of PEP may not have been included in the entry-level curricula of these respondents. Hospitals with smaller bed numbers are often situated in rural or smaller regional areas and clinicians working in these settings may not use PEP due to a lack of specialised training or due

**Table 4: Equipment used to construct self-made PEP systems as reported by respondents who used this type of PEP therapy. Respondents were permitted to choose more than one response.**

| | Bubble PEP (n=61) | Non-bubble PEP (n=9) |
|---|---|---|
| *Type of water container* | n (%) | n (%) |
| Water for irrigation | 22 (36) | - |
| Drink bottle | 17 (28) | - |
| Sterile water | 8 (13) | - |
| Saline bottle | 8 (13) | - |
| Milkshake container | 2 (3) | - |
| Wall mounted suction bag | 1 (2) | - |
| Patient's water jug | 1 (2) | - |
| Missing | 2 (3) | - |
| *Volume of container (ml)* | | |
| 500 | 10 (17) | - |
| 600 | 5 (8) | - |
| 1000 | 12 (20) | - |
| 1250 | 2 (3) | - |
| 2000 | 8 (13) | - |
| Missing | 24 (39) | - |
| *Type of tubing* | | |
| Oxygen tubing | 37 (60) | 7 (78) |
| Suction tubing | 18 (30) | 0 (0) |
| Drinking straw | 4 (7) | 0 (0) |
| Chest drain tubing | 2 (3) | 0 (0) |
| Syringe | - | 4 (44) |
| Other tubing | - | 2 (22) |
| *Tubing Length (cm)* | | |
| 10 | 0 (0) | 2 (22) |
| 15 | 9 (15) | 0 (0) |
| 20 | 24 (39) | 4 (44) |
| 25 | 3 (5) | 0 (0) |
| 30 | 7 (12) | 1 (11) |
| >30 | 11 (18) | 0 (0) |
| Did not specify | 7 (11) | 2 (22) |
| *Diameter of tubing(cm)* | | |
| 0.5 | 9 (15) | 2 (22) |
| 1 | 39 (63) | 4 (44) |
| 1.5 | 3 (5) | 0 (0) |
| Did not specify | 10 (17) | 3 (34) |

to resource constraints (such as availability of finances for equipment or access to services such as on site sterilisation), issues commonly facing rural/remote healthcare practitioners. Further specific training for relevant healthcare practitioners in the use of PEP may be beneficial.

The pattern of use of PEP therapy reported by respondents in this study appears to be largely consistent with that of the published research relating to the technique. Those who reported using PEP mainly used it in the management of patients with medical cardiorespiratory conditions (acute and chronic), mostly in combination with other techniques and primarily with the aim of clearing excessive secretions. Most studies into the effectiveness of PEP have been undertaken in patients with cystic fibrosis (Darbee et al 1994, Lannefors et al 1992, McIlwaine et al 1997, McIlwaine et al 2001); however, its use has also been recommended for those with other conditions (such as chronic obstructive pulmonary disease and pneumonia) often characterised by excessive respiratory secretions (Bott et al 2009, Hill et al 2010, Langer et al 2009, Olsen and Westerdahl 2009). Other studies have reported that positive pressure therapy (including PEP) was used by clinicians to manage atelectasis (Fiore et al 2010). Respondents in our study reported using PEP for the treatment of alveolar collapse; however, it is not clear whether this relates to alveolar collapse seen as a result of post-operative respiratory dysfunction. Post-operative patients were not a group specified by respondents in this study as being commonly treated with PEP therapy. The inclusion of PEP in the management of post-operative patients has been investigated (Campbell et al 1986, Orman and Westerdahl 2010, Urell et al 2011) ;however, there is less information about this aspect of the technique.

Respondents reported that they commonly combined PEP therapy with other cardiorespiratory physiotherapy treatment techniques. There is limited evidence about the practice or effectiveness of using PEP in combination with other treatment techniques. Most commonly, PEP has been studied as an independent technique in comparison to conventional chest physiotherapy; however, it has also been investigated in combination with forced expirations or the Forced Expiratory Technique (FET) (Hofmeyer et al 1986, McIlwaine et al 1997, McIlwaine et al 2001). The survey respondents reported that they used PEP therapy more commonly in combination with postural drainage and the Active Cycle of Breathing Techniques (ACBT) than with the FET. How common the practice of combining PEP with other techniques internationally is unknown and warrants further investigation.

The most commonly reported dosage parameters were 3-5 sets of 3-10 breaths, performed 3 to 5 times each day with PEP levels of 10-20 cmH$_2$O, all broadly consistent with published research (Olsen and Westerdahl 2009, Orman and Westerdahl 2010). However, despite respondents reporting the use of defined dosage parameters consistent with recommendations, whether healthcare practitioners actually measure the level of PEP in their clinical practice is unknown. The low reported use of manometers for prescription of treatment would indicate that PEP levels are not frequently measured, a not unexpected finding given the high reported use of self-made devices.

Non-commercial devices for PEP therapy were more commonly used than commercially available devices by the respondents in this study. Questions relating to the respondents' rationale for their choice of device were not included in the current survey so it is not clear why this means of delivering PEP was chosen. Reasons may include a lack of specific training with commercially available devices and/or resource limitations. Many commercial devices are quite expensive and/or require sterilisation for between-patient use. The option of a simple self-made device which can be cheaply constructed for single-patient use would be attractive in a climate of limited healthcare financial resources. However, the potential for poor effectiveness or patient harm is higher when non-standardised improvised devices are constructed and used.

The most commonly used form of non-commercial device reported in this study was bubble-PEP. Use of bubble-PEP has been reported in Sweden (Bjorkqvist et al 1997, Sehlin et al 2007), Australia and New Zealand (Lee et al 2008), and the United Kingdom (O'Neill et al 2002). A survey of general physiotherapy clinical practice in Australia and New Zealand (Lee et al 2008) found that 50% of locations surveyed used PEP devices for the treatment of patients with chronic obstructive pulmonary disease and bronchiectasis and 76% of locations used bubble-PEP in such treatment. The present study also confirms that bubble-PEP is commonly used clinically; however, there is very little published research regarding the effectiveness of this technique in clinical practice.

Respondents in the current study reported using a diverse range of materials and methods to construct bubble-PEP devices. Bubble-PEP devices need to be accurately constructed to deliver the prescribed level of positive expiratory airway pressure. Differences between commercially available PEP masks and improvised bubble-PEP in terms of physiological parameters such as airflow and airway pressure have been demonstrated (Sehlin et al 2007). Bubble-PEP devices that do not conform to correct design parameters may deliver inappropriate levels of PEP and may be hazardous for patients, for example by increasing work of breathing (Mestriner et al 2009, Sehlin et al 2007).

Recommendations regarding the optimum design parameters for a bubble-PEP device have been published. In order to achieve the desired PEP level of 10-20cm $H_2O$, Mestriner et al (2009) recommend the use of 10cm of liquid, 20cm of tubing of at least 8mm diameter and sealing of the device with an 8mm or greater escape orifice. In the current study, the most commonly reported tubing specifications corresponded with the recommended parameters. However, despite many respondents reporting the use of 1cm diameter tubing, these same respondents reported that they were most commonly using "oxygen" tubing. The diameter of standard commercial oxygen tubing is usually less than 0.8cm (for example, 0.55cm) (APS Medical 2009), the use of which may result in a higher level of PEP than recommended.

A large number of respondents reported using liquid containers such as drink bottles, which are not standardised particularly with respect to the air-escape orifice (Mestriner et al 2009). Several respondents also reported using other improvised non-bubble PEP therapy devices (including "PEP-tubes"), which were also variably constructed. Given the apparent common clinical use of improvised PEP therapy and the variety of methods used in construction of the devices, further research into the use and effectiveness of this form of therapy with a variety of patient groups is essential. It would also be of interest to compare adherence to optimal design parameters internationally.

Along with the lack of standardisation in construction, another issue of concern is that improvised bubble-PEP devices require receptacles containing liquid to be present at the bedside, possibly for extended periods. This may be an infection control risk. Standing liquid which is not changed regularly has the potential to be a source of pathogens (Gould et al 2005). Liquid containers remaining at the bedside also add to clutter and may compromise the safety of electrical equipment. In addition, patients with impaired airway protection mechanisms (for example poor glottic closure or ineffective cough) may also be at risk of aspiration either during bubble-PEP treatment or due to inadvertently attempting to drink the water from the container.

The response rate for this study was 60% which is consistent with literature and commonly deemed acceptable (Cook et al 2005, Livingstone and Wislar 2012). It is unknown as to whether the non-responders were different from the responders. Those responding to the survey had a wide range of clinical experience and represented diverse geographical settings. The profile of respondents, in terms of years of experience, is typical of the population of physiotherapists practicing in NSW (AIHW 2006). Responses were received from all geographical areas including rural, regional and metropolitan settings and the proportion of respondents working in small hospitals compared to larger sites was also commensurate with state-wide data (AIHW 2009).

One of the limitations of the study may be a response bias due to surveys being completed by only one therapist at each site. However, most of the questions required factual answers rather than personal opinion and it is unlikely that others working in the same site would have different PEP protocols. Healthcare practitioners working in other settings such as community health, private hospitals or private practice were not included in the study and their inclusion in further research may yield useful information.

## CONCLUSION

This study has shown that PEP therapy is a technique commonly used by physiotherapists for the treatment of patients with cardiorespiratory conditions. General parameters for use were consistent with published research and improvised devices were more commonly used than commercially available devices. Bubble-PEP devices were the non-commercial devices most frequently used and were constructed using a variety of materials and methods with little standardisation. The widespread use of bubble-PEP needs to be considered in the light of the potential hazards to patients due to non-standardised construction methods, inadequate measurement of airway pressure delivered during treatment, and infection control risks. This study highlights the need for more research about the effectiveness of PEP delivered with improvised devices, such as bubble-PEP, and indicates that more specific training of healthcare practitioners regarding the clinical use of PEP therapy may be required and beneficial.

## KEY POINTS

- Positive Expiratory Pressure (PEP) therapy is an effective technique commonly used by physiotherapists in the management of people with cardiorespiratory dysfunction. PEP therapy may be delivered via commercial or non-commercial devices (including simple improvised devices such as "bottle/bubble"-PEP) however there is little information about the actual clinical usage of PEP therapy.
- This study describes the current clinical use of PEP therapy. PEP therapy was found to be regularly used by public hospital physiotherapists with improvised devices (such as bubble-PEP) more commonly used than commercially available devices.
- The construction of these devices was variable and frequently non-standard. This raises concerns regarding effectiveness and potential impact

on patient safety. Further research regarding the use of PEP therapy delivered with improvised devices, such as bubble-PEP, is necessary.

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## PERMISSIONS

Ethical approval for this study was granted from The University of Newcastle, Australia, Human Research Ethics Committee (Reference number H-2009-0162).

## CORRESPONDING AUTHOR

Catherine L Johnston, School of Health Sciences, The University of Newcastle, Callaghan 2308, NSW, Australia.Telephone: 61 2 49217782. Email: cath.johnston@newcastle.edu.au

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# Adverse reactions to acupuncture: policy recommendations based on practitioner opinion in New Zealand

**Jillian Marie McDowell** *MPhty, MNZCP (Acupuncture), MCTA*
*Private practitioner, Prohealth Physiotherapy, 124 Kelvin Street, Invercargill, New Zealand*
**Gillian Margaret Johnson** *PhD, MSc, FNZCP*
*Senior Lecturer, Centre for Physiotherapy Research, University of Otago, New Zealand*
**Leigh Hale** *PhD, MSc, FNZCP*
*Associate Dean of Research, Centre for Physiotherapy Research, University of Otago, New Zealand*

## ABSTRACT

Acupuncture risk/benefit assessment relies heavily on the accurate reporting of negative outcomes. For such reports to be valid they must employ standardised terms which hold the same meaning and weighting for each reporting practitioner. A postal questionnaire was undertaken to explore the understanding of descriptive and evaluative terms associated with adverse reactions to acupuncture held by a sample of New Zealand acupuncture practitioners. Volunteers were sought from the Physiotherapy Acupuncture Association of New Zealand (PAANZ) (n=287) and Medical Acupuncture Society of New Zealand (MASNZ) (n=58). Data were analysed using descriptive methods and a series of item reduction and decision rules. The response rate was 42% (n=135) with a moderate endorsement (48%) for the preferred definition of an adverse reaction being *any adverse effects possibly related to acupuncture making treatment necessary or severely interfering with the patient's wellbeing.* Vomiting, seizure and convulsion were all classified to be 'adverse reactions' in a categorisation task carried out by the respondents. A low consensus of opinion was displayed when respondents considered timeframes for reporting and patient perception was weighted as the least important factor in the decision to report an adverse reaction. Recommendations are made for future adverse reaction to acupuncture reporting policy formation based on these research findings.

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Keywords: acupuncture, adverse reaction, opinion, policy, questionnaire

## INTRODUCTION

Media coverage of large contemporary epidemiological studies highlighting harm due to medical management, has brought the concept of 'adverse reactions' to the fore (Small and Barach 2002). This concept, which was originally defined for the drug pharmacovigilence in Western medicine (Alvarez-Requejo et al 1998), also has relevance to the domain of acupuncture.

The frequency of adverse reactions to acupuncture (ARA) has been extensively reported in studies ranging geographically from Australia (Bensoussan et al 2000) to China (Zhang et al 2010) to population sub-groups as disparate as paediatrics (Adams et al 2011) and adult outpatients (Endres et al 2004). However, the wide variation in the terminology, particularly in relation to the definition of an adverse reaction to acupuncture, greatly limits any ability to draw comparisons between such studies (White 2004). The problem of gaining accurate information about adverse reactions to acupuncture is compounded further by the loose and synonymous use of nomenclature of terms such as 'adverse reaction', 'adverse event', 'adverse effect', 'complication' and 'side effect' (White 2004).

It is not known if the key terms used to describe a negative outcome to acupuncture are held in the same regard by practitioners and interpreted with the same relative weighting or meaning (MacPherson et al 2004, Norheim and Fonnebo 2000). It is interesting to note that although researchers have surveyed patients' understanding of an 'adverse reaction', (Ernst et al 2004, MacPherson et al 2004, Park et al 2009, Witt et al 2009) practitioner awareness and comprehension has been neglected. Norheim and Fonnebo (1996) indirectly reflected on practitioners' concepts of an 'adverse reaction' by investigating the experiences of doctors and acupuncturists regarding adverse reactions to acupuncture. In this latter study, practitioners were asked to reflect and retrospectively report on the question, "Have you ever in your practice met patients with acupuncture adverse effects?" and volunteered information on reactions they had witnessed and perceived to have been adverse (Norheim and Fonnebo 1996).

Both Western and traditional Chinese acupuncturists still lack accepted standards and systems for the collection and reporting of adverse reactions that utilise standardised disease classification systems and include sufficient detail of the event to establish causality (Lee et al 2005). Early knowledge about the safety of acupuncture has arisen primarily from largely anecdotal evidence and case reports of adverse effects (Ernst and White 2001, Vincent 2001). Internationally, there is scarce information on reporting systems used for adverse reactions to acupuncture, with researchers tending to collect reports on a national basis to try to establish incidence rates (Ernst and White 2001, Park et al 2010, White et al 2001a). Sound safety processes are imperative with the acceptance of and demand for acupuncture increasing (Pirotta et al 2000, Charles 2007).

In New Zealand (NZ) 3.6% of all physiotherapy-related treatment injuries accepted by the Accident Compensation

Corporation (ACC) between 2005 and 2011 were acupuncture-related, with three claims deemed to be of a major consequence according to ACC's level of harm criteria (Johnson et al 2012). Although guidelines for case reporting (Peuker and Filler 2004) and neurophysiological mechanisms based classification of adverse reactions to acupuncture (McDowell et al 2011a) have been proposed, there is little evidence that they have been adopted into national guidelines or common practice for all practitioners in NZ to date. Physiotherapists practicing acupuncture in NZ have the opportunity to participate in a voluntary reporting system promoted by Physiotherapy New Zealand (PNZ) though no such scheme exists for general medical practitioners in this country. Confusion over the adverse reaction terminology pertaining to acupuncture is likely to be an influential factor in the number and type of incidents registered with PNZ.

There is a need to clarify the terminology relating to adverse reactions to acupuncture internationally, and more specifically within the NZ context, in order to develop a more robust adverse reaction reporting system for acupuncture practitioners. This paper reports on a survey of a sample of NZ physiotherapy and general medical practitioner acupuncturists (hereafter called "practitioners"). The aims of the survey were threefold: 1, to identify whether the practitioners had a preferred definition for an adverse reaction to acupuncture, 2, interpreted key words pertaining to the concept (being prone to synonymy) in the same way and 3, which signs and symptoms were considered to be adverse reactions. Additional information was sought on reporting thresholds and time frames to establish whether under or over reporting occurred within the group. The intention was to make policy recommendations based on their responses.

## METHODS

### Questionnaire development

A custom-designed questionnaire examining descriptive and evaluative terms associated with adverse reactions to acupuncture held by practitioners, comprising 101 items, was developed for the purposes of this research (McDowell 2007). The questionnaire development and retest reliability of the visual analogue scales (VAS) and categorisation tasks used in the questionnaire have been described previously (McDowell et al 2011b).

### *Survey Participants*

The members of the Physiotherapy Acupuncture Association of New Zealand (PAANZ), a special interest group of the PNZ (n=287) and the members of the Medical Acupuncture Association of New Zealand (MASNZ), a special interest group of the Royal College of General Practitioners (n=58) were selected to be surveyed as identifiable subgroups. At the time of the survey, PAANZ and MASNZ had the most readily accessible memberships out of the 14 identifiable acupuncture groups practising in NZ and were, at this time, two of only four groups with a registration body providing scope and standards of practice.

The majority of PAANZ and MASNZ members, regardless of whether they were practising traditional Chinese and Western acupuncture, would have had an undergraduate education based on a Western medical paradigm and an assumption was made here that this group would be familiar with medical adverse reaction terminology. Exclusion criteria were applied to those individuals who had participated in the pilot study (McDowell et al 2011b), along with those members of PAANZ or MASNZ who were neither physiotherapists nor general practitioners. Participants were required to be residing in NZ at the time of the survey. It was estimated that a response rate of 60% could be achieved from the PAANZ and MASNZ groups giving a margin of error of 7.2%.

The University of Otago Human Ethics Committee granted ethics approval for the survey (no: 06/302). Both PAANZ and MASNZ consented to forward the questionnaires to their members on behalf of the principal researcher. All participants provided written informed consent prior to undertaking the survey.

### *Procedure*

The delivery of 319 questionnaires, introductory letter, written consent form and a return envelope was administered by the PAANZ and MASNZ secretariats. On their return a research assistant separated the consent forms from the questionnaires to maintain participant anonymity from the principal researcher. Reminder group emails regarding completion of the questionnaire were sent 14, 28 and 40 days working days following the initial mail out in order to optimize the response rate.

### *Data analysis*

Data from the survey results were recorded using SPSS-13.0 (SPSS Inc., Chicago, IL). The descriptive characteristics (means, medians, standard deviations (SD) and ranges) were calculated for the questions on population demographics reporting timeframes and thresholds. A VAS was used to assess the synonymy of key terms ratings of symptoms as an adverse reaction and agreement level with six adverse reaction-reporting statements. These were also subjected to descriptive data analysis and an *a priori* decision process (McDowell et al 2011b).

Levels of endorsement were calculated by recording absolute and cumulative frequencies of item selection using ranking responses regarding definition preference, seriousness of key terms and factors influencing adverse reaction reporting. A three step decision rule (Fernandez and Boyle 2001) was applied to the symptom and sequelae categorisation task responses (McDowell et al 2011b).

The internal consistency of responses was assessed by comparing the results of the question evaluating ratings of symptoms as an adverse reaction to acupuncture to the symptom categorisation task. The best indicator of the location of central tendency was taken from the question evaluating rating of symptoms of an adverse reaction to acupuncture. If the difference between the mean and median exceeded 1.4 VAS points then the median was taken as the best indicator of central tendency for the comparison. Here it was reasoned that symptoms that were rated highly as being adverse reactions would be categorised similarly in both tasks. The free text generated in response to the question examining agreement with adverse reaction reporting statements was searched for key comments and the frequency of their appearance was assigned to identifiable themes.

## RESULTS

One hundred and thirty five of the 319 eligible members who met the study inclusion criteria responded to the questionnaire, giving a response rate of 42%. One hundred and twenty three responses were from the PAANZ group (123/287, 46%) and 12 from the MASNZ group (12/58, 23%), yielding a sex proportionate and a moderately sex proportionate sample of the memberships respectively.

### *Data quality*

A total of 101 items from 18 questions per questionnaire were tabulated. Missing data for responses were low (range 0 to 12.3% per question). A total of 125 of a possible 12690 responses were missing (2%). Forty four percent of respondents endorsed all 101 responses (100% complete data), 26% missed one response, 5% missed out two responses and 10% missed out three responses. The calculated margin of error for this study with the 42% response rate was 8.6% (Rumsey 2003).

### *Questionnaire responses*

The demographics of the PAANZ and MASNZ respondents are summarised in Table 1. The mean age of the respondents was 42.7 years (SD 9.6; range 24-75 years), with a mean year of acupuncture experience of 10.7 (SD 7.1; range 0.3-35 years). In terms of personal experience, 113 respondents (84%) had observed an adverse reaction in their own patient cohort, with a further 44% (60/144) recalling an experience of an adverse reaction in colleagues' patients. Only 27% of respondents had ever reported an adverse reaction, with typically only one report (20/135, 15%) in the entirety of their career.

**Table 1: Demographics of survey respondents (n=135)**

| | | Frequency (max n=135) | Percent (%) |
|---|---|---|---|
| Sex | Male | 29 | 21.5 |
| | Female | 106 | 78.5 |
| Ethnicity | Cook Island Maori | 1 | 0.7 |
| | Maori | 3 | 2.2 |
| | Other | 21 | 15.6 |
| | New Zealand European | 107 | 79.3 |
| Highest acupuncture qualification | NZQA Qualification | 5 | 3.7 |
| | MASNZ Course | 6 | 4.4 |
| | Other | 8 | 5.9 |
| | University qualification | 26 | 19.3 |
| | PAANZ Introductory course | 90 | 66.7 |
| Area of practice | Public | 15 | 11.1 |
| | Private | 120 | 88.9 |

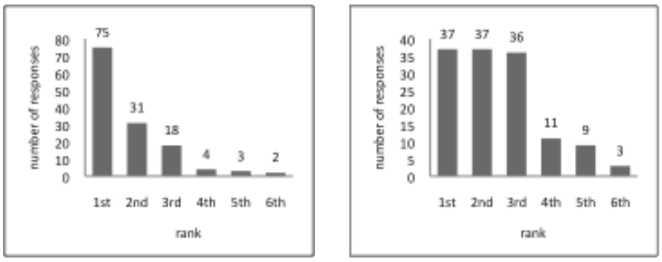
The data yielded a moderate consensus level amongst the respondents (~48% - based on a first or second preference option) for their preferred definition of an adverse reaction to acupuncture (*any adverse effects possibly related to acupuncture making treatment necessary or severely interfering with the patient's wellbeing*).

Fifty six percent of the respondents rated *the need for medical intervention* as the most important factor when making the determination to report an adverse reaction (Figure 1A-F). Seventeen percent of respondents indicated they would report a 'mild' adverse reaction. Levels of reporting increased to 71% when the adverse reaction was viewed in the context of being 'moderate' and to that of 98%, in the case of 'severe' (Table 2). A wide variation of up to 10 days between respondents in the threshold of symptom duration before they would initiate a report, regardless of whether the adverse reaction was considered to be a complication, side effect, or adverse reaction was reported.

**Figure 1A-F: Ranking of significance held by survey respondents (n=135) of the factors A. medical intervention, B. permanence, C. loss of function, D. severity, E. duration and F. patient perception, on the reporting of an adverse reaction to acupuncture**

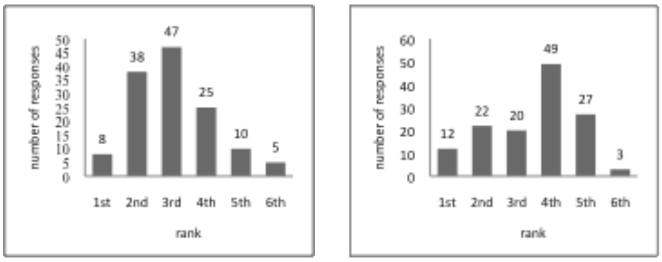
A. Medical Intervention

B. Permanence



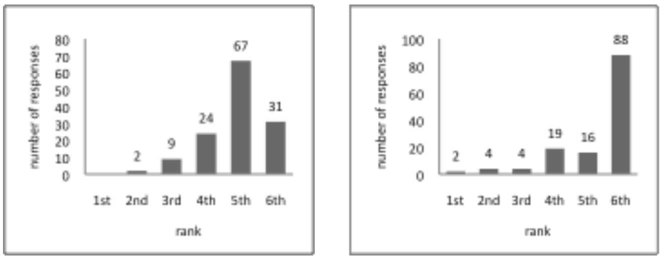
C. Loss of function

D. Severity



E. Duration

F. Patient Perception



The sequelae of pneumothorax, infection, pseudoaneurysm, neuropraxia and fainting showed a lack of internal consistency between being rated as an 'adverse reaction' and their assignation into the 'adverse reaction' domain. Only three sequelae were able to be categorised as an 'adverse reaction' (vomiting, convulsion and seizure) while 20 symptoms displayed bimodal or multimodal distributions across the key categories of 'malpractice', 'side effect', 'complication' and 'adverse reaction' (Table 3). Vasovagal responses commonly witnessed with

**Table 2: Reporting patterns of survey respondents when considering quantifier and key word combinations to describe an adverse reaction (n=135)**

| Reporting of | | Agree | Disagree | No response |
|---|---|---|---|---|
| | | Frequency max (n=135) (%) | Frequency max (n=135) (%) | Frequency max (n=135) (%) |
| Mild | Side effects | 1 (0.7) | 132 (97.8) | 2 (1.5) |
| | Complications | 17 (12.6) | 116 (85.9) | 2 (1.5) |
| | Adverse reactions | 17 (12.6) | 116 (85.9) | 2 (1.5) |
| Moderate | Side effects | 49 (36.3) | 84 (62.2) | 2 (1.5) |
| | Complications | 83 (61.5) | 49 (36.3) | 3 (2.2) |
| | Adverse reactions | 96 (71.1) | 37 (27.4) | 2 (1.5) |
| Severe | Side effects | 124 (91.9) | 9 (6.7) | 2 (1.5) |
| | Complications | 131 (97) | 2 (1.5) | 2 (1.5) |
| | Adverse reactions | 132 (97.8) | 1 (0.7) | 2 (1.5) |

needling failed to be categorised (faint, feeling cold) despite their frequency in practice and practitioners disagreed whether pneumothorax was malpractice (50%) or a complication (36%).

'Complication' was ranked as the key term with the second most serious connotation by 49% of respondents but was given a considerably lower ranking (ranked fourth with 37%) when the quantifier 'moderate' was applied (Figure 2A-F). Thirty six percent of respondents would not report a moderate complication, while only 27% would not report a moderate adverse reaction (Table 2).

The sequelae of pneumothorax, cardiac tamponade, infection, pseudoaneurysm, and neuropraxia were ranked strongly as being adverse reactions (median values 4.8, 4.8, 4.7, 3.8, and 3.7 VAS points respectively) yet failed to be recognised as such under the domain of an adverse reaction in the categorisation task. The use of quantifier and qualifiers altered reporting thresholds and timeframes, and respondents demonstrated wide standard deviations when considering key terms for synonymy (range 2.25 – 3.23 VAS points), highlighting a divergence of opinion and interpretation of meaning (Table 4).

The results indicated that the MASNZ respondents required mild or moderate reactions to be present for longer (mean 16, SD 26 days) than the PAANZ respondents (13, SD 10 days) before making the decision to report. The MASNZ respondents considered the symptom of fainting to be less serious than the PAANZ group, ranking fainting on average 2.2 VAS points lower than their counterparts as 'being an adverse reaction'. The MASNZ respondents also displayed less extreme opinions on the statements pertaining to adverse reaction reporting and the synonymy of the terms 'malpractice' and 'side effect' to the term 'adverse reaction'. Unlike the PAANZ group the MASNZ respondents weighted permanence (50%) and loss of function (50%) above that of the need for medical intervention as important factors in their decision to report an adverse reaction.

## DISCUSSION

The results of the survey conducted on the NZ practitioners who were sampled confirmed the suspicion of under-reporting

**Figure 2A-F: Ranking signifying perceptions of seriousness of the key terms used to describe an adverse reaction to acupuncture held by survey respondents (n=135) in the case of A. adverse event, B. complication, C. adverse event, D. adverse reaction, E. adverse effect and F. side effect**

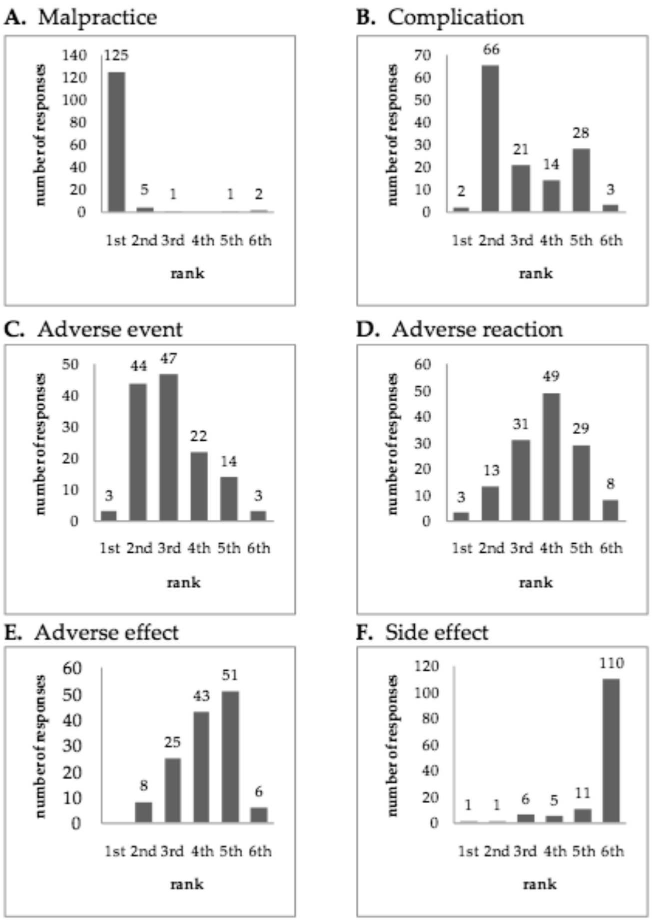


**Table 3: Categorisation status of acupuncture symptoms according to the domains of known side effect, adverse reactions, complication and malpractice.**

| Distribution | Symptoms | Domains (max n=135) | | | |
|---|---|---|---|---|---|
| | | Known side effect | Adverse reaction | Complication | Malpractice |
| Unimodal* | Sleepiness | 124 | 8 | 1 | - |
| | Euphoria | 120 | 4 | | - |
| | Point bleed | 115 | 5 | 11 | - |
| | Tiredness/malaise | 111 | 16 | 5 | - |
| | Sweating | 101 | 26 | 5 | - |
| | Pain at needle site | 100 | 21 | 14 | - |
| | Bruising | 88 | 22 | 24 | - |
| | Vomiting | 18 | 104 | 7 | - |
| | Convulsion | 1 | 101 | 24 | 4 |
| | Seizure | - | 98 | 24 | 4 |
| | Perichondritis | 1 | 36 | 67 | 19 |
| | Spinal cord lesion | - | 5 | 10 | 108 |
| | Hepatitis | 2 | 5 | 17 | 99 |
| | Forgotten needle | 3 | 9 | 16 | 87 |
| | Cardiac Tamponade | - | 14 | 21 | 72 |
| Bimodal** | Faint | 49 | 78 | 9 | - |
| | Feeling cold | 70 | 37 | 8 | 1 |
| | Headache | 39 | 72 | 20 | - |
| | Paraesthesia | 19 | 63 | 39 | 5 |
| | Pneumothorax | - | 19 | 49 | 69 |
| Multimodal** | Abscess | - | 25 | 62 | 30 |
| | Aggravation of symptoms | 58 | 58 | 20 | - |
| | Endocarditis | - | 18 | 23 | 47 |
| | Granuloma | 8 | 34 | 35 | 1 |
| | Haematoma | 41 | 58 | 36 | 2 |
| | Infection | 1 | 34 | 63 | 32 |
| | Insomnia | 51 | 48 | 14 | - |
| | Myositis | 6 | 47 | 52 | 9 |
| | Nausea | 63 | 57 | 11 | - |
| | Neuropraxia | 3 | 48 | 54 | 21 |
| | New symptoms | 20 | 51 | 27 | - |
| | Osteomyelitis | - | 23 | 42 | 32 |
| | Peritonitis | - | 23 | 35 | 38 |
| | Pseudoaneurysm | 3 | 25 | 33 | 12 |
| | Psychiatric disturbance | 7 | 57 | 30 | 1 |

*achieving categorization; **failing categorisation

of adverse reactions to acupuncture. It was found only 27% of respondents had ever formally reported such an event to an external body, even though 84% of respondents recalled seeing an adverse reaction in one of their own patients. The respondents in this study also expressed uncertainty about reporting reactions of a minor nature and were unclear about the boundaries between their documentation in patient notes and reporting to an external body. The level of under-reporting identified in this current study is in keeping with 39-90% levels reported in the drug literature (Alvarez-Requejo et al 1998, Belton et al 1995, Pirmohamed et al 1998, Sweis and Wong 2000) even though drug-drug and multi-drug interactions tend to result in higher reporting levels (Leone et al 2010).

Overall, the respondents in this survey considered that physiological responses to acupuncture fell outside the domain of an adverse reaction agreeing with Yamashita et al (1999) who considered that symptoms and sequelae, such as pain at the needle site and minor bleeding, were an inevitable consequence

**Table 4: The median, mean (standard deviation) and difference between median and mean scores from the visual analogue scales for the perceived synonymy of key terms associated with adverse reactions to acupuncture held by survey respondents (n=135)**

| | Median | Mean (SD) | Difference between median and mean scores |
|---|---|---|---|
| Adverse effect & adverse reaction | 3.7 | 3.0 (2.3) | 0.7 |
| Adverse event & adverse reaction | 1.5 | 0.8 (3.2) | 0.7 |
| Complication & adverse reaction | -1.3 | -0.8 (2.9) | 0.5 |
| Side effect & adverse reaction | -2.0 | -1.0 (3.2) | 1.0 |
| Medical error & adverse reaction | -4.7 | -3.5 (2.8) | 1.2 |

Ranking on a +5 to -5 visual analogue scale: An *a priori* decision was made to interpret the VAS score responses as being strongly negative if they fell between –5.0–3.5, moderately negative between 3.5–2.1, and mildly negative between 2.1–0.7. Corresponding interpretations were given for scores in the affirmative direction with neutral being interpreted between –0.7 and 0.7.

to acupuncture even in careful standard treatment. While some authors argue that neither the expectancy (White et al 2001b) nor transience (MacPherson et al 2001) of a physiological response should preclude it from classification as an adverse reaction, practitioners often decline to report their presence due to their minimal influence on the patient's well-being, and their "commonality" (Grabowska et al 2003). Whilst patients may beg to differ (Odsberg et al 2001), respondents in this study weighted the patients' perception as being the least important factor in the determination to make an adverse reaction report. GP's were less influenced by the need to seek medical intervention as a factor in reporting. Potentially this could be due to their ability to use their own medical skill to address the reaction or their greater years average of acupuncture experience.

In this study, there was only a moderate consensus level of (48%) for the definition *'any adverse effects possibly related to acupuncture making treatment necessary or severely interfering with the patients well-being'*. Some researchers have used broad umbrella definitions with sub-classifications to fully describe their concept of an adverse reaction to acupuncture (MacPherson et al 2001, Melchart et al 2004, White et al 2001a) in order to deal with the complexities of generating an all-encompassing definition. Melchart et al (2004) prefaced a broader general definition "any adverse event possibly related to acupuncture", before sub-classifying further, using the definition endorsed by the respondents above to describe 'serious adverse effects'. The use of such sub-classifications may be a practical solution allowing the separation of technically preventable reactions (malpractice/negligence) and minor transient reactions (which respondents felt should not be reported to an external body), from unpredictable serious adverse reactions.

An alternative method of sub-classification is already utilised by the pharmacological profession, where adverse drug reactions are defined as either Type A or Type B reactions (Medicines and Healthcare Products Regulatory Agency 2005). From a neurophysiological perspective, Type A acupuncture adverse reactions such as fainting or vomiting could be considered an augmentation of the physiological actions of acupuncture, being dose dependent (number of needles, retention time, stimulation) and readily reversible on reducing the dose or withdrawing the needle/treatment (McDowell et al 2011a). Type B acupuncture adverse reactions could encompass any bizarre and unpredictable responses distinct from the known reactions to or effects of acupuncture (McDowell et al 2011a), leaving practitioner error as a category to explain tissue trauma such as pneumothorax, cardiac tamponade, and pseudoaneurysm. Utilising this framework could reduce the difficulties established by this survey with the interpretation of nomenclature by practitioners in NZ.

It is not known how many physiotherapists or general practitioners, practise acupuncture without maintaining a membership with their respective professional acupuncture bodies. Other professional and lay acupuncture groups practicing in NZ at the time of survey were not included and reporting discrepancies may not be inferred nationwide. Consequently, a noted limitation to this study was that study cohort was not representative of the entire population of practising acupuncturists within NZ. A sample bias may be inferred by the utilisation of the PAANZ and MASNZ groups who had accessible secreteriats known to the author at the time of the survey. The survey did not establish whether English was a second language, which also may have had some bearing on the practitioners' ability to interpret the terminology used in the questionnaire.

It is recognised that clinicians may feel more protective of a modality which is heavily incorporated into their practice, and therefore have a vested interest in under reporting problems (White et al 2001a). However, it may also be argued that PAANZ and MASNZ members are more likely to report adverse reactions than non-members due to their commitment to postgraduate education and professional development, their ready access to policy documents on acupuncture safety, along with exposure to professional newsletters. A sample bias may also be inferred due to the volunteer nature of participant recruitment, with their motivation to be involved with the study due to a personal interest in the subject or a sense of responsibility to the profession. No attempts were made to identify barriers to ARA reporting within the groups surveyed.

The strengths of the current research lie in the original nature of the investigation undertaken and specificity to the two NZ professional groups, which were surveyed. It is the authors' position that attempts to establish incidence rates are meaningless unless it is determined that practitioners are interpreting and reporting ARA's homogenously. Further, to the authors' knowledge, there are no such reports of research examining practitioners' opinion and interpretation of acupuncture adverse reaction nomenclature available in the research literature. Nor has any comparable research investigated the decision threshold for reporting an adverse reaction, in particular, the timeframe for which a symptom must be present before a decision is made to report it. The relatively homogenous physiotherapy acupuncture population available in NZ, which were devoid of political or legislative boundaries such that exist in other countries such as Australia (personal communication Leigh McCutcheon) or the United States of America (personal communication Frank Gargano), made it an ideal sample for the current study.

Since the completion of this survey the principal author has designed a new adverse reaction reporting template which has been adopted by PNZ.  PAANZ members have had safety guidelines updated (PAANZ 2011 and 2013) and presentations on ARA definitions in special interest group conferences. Further research may be warranted to investigate why the NZ practitioners considered patient perception as the least important factor in their decision to report and adverse reaction, what reporting barriers may exist and what actual incidence rates could potentially be, given the under reporting acknowledged by this survey group.

## CONCLUSION

Adverse reaction reporting should be encouraged within all professional acupuncture groups in NZ, with the aim of improving reporting rates to enable the collection of meaningful data for such reflection and research.  Reaching a consensus on the use of common terminology is the first step towards the standardisation of adverse reaction to acupuncture reporting, which will in turn assist future research in the areas of safety and incident patterns.

Based on the research findings and within the bounds of the acknowledged study limitations, recommendations may be made to improve adverse reaction to acupuncture reporting patterns in NZ and to assist reporting policy development: *'Any adverse effects possibly related to acupuncture making treatment necessary or severely interfering with the patients well being'* is recommended as the definition of choice for an adverse reaction to acupuncture for NZ practitioners.  The terms side effect and complication should be avoided.

The term 'adverse reaction' should be used to describe the negative outcome from the perspective of acupuncture itself and, that of an 'adverse event', to describe the negative outcome from the perspective of the patient.

Participation in future adverse reaction reporting systems should be fostered by using only that nomenclature in reporting forms which has been established as being meaningful and constructive to those practitioners who will be required to work with it.

Qualifiers should be predefined within reporting systems so as to standardise scales of seriousness and severity.  Further practitioner consensus is required on whether common vasovagal responses to needling should be also be included in acupuncture adverse reaction reporting systems.

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## KEYPOINTS

- There are differences in the way that NZ acupuncture practitioners interpret the concept of an adverse reaction to acupuncture and associated terminology.
- The variations in interpretation are important factors in reporting thresholds and the types of symptoms and sequelae that are reported.
- The recommendation is made that NZ acupuncture practitioners use the adverse reaction to acupuncture definition *'Any adverse effects possibly related to acupuncture making treatment necessary or severely interfering with the patients well being'.*

## CONFLICT OF INTEREST STATEMENT

The authors have no conflict of interest to declare.

## ADDRESS FOR CORRESPONDENCE

Jillian McDowell, Prohealth Physiotherapy, 124 Kelvin St, Invercargill 9810, New Zealand. Phone 032189052, Fax 032141950. Email: jillianmmcdowell@gmail.com

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# Physiotherapy alignment with guidelines for the management of stroke in the inpatient setting

**Jessica Johnston**
*Year 4 physiotherapy student, AUT University*

**Suzie Mudge** *PhD*
*Post Doctoral Research Fellow, Person Centred Research Centre, AUT University*

**Paula Kersten** *PhD*
*Associate Professor Rehabilitation, Person Centred Research Centre, AUT University*

**Andrew Jones** *BHSc (Physiotherapy), PGDipHSc, PGDipBus*
*Physiotherapy Professional Leader, Waitemata District Health Board*

## ABSTRACT

Clinical guidelines provide a summary of published research to aid the delivery of evidence-based health care. Although alignment with clinical guidelines is associated with positive outcomes in stroke care, there is a lack of evidence to show that physiotherapy management is aligned with the *New Zealand Clinical Guidelines for Stroke Management 2010.* A retrospective audit was performed on the clinical records of 101 patients discharged from a public hospital in the Auckland region with a diagnosis of stroke in 2012. Issues of management were identified and recorded as in alignment with the guidelines or not. Results showed wide variation in areas of alignment. The highest overall alignment was for management of shoulder pain (100%) and follow up physiotherapy (99%). The alignment with guidelines for activity related limitations (sitting balance, sit to stand, standing balance, walking/mobility, difficulties with activities of daily living, and upper limb functional deficits) were consistently addressed, with a focus on lower limb function and mobility. Recommendations with lower levels of evidence and for issues which do not appear to be a primary functional problem had lower alignment. Ongoing audit cycles would be useful to provide setting specific information of stroke management for improving stroke care.

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Keywords: Stroke, guidelines, physiotherapy

## INTRODUCTION

Clinical guidelines are systematically developed statements to assist the delivery of appropriate health care (Hill and Lalor 2008, Thomas et al 1999, van der Wees et al 2008). Guidelines aim to reduce inappropriate variations in practice, promote the delivery of high quality, evidence-based healthcare and improve cost effectiveness by providing a convenient, up to date and unbiased summary of published research to be implemented in clinical settings (Hill et al 2009, Otterman et al 2012, Thomas et al 1999, van der Wees et al 2008). In acute stroke, positive associations between the alignment with recommended stroke management and health outcomes have been documented (Hubbard et al 2012). Research conducted in countries such as the United Kingdom (UK) (Hammond et al 2005, Irwin et al 2005, Roberts et al 2000, Rudd et al 2007, Rudd et al 1999, Rudd et al 2001, Walsh et al 2009, Wolfe et al 1997), Australia (Cadilhac et al 2004, Harris et al 2010, Hubbard et al 2012, Luker and Grimmer-Somers 2009) and New Zealand (Gommans et al 2003, Gommans et al 2008) concludes that standards of stroke care could be more aligned with guidelines. However, these studies refer to the stroke management provided by Australian and UK rehabilitation units and cannot be easily generalised to a New Zealand setting. The results from one study (Hubbard et al 2012) highlight the value of nationally agreed clinical guidelines in relation to undertaking national audits. In 2010, the Stroke Foundation of New Zealand partnered with the National Stroke Foundation of Australia and the New Zealand Guidelines Group to revise and adapt the Australian national guidelines for New Zealand (Stroke Foundation of New Zealand and New Zealand Guidelines Group 2010). It is therefore timely to evaluate if physiotherapy in New Zealand is aligned with these new guidelines. This study aimed to audit this in one New Zealand hospital in the Auckland region.

## METHODS

Approval for this audit was obtained from the Waitemata District Health Board Awhina Research and Knowledge Centre.

### Study design and patient sample

A retrospective audit was performed of the physiotherapy clinical notes using an audit checklist (Appendix 1), based on the *New Zealand Clinical Guidelines for Stroke Management 2010* and the management issues identified by Hubbard et al (2012). The focus points of physiotherapy management included in the audit were selected based on the focus of physiotherapy assessment and treatment. After a pilot screen of three clinical records and discussion between the authors, it was decided that issues such as continence, perception, communication, vision, cognition, psychological impairments, secondary prevention, home assessment, community reintegration and post-discharge were areas of management to be excluded from the audit, as they do not fall under the sole responsibility of physiotherapy. Some issues identified as secondary complications as well as influencing secondary prevention, such as reduced cardiorespiratory fitness, were included in the audit as they have recommendations relevant to physiotherapy management in the inpatient setting. The checklist was trialed on a randomly selected patient file. The results gathered by the Physiotherapy Professional Leader (PPL) at Waitemata District Health Board were compared with the results gathered by the auditor, which enabled any points of difference to be discussed and clarified with the PPL. Nothing was changed as a result of this process.

All clinical records for patients with a discharge diagnosis of stroke, discharged from a public hospital in the Auckland region, within a consecutive three month period in 2012, were retrieved, resulting in 101 sets of records. Records were selected if the patient was admitted to an acute ward (stroke unit or medical ward) or Assessment, Treatment and Rehabilitation ward (referred to as a rehabilitation ward) at this hospital and had received physiotherapy management. Diagnoses of transient ischaemic attack (TIA) were not included as the recommended management is published separately in the New Zealand TIA Guidelines (2008). If patients had a recorded discharge diagnosis of stroke, yet the medical notes referred to the event as a TIA, they also were excluded. Clinical records were also excluded if the records stated that physiotherapy management was not indicated. If a patient was transferred from an acute ward to the rehabilitation ward, the management received on this ward was only audited if discharge from the rehabilitation ward fell within the auditing dates.

In total, seven out of 101 records were excluded, resulting in 94 notes available for auditing and analysis. This number represented 17% of the total stroke events per year at the studied hospital and is consistent with a sample of stroke population that has been used in an Australian audit (16%) (Luker and Grimmer-Somers 2009).

Patient demographic data (age, gender, ethnicity, smoking status, admission and discharge dates to and from wards, and place of residence prior to admission and after discharge) were recorded. Audit data were extracted manually from clinical records, recorded on a hard copy sheet and transferred into an Excel Spreadsheet. The data entry was checked twice for errors and audit numbers were used to ensure confidentiality.

### Data analysis

Patient data were extracted from patients' records from the point of admission to discharge, including acute ward and rehabilitation ward admissions. The following criteria were used to identify the presence of an impairment or management issue:

Recorded in the notes as being reported by patient as a problem, or

Patient was at a lower level of function than pre-admission (by patient or health professional identification), or

Recorded by physiotherapist as an impairment, or

Results from a standardised measure indicated impairment and/or loss of function.

The impairments were recorded if present at the time of physiotherapy assessment and it should be noted that some symptoms, for example weakness, may have resolved by the time the patient was seen by the physiotherapist.

If a management issue was present, the management received was dichotomously categorised as being in alignment with the guidelines or not. If no treatment was described or documentation was inadequate, it was categorised as not in alignment. An activity limitation was also recorded as present if the activity was beyond the functional capability of a patient but not explicitly recorded. Alignment was identified if the impairment was present and the intervention received was the management recommended in the *New Zealand Clinical Guidelines for Stroke Management 2010*. Alignment was considered if there were at least five records with the impairment present. The percentage of alignment with the recommended management for each specific management issue was calculated with the denominator "impairment present" and the numerator "guideline aligned management was received". All data calculations were made using Microsoft Excel and the final percentages rounded to the nearest whole number. The overall alignment was calculated as a mean of the percentage alignment of the acute ward and rehabilitation ward. The alignment was compared between the two settings but statistical tests were not carried out.

## RESULTS

Information about audited cases is presented in Table 1. Of the 94 notes audited, all received physiotherapy management in an acute ward and 24 in both an acute and a rehabilitation ward. The mean age of patients was 76 years. The average length of stay in an acute ward was 10 days and 19 days in a rehabilitation ward. The majority of patients were discharged to the same place of residence as before the stroke (74%), some were discharged to a different destination where they would receive a higher level of support (18%), a small number died (4%) and some were not stated (3%).

The recommendations for education and goal setting were relevant for all patients and therefore were a management issue for 100% of patients (Table 2). Aside from issues relevant to all patients, the most commonly identified management issues in the acute setting were loss of cardiovascular fitness (84%), falls risk (83%), and walking and mobility (72%). The most commonly identified in the rehabilitation setting were falls risk (88%), walking and mobility (88%), and loss of cardiovascular fitness (75%).

Alignment with the guideline recommendations based on the presence of impairments is shown in Table 2. The areas with the highest overall alignment with the guidelines were shoulder pain and central pain (100%) and follow up physiotherapy (99%). The overall alignment was low (less than 50%) in areas of altered sensation (5%), goal setting (14%), education (30%), contracture (37%) and falls risks (47%).

As shown in Figure 1, there was greater alignment in the rehabilitation setting than the acute setting for all management issues except for altered sensation (0% compared to 9% respectively), difficulties with activities of daily living (ADLs) (60% compared to 61% respectively), and education (17% compared to 43% respectively). No cases of central pain were identified in the acute setting.

Alignment for the management issues of activity limitations varied between acute and rehabilitation settings. The greatest overall alignment was for walking and mobility (77%), followed by sitting balance (73%), sit to stand (71%), standing balance (71%) and then difficulties with activities of daily living (60%). The ranking of order in the rehabilitation setting was similar to

**Table 1: Characteristics of Audited Patients**

| Characteristic | n | Characteristic | n (%) |
|---|---|---|---|
| Age (years) | | Ethnicity | |
| <65 | 13 | NZ European | 61 (65) |
| 65-74 | 18 | Maori | 4 (4) |
| 75-84 | 42 | Pasifika | 4 (4) |
| >85 | 21 | Other European | 16 (17) |
| Mean (range, SD) | 76 (36-100, 12) | Chinese | 7 (7) |
| | | Middle Eastern | 1 (1) |
| | | Not stated | 1 (1) |
| Mean length of stay | days (range, SD) | Discharge destination | |
| Acute ward | 10 (1-38, 8) | Same as preadmission | 70 (74) |
| Rehabilitation | 19 (1-56, 14) | Different to preadmission | 17 (18) |
| | | Deceased | 4 (4) |
| | | Not stated | 3 (3) |
| Sex | | Smoking status | |
| Male | 55 (59%) | Current (<4 weeks) | 10 (11) |
| Female | 39 (41%) | Ex smoker | 35 (37) |
| | | Non smoker | 48 (51) |
| | | Not stated | 1 (1) |

the overall ranking of alignment, but the order of alignment in the acute setting was ranked differently. Sitting balance had the highest alignment (71%) out of activity limitations in the acute setting. Upper limb functional deficit had the lowest level of alignment out of activity limitations in both the acute and rehabilitation settings and this was reflected by an overall alignment of 52%. Weakness was also a fairly common problem as 59% of patients admitted to an acute ward and 73% of those in a rehabilitation ward were identified as having weakness; however, guideline alignment was only 39% and 75% respectively.

Although cardiovascular fitness was identified as one of the most prevalent issues in both the acute and rehabilitation settings, the overall alignment was only 51% (acute: 24%, rehabilitation: 78%). In addition, physiotherapists identified impairments with neuromuscular control and coordination, but there were no clinical recommendations in the guidelines to which management could be aligned.

## DISCUSSION

The key finding of this audit is that activity related limitations were regularly addressed but there were variations in areas of alignment. Variation was seen between settings (acute compared to rehabilitation) and also between different issues addressed, relating to the type of impairment. Barriers may have hindered the provision of management in alignment with the guidelines and consequently some management issues may appear prioritised. For example, it appears that importance is placed on enabling patients to regain their functional ability in order to manage activities of daily living once discharged from the hospital.

The literature suggests various barriers to providing care in alignment with national guidelines. These include lack of time (Bayley et al 2012, Hammond et al 2005, Heinemann et al 2003, Luker and Grimmer-Somers 2009, Otterman et al 2012, Van Peppen et al 2008), staffing issues (Bayley et al 2012, Hamilton et al 2006, Walsh et al 2009) and financial factors (Heinemann et al 2003, Otterman et al 2012, Van Peppen et al 2008, Wolfe et al 1997). In particular, barriers identified by the Ontario stroke group (Bayley et al 2008) such as lack of time, team functioning and communication and prioritisation of therapy may have challenged the direct translation of guidelines into practice in the current study. It also cannot be assumed that the recommended management was a suitable treatment, as medical stability and co-morbidities are just two factors which may influence the decision to provide an intervention. As this audit only provides data on alignment, it would be beneficial to explore what factors affect alignment to the guidelines in New Zealand.

In the acute setting, activity limitations had a higher alignment than impairments such as weakness, in contrast to the rehabilitation wards, where the management of weakness and activity limitations had similar rates of alignment. This may be because in the acute setting, functional activities need to be prioritised to facilitate discharge. A shorter length of stay in an acute ward implies time constraints and so one intervention may have been used to address multiple issues. Interventions recommended by the guidelines for one issue, for example repeated sit to stand practice for limitations with sit to stand, could have been used with the aim of also addressing weakness, even though this activity does not explicitly meet the recommendation for weakness. This explanation could not be substantiated as the rationale for treatment selection was not documented.

**Table 2: Alignment with Recommended Management**

| Management issue | Acute |  |  | Assessment, Treatment and Rehabilitation |  |  | Overall alignment (%) |
|---|---|---|---|---|---|---|---|
|  | Impairment present (n) | Guidelines met (n) | Alignment (%) | Impairment present (n) | Guidelines met (n) | Alignment (%) |  |
| Sensorimotor impairment |  |  |  |  |  |  |  |
| Weakness | 55 | 22 | 40% | 17 | 13 | 76% | 58% |
| Altered sensation | 22 | 2 | 9% | 3 | 0 | 0% | 5% |
| NMC/coordination* | 16 | - | - | 5 | - | - | - |
| Activity limitations |  |  |  |  |  |  |  |
| Sitting balance | 24 | 17 | 71% | 4 | 3 | 75% | 73% |
| Sit to stand | 36 | 24 | 67% | 12 | 9 | 75% | 71% |
| Standing balance | 59 | 36 | 61% | 17 | 13 | 76% | 69% |
| Walking/mobility | 68 | 46 | 68% | 21 | 18 | 86% | 77% |
| Upper limb functional deficit | 26 | 12 | 46% | 7 | 4 | 57% | 52% |
| Difficulties with ADLs† | 28 | 17 | 61% | 5 | 3 | 60% | 60% |
| Secondary complications |  |  |  |  |  |  |  |
| Contracture | 12 | 4 | 33% | 5 | 2 | 40% | 37% |
| Subluxation | 7 | 5 | 71% | 2 | 2 | 100% | 86% |
| Shoulder Pain | 7 | 7 | 100% | 1 | 1 | 100% | 100% |
| Central Pain | 0 | 0 | - | 1 | 1 | 100% | 100% |
| Swelling | 1 | 0 | 0% | 1 | 0 | 0% | 0% |
| Loss of cardiovascular fitness/decreased exercise tolerance | 79 | 19 | 24% | 18 | 14 | 78% | 51% |
| Fatigue | 37 | 16 | 43% | 8 | 5 | 63% | 53% |
| Other |  |  |  |  |  |  |  |
| Education | 94 | 40 | 43% | 24 | 4 | 17% | 30% |
| Falls risk | 78 | 22 | 28% | 21 | 14 | 67% | 47% |
| Follow up physiotherapy | 41 | 40 | 98% | 6 | 6 | 100% | 99% |
| Goal setting | 94 | 6 | 6% | 24 | 5 | 21% | 14% |

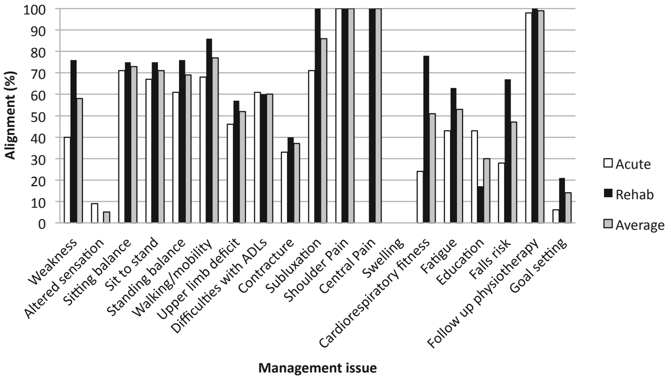
Notes. There are no recommendations for the management of neuromuscular control and coordination therefore no data was gathered on alignment. *NMC: Neuromuscular control. †ADLs: Activities of daily living.

The rationale for the management of sensation was unclear and although alignment was good for the consensus recommendation of assessing and informing the patient, the grade C evidence supporting interventions was not always followed. Because there was no documentation to justify that the sensation intervention was not appropriate, management was recorded as not aligned. Thus more evidence is required to enable appropriate management.

Once patients were able to mobilise independently or were at a functional level similar to their preadmission status, they were discharged from acute physiotherapy. If a patient was identified as having the potential to benefit from further rehabilitation they were usually discharged to a rehabilitation ward. Although it is important to start rehabilitation as early as possible, the consistently higher alignment of management in the rehabilitation setting indicates the consideration of whether it is feasible to expect care 100% aligned with guidelines in the acute setting or to focus on providing care according to clinical risk.

When patients are in hospital for a prolonged period of time for rehabilitation and are of low clinical risk, cardiovascular fitness must not be overlooked. A loss of cardiovascular fitness was documented as an impairment in 84% (acute) and 75% (rehabilitation) of cases but has been identified as a precursor of stroke as well as a secondary complication. Severe cardiovascular deconditioning occurs

**Figure 1: Physiotherapy alignment with stroke guidelines at a public Hospital, Auckland Region.**



as a result of the immobility imposed after early stroke (Kelly et al 2003), which implies all patients would benefit from addressing this issue. There is grade A evidence to support that interventions should be provided to increase cardiovascular fitness once the person with stroke has sufficient strength in the large lower limb muscle groups, and regular ongoing fitness training should be encouraged. This would consequently address what the guidelines identify as a secondary complication, as well as addressing secondary prevention of subsequent cardiovascular events (Saunders et al 2009, Stroke Foundation of New Zealand and New Zealand Guidelines Group 2010). Only half the patients identified as having reduced cardiovascular fitness received management in alignment with the guidelines, so this may be an area to focus on for change.

The focus of physiotherapy management for activity limitations appeared to be on lower limb function and mobility, as upper limb functional deficits had the lowest overall alignment of the activity limitations. The audit performed by Hubbard et al (2012) found that alignment for this management issue was 60%, compared to an average 52% in the current study. Hubbard et al (2012) gathered data from hospitals that included management from all disciplines rather than focusing specifically on physiotherapy. When gathering the data for the current audit, it was observed that the alignment of management for this issue occurred when a physiotherapist performed a joint therapy session with an occupational therapist and did repetitive task related training. Thus, a lower alignment of physiotherapy management to guidelines may be owing to team functioning, with another profession taking a lead role in providing the management. It would be beneficial to conduct further research into factors such as role overlap, which may affect the implementation of guidelines.

The low alignment for issues such as education of the patient and goal setting appears to be a cause for concern and requires further investigation. Both goal setting and patient education are key competencies of physiotherapists; however, a lack of alignment may also be a result of role overlap or paucity of documentation. Goal setting is not only relevant to physiotherapy and consequently may not have been documented in the physiotherapy notes if it occurred in a team setting. Education and strategies for fatigue management was not clearly provided which was also reflected in the low alignment for fatigue management. It is also important for physiotherapists to clearly provide ongoing education tailored to patients' needs regarding exercise and secondary prevention, and also managing with their impairments once discharged.

Management of patients with falls risk also had low alignment. The guidelines recommend, based on consensus, that a valid tool should be used for screening and identifying patients at risk of falls. The audit indicated that the "patient handling profile" or a Morse Falls Risk score card was used in this study's hospital to assess a patient on admission. Some patients did receive an individual exercise programme but although a referral may have been made to receive care in the community, it was not possible for our audit to determine if this guideline had been met.

The management of shoulder pain and central pain were closely aligned with the guidelines, but these results should be interpreted with caution as there were only a small number of cases with these impairments. Furthermore, the evidence to support the management of these impairments is grade B, C or consensus, which provides less clear direction for clinical practice. The recommended management often involved referring to a specialist or not providing an intervention, such as ultrasound for shoulder pain, so alignment with the guidelines did not necessarily reflect active treatment.

This audit provides a comprehensive picture of stroke care provided by physiotherapists at a public hospital in the Auckland region, based on clinical documentation. Future research could extend this audit to other hospitals in New Zealand and explore what facilitates or hinders alignment to guidelines in the New Zealand. It would be beneficial to perform qualitative research to explore the barriers to implementation of the stroke guidelines in New Zealand.

## Limitations

The results of this study are limited to the findings of one New Zealand hospital which may be different to clinical practice at other New Zealand hospitals. Additionally, alignment with management may have been under-reported because data were retrospectively extracted from clinical records. The results were limited by the quality of documentation, so it is not possible to say whether patients actually received the intervention recorded or whether they received interventions which were not recorded. For the purposes of this audit, it had to be assumed that if an intervention was not recorded it was not received. Impairments may have been present but not assessed and therefore also have been under-reported. The scope of this study was limited to the interventions provided by physiotherapists. A lack of alignment with the guidelines therefore may also have been a result of another profession providing management for the impairment. An advantage of working in a multidisciplinary team is that roles overlap and therefore different professions can focus on different impairments. However, a risk when working in a multidisciplinary team can arise if assumptions are made about another discipline providing an intervention which then does not occur at all. This risk can be minimized by effective communication and use of clinical pathways.

This study was an audit of alignment but not outcomes. The content may have appeared to be the recommended management but it is not possible to determine how effective the management was, as the focus was on content of management and not duration, frequency or intensity. In order to get reliable data for these parameters, an observational study would have to be conducted.

## CONCLUSION

This audit provides an initial picture of the current alignment of physiotherapy management with the New Zealand Guidelines for Stroke Rehabilitation (2010) at a public hospital in the Auckland region. The results show variation in areas of alignment, with activity related limitations being addressed fairly consistently.

Clinical services can use these data to inform their practice. Implications from this study include the importance of continuing to address activity limitations to achieve function and mobility. However, recommendations regarding goal setting and education are supported by strong evidence and therefore should be provided and clearly documented in physiotherapy clinical notes. Issues which may not appear to be a primary functional problem should not be overlooked, especially if the evidence can support interventions to support secondary complications and prevention. Despite the need for stronger evidence to guide management of some issues, there is scope to improve alignment of physiotherapy management, particularly in areas where there is robust evidence.

## KEY POINTS:

- Physiotherapists' management of activity limitations to enable function and mobility are consistently aligned with the guidelines.
- Physiotherapists' provision and documentation of goal setting and patient education showed poor alignment to the guidelines despite strong evidence.
- There was less alignment to stroke guidelines when recommendations were supported by lower level evidence, and further research on how to best manage these issues (such as sensation and neuromuscular control) would be beneficial.
- Further detailed audits of physiotherapy management of stroke in other settings are also likely to provide useful and setting-specific information to improve stroke care.

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## CORRESPONDING AUTHOR

Suzie Mudge, A-11 AUT University, Private Bag 92006, Auckland 1142. Email: suzie.mudge@aut.ac.nz

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## CONFLICT OF INTEREST

The authors identify no conflicts of interest.

## PERMISSIONS

Approval for this research was obtained from the Waitemata District Health Board Awhina Research and Knowledge Centre.

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| Audit checklist for management issues and alignment with the New Zealand Clinical Guidelines for Stroke Management 2010 | | | | | | Audit # | |
|---|---|---|---|---|---|---|---|
| **Management issue** | Acute | | Rehabilitation | | Measurement used | | |
| **APPENDIX 1** | Impairment present | Guidelines met | Impairment present | Guidelines met | | | |
| *Sensorimotor impairment* | | | | | | | |
| Weakness | | | | | | | |
| Altered sensation | | | | | | | |
| NMC*/coordination | | | | | | | |
| *Activity limitations* | | | | | | | |
| Sitting balance | | | | | | | |
| Sit to stand | | | | | | | |
| Standing balance | | | | | | | |
| Walking/mobility | | | | | | | |
| Upper limb functional deficit | | | | | | | |
| Difficulties with ADLs** | | | | | | | |
| *Secondary complications* | | | | | | | |
| Contracture | | | | | | | |
| Subluxation | | | | | | | |
| Shoulder Pain | | | | | | | |
| Central Pain | | | | | | | |
| Swelling | | | | | | | |
| Loss of cardiovascular fitness/decreased exercise tolerance | | | | | | | |
| Fatigue | | | | | | | |
| *Other* | | | | | | | |
| Education | | | | | | | |
| Identified falls risk | | | | | | | |
| Referral for follow up physiotherapy | | | | | | | |
| Goal setting | | | | | | | |
| **Notes**<br>*NMC: Neuromuscular control **ADLs: activities of daily living | | | | | | | |

## APPENDIX 2

| Management issue | Guideline recommendations |
|---|---|
| *Sensorimotor impairment* | |
| Weakness | One or more of the following interventions should be used for people who have reduced strength: Progressive resistance exercise, EMG biofeedback with conventional therapy, Electrical stimulation. |
| Altered sensation | People with stroke should be assessed by an appropriate health practitioner for loss of or reduction or alteration of sensation, including hypersensitivity. This information should be shared with patients, their family/carers and the interdisciplinary team in order to implement specific strategies for optimising function and safety. Sensory-specific training can be provided. Sensory training designed to facilitate transfer can also be provided. |
| *Activity limitations* | |
| Sitting balance | Sitting practice with supervision/assistance should be provided for people who have difficulty sitting |
| Sit to stand | Practising standing up should be undertaken for people who have difficulty in standing up from a chair |
| Standing | Practising standing up should be undertaken for people who have difficulty in standing up from a chair |
| Walking | After thorough assessment and goal setting by a trained clinician, all people with difficulty walking should be given the opportunity to undertake tailored, repetitive practice of walking (or components of walking) as much as possible. One or more of the following interventions can be used in addition to conventional walking therapy:<br>cueing of cadence<br>mechanically assisted gait (via treadmill, automated mechanical or robotic device)<br>joint position biofeedback<br>virtual reality training<br>Ankle-foot orthoses can be used for people with persistent drop foot. If used, the ankle-foot orthosis should be individually fitted |
| Upper limb functional deficit | For people with difficulty using their upper limb one or more of the following interventions should be given in order to encourage using their upper limb as much as possible:<br>constraint-induced movement therapy<br>mechanical assisted training<br>repetitive task-specific training<br>One or more of the following interventions can be used in addition to interventions listed above:<br>mental practice<br>mirror therapy<br>EMG biofeedback in conjunction with conventional therapy<br>electrical stimulation<br>bilateral training |
| Difficulties with ADLs | Patients with difficulties in performance of daily activities should be assessed by a trained clinician<br>Patients with confirmed difficulties in personal or extended activities of daily living should have specific therapy (e.g., task-specific practice and trained use of appropriate aids) to address these issues<br>Other staff members, the person with stroke and carer/family should be advised regarding techniques and equipment to maximise outcomes relating to performance of daily activities and life roles, and to optimise sensorimotor, perceptual and cognitive capacities.<br>People with difficulties in community transport and mobility should set individualised goals and undertake tailored strategies such as multiple escorted outdoor journeys (i.e., up to seven) which may include practice crossing roads, visits to local shops, bus or train travel, help to resume driving, aids and equipment, and written information about local transport options/alternatives<br>Administration of amphetamines to improve activities of daily living is NOT currently recommended<br>The routine use of acupuncture alone or in combination with traditional herbal medicines is NOT currently recommended in stroke |

| | |
|---|---|
| *Secondary complications* | |
| Contracture | For people at risk of developing contractures undergoing active rehabilitation, the addition of prolonged positioning of muscles in a lengthened position to maintain range of motion is NOT recommended<br>Overhead pulley exercise should NOT be used to maintain range of motion of the shoulder<br>For people who have contracture, management can include the following interventions to increase range of motion:<br>electrical stimulation<br>casting/serial casting |
| Subluxation | For people with severe weakness who are at risk of developing a subluxed shoulder, management should include one or both of the following interventions to minimise subluxation:<br>electrical stimulation<br>firm support devices<br>For people who have developed a subluxed shoulder, management can include firm support devices (e.g., lap trays, arm troughs and triangular slings) to prevent further subluxation<br>People with stroke, carers and staff should receive appropriate training in the care of the shoulder and use of support devices to prevent/minimise subluxation. |
| Shoulder Pain | For people with severe weakness who are at risk of developing shoulder pain, management can include:<br>shoulder strapping<br>interventions to educate staff, carers and people with stroke to prevent trauma to the shoulder.<br>For people with severe weakness who are at risk of developing shoulder pain or who have already developed shoulder pain, the following interventions are NOT recommended:<br>Ultrasound<br>As there is no clear evidence for effective interventions once shoulder pain is already present in people with stroke, management should be based on other guidelines for acute musculoskeletal pain |
| Central Pain | People with stroke found to have unresolved central post stroke pain should receive a trial of:<br>tricyclic antidepressants (e.g., trial amitriptyline first followed by other tricyclic agents or venlafaxine)<br>anticonvulsants (e.g., carbamazepine)<br>Any patient whose central post stroke pain is not controlled within a few weeks should be referred to a specialist pain management team.<br>Other muscular skeletal conditions should be considered as a cause for the patient's pain. |
| Swelling | For people who are immobile, management can include the following interventions to prevent swelling in the hand and foot:<br>dynamic pressure garments for the upper limb<br>electrical stimulation<br>elevation of the limb when resting<br>For people who have swollen extremities, management can include the following interventions to reduce swelling of the hand and foot:<br>dynamic pressure garments for the upper limb<br>electrical stimulation<br>continuous passive motion with elevation<br>elevation of the limb when resting |
| Loss of cardiovascular fitness | Rehabilitation should include interventions to increase cardiorespiratory fitness once the person with stroke has sufficient strength in the large lower limb muscle groups. People with stroke should be encouraged to undertake regular, ongoing fitness training. |
| Fatigue | Therapy sessions should be scheduled and paced to coincide with periods of the day when the person with stroke is most alert and least likely to be physically or cognitively fatigued.<br>People with stroke and their families/carers should be provided with information and education about fatigue including potential management strategies. |

| | |
|---|---|
| *Other* | |
| Education | Where change is required, initial and ongoing education is essential and is relevant for all recommendations in this guideline. All people with stroke and their families/carers should be offered information that is tailored to meet their needs and provided using relevant language and communication formats.<br>Information should be provided at different stages in the recovery process.<br>Routine, follow-up opportunities should be provided to people with stroke and their families/carers with opportunities for clarification or reinforcement of the information provided. |
| Screening: falls risk | Falls risk assessment should be undertaken using a valid tool on admission to hospital. A management plan should be initiated for all those identified as at risk of falls.<br>Multifactorial interventions in the community, including an individually prescribed exercise programme, should be provided for people who are at risk of falling. |
| Referral for follow up physiotherapy | Patients should be transferred to a stroke rehabilitation unit (where available) if ongoing inpatient rehabilitation is required. All patients with severe stroke, who are not receiving palliative care, should be assessed by the specialist rehabilitation team regarding their suitability for ongoing rehabilitation prior to discharge from hospital. |
| Goal setting meeting | Where it is the wish of the persons with stroke (and their family/carer), carers should be actively involved in the recovery process by assisting with goal setting, therapy sessions, discharge planning, and long-term activities. All persons with stroke and their family/carer involved in the recovery process should have their wishes and expectations established and acknowledged.<br>All persons with stroke and their family/carer should be provided with the opportunity to participate in the process of setting goals unless they choose not to or are unable to participate.<br>Health practitioners should collaboratively set goals with the patient for rehabilitation. Goals should be prescribed, specific and challenging. They should be recorded, reviewed and updated regularly.<br>People with stroke should be offered training in self-management skills, which include active problem-solving and individual goal setting. |

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# Barriers and facilitators to engagement in rehabilitation for people with stroke: a review of the literature

Grace A MacDonald BHSc (Physiotherapy), NZRP
*Physiotherapist (Shore Physiotherapy)*

Nicola M Kayes BSc, MSc(Hons), PhD
*Senior Lecturer, Person Centred Research Centre, Health and Rehabilitation Research Institute, AUT University*

Felicity Bright BSLT (Hons), MHSc (Hons), MNZSTA
*Speech Language Therapist, School of Rehabilitation and Occupation Studies*
*PhD Candidate, Person Centred Research Centre, Health and Rehabilitation Research Institute, AUT University*

## ABSTRACT

While there is a growing acknowledgement of the significant role that engagement plays in rehabilitation, there is limited knowledge of the factors that may help or hinder engagement in stroke rehabilitation. This review drew on systematic principles and aimed to explore what is currently known about the perceived barriers and facilitators to engagement in stroke rehabilitation. EBSCO, SCOPUS and Google Scholar databases and reference lists were searched for papers that provided insight into the process of engagement or disengagement in stroke rehabilitation. Data were extracted and synthesised thematically from 17 papers. Themes included goal setting, therapeutic connection, personalised rehabilitation, paternalism versus independence, patient centred practice, knowledge is power, and feedback and achievement. None of the papers identified however, explicitly sought to investigate the complexities of engagement in rehabilitation specifically within the stroke population. Future research is needed to explore this topic in more depth from the perspective of all the key stakeholders. A more comprehensive understanding of engagement in stroke rehabilitation may inform the development of interventions to better equip rehabilitation providers with the clinical skills to facilitate engagement and effectively deliver rehabilitation modalities.

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Key Words: stroke, rehabilitation, engagement, facilitator, barrier, experience

## INTRODUCTION

Strokes are a major source of disability in the New Zealand adult population, with around 7600 people experiencing a stroke each year (Stroke Foundation 2012). In 2007 there were estimated to be 57,700 stroke survivors living in New Zealand, many severely disabled and needing significant daily assistance (Ministry of Health 2008). This number is likely to have increased since. It is suggested that these individuals, many who often have multiple impairments affecting physical, cognitive and/or communicative functioning, may benefit from an intensive multidisciplinary rehabilitation approach (Bonita et al 1993, Horton et al 2011). Rehabilitation is advocated as best practice following stroke (Stroke Foundation of New Zealand 2010); however, the positive outcomes observed in response to rehabilitation strategies in research frequently fail to translate to effective strategies in real world practice. A person's engagement within the rehabilitation process has been suggested as one variable that may impact on rehabilitation outcomes (Lequerica et al 2009, Lequerica and Kortte 2010, Medley and Powell 2010).

Lequerica and Kortee (2010) define engagement as "a deliberate effort and commitment to working toward the goals of rehabilitation interventions, typically demonstrated through active, effortful participation in therapies and cooperation with treatment providers" (p.416) in which individuals incorporate "high levels of vested interest" (p.416). It is suggested that engagement is demonstrated through body language and non-verbal actions (Simmons-Mackie and Kovarsky 2009), as well as attendance, compliance, working alliance, disclosure and active participation within rehabilitation sessions (Lequerica and Kortte 2010, Staudt et al 2012, Tetley et al 2011). Increased levels of engagement within the rehabilitation process have been associated with enhanced adherence and attendance, functional improvements during inpatient rehabilitation, reduced levels of depression and improved function after discharge (Kortte et al 2007, Lequerica and Kortte 2010). Absence of patient engagement within rehabilitation can impede an individual's functional recovery of cognitive and motor functioning and increase their time in hospital (Lequerica et al 2009, Lequerica and Kortte 2010).

Despite the increasing acknowledgment of the significant role that engagement plays in rehabilitation, there is less known about what constitutes engagement, influencing factors, and how it is best applied in a clinical setting. Rehabilitation is a lifelong process for many people following stroke. As such a more comprehensive understanding of the factors that may help or hinder their engagement in that process is needed.

This may inform the development of interventions to better equip rehabilitation providers with the clinical skills to facilitate engagement and effectively deliver rehabilitation modalities. The aim of this review was to explore what is currently known about the perceived barriers and facilitators to engagement in stroke rehabilitation.

## METHOD

A literature review drawing on principles of systematic review and using thematic analysis was undertaken.

### Search Strategy

Key search terms are stated in Table 1. Databases searched included EBSCO health databases (CINAHL, MEDLINE, SPORTDiscus, Health Source: Nursing/Academic Edition & Psychology and Behavioral Sciences) and Scopus. In addition, a hand search of the reference lists from all included articles and two review articles was completed in order to capture any additional papers relevant to the topic. Finally, a Google Scholar search was administered using the terms; "stroke", "engagement" and "rehabilitation" and the first 50 citations reviewed.

**Table 1: Key search terms for the literature search**

| |
|---|
| stroke OR cva OR "cerebrovascular accident*" OR "cerebrovascular disease" |
| AND |
| rehabilit* OR "physical therap*" OR physiotherap* OR "occupational therap*" OR therap* |
| AND |
| participat* OR engage* OR involvement |
| AND |
| success* OR fail* OR help OR hinder OR facilitat* OR barrier* OR experience* |

### Inclusion and exclusion criteria

Papers were included if they reported empirical studies that provided insight into the process of engagement or disengagement in stroke rehabilitation. They were included if they were: a) published in an English-language peer-reviewed journal; b) set in the context of active stroke rehabilitation, and c) either explicitly explored engagement-related issues, reported engagement-related issues as a key finding, or if they explored experiences of stroke rehabilitation such that they might offer insight into engagement-related issues. Papers were considered to be set in the context of active stroke rehabilitation if there was evidence of, or reference to, a therapeutic encounter between a person with stroke and rehabilitation professional. Papers which met these criteria were included regardless of whose perspectives of engagement were being explored, including but not limited to people with stroke, their caregivers, family/whānau and/or health professionals working in the context of stroke rehabilitation. Papers were excluded if they were not exclusive to stroke rehabilitation, for example, where participants with impairments not related to stroke were included in the study sample.

### Procedures

The titles and abstracts of all papers yielded in the search were screened for relevance independently by two researchers (GM and FB). Full text copies of papers were obtained when papers were identified to possibly or probably meet the inclusion criteria, or if this could not be determined by reviewing the title and abstract. The full text was then reviewed to confirm eligibility. Disagreements regarding eligibility for inclusion were initially discussed by GM and FB to see if a consensus could be reached. If agreement was not reached, a third researcher (NK) was called upon to arbitrate. Included articles were read multiple times to gain an in-depth understanding of the selected topic. Analysis identified key ideas relating to the process of engagement in stroke rehabilitation and factors that were perceived to help or hinder this process. These were coded initially by the lead author; these codes were then grouped to generate themes. Meetings were held to discuss codes, themes and supporting data to check for consistency of interpretation.

### Data extraction and critical appraisal

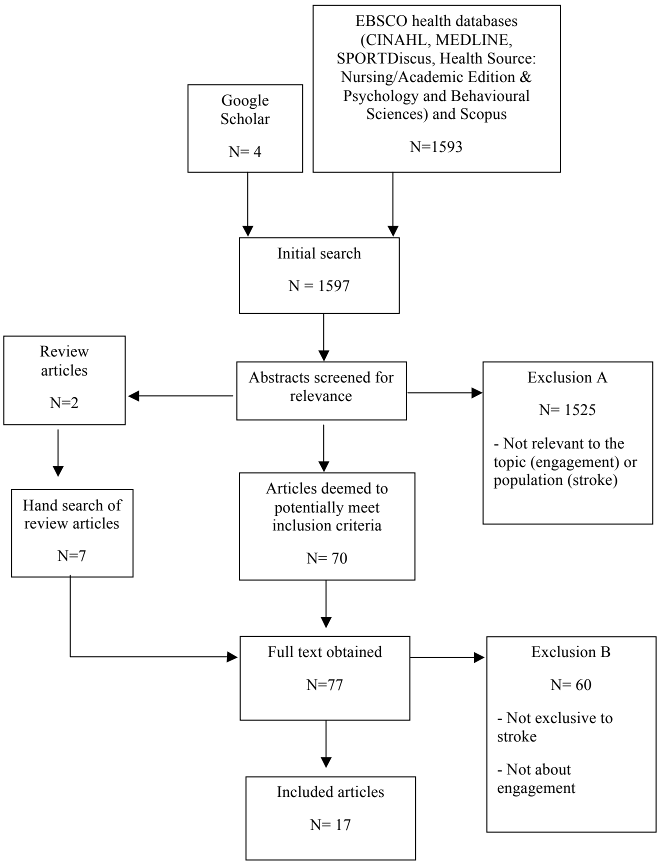
The included articles were read and relevant data extracted including study aim, design, data collection methods, study perspective, participants and key findings relevant to engagement. The methodological quality of qualitative studies was determined using the Critical Appraisal Skills Programme (CASP) framework. This tool uses ten questions to critique theoretical perspectives and quality of qualitative research evidence (Public Health Resource Unit 2007). The mixed method studies were critiqued using the mixed method appraisal tool, a tool designed to concomitantly appraise and describe the methodological quality for three methodological domains of studies: mixed, qualitative and quantitative (Pluye et al 2011). Critical appraisal was undertaken by the lead author with oversight by NK regarding the appropriateness and relevance of the study design, explicitness and generalisibility of the reported findings and relevance to practice. Papers were included in the review regardless of methodological quality as per recommendations for this type of review where the aim is to gain a better conceptual understanding of a phenomenon of interest (Morse 2000). Methodological quality was reported so the findings might be interpreted within that context.

## RESULTS

The search results are outlined in Figure 1. In total, 1597 articles were identified using the original search terms and were screened for applicability. Of these, 70 were identified as probably or possibly meeting the inclusion criteria. Two review articles were identified and although they were not directly relevant to engagement in stroke rehabilitation, their reference lists were hand searched identifying a further seven potentially relevant articles. The full texts of these 77 papers were retrieved. After reviewing the full text, 17 were identified to meet the inclusion criteria for this review.

Table 2 refers to the characteristics of the included studies. None of the included articles explicitly explored engagement within a stroke rehabilitation setting. The majority explored experiences of stroke rehabilitation such that they might

**Figure 1: Search result**



offer insight into engagement-related issues. Of the 17 studies that explored patient and therapist experiences of stroke rehabilitation, 14 were qualitative and three used a mixed method design. Several papers used semi-structured interviews whilst some also used observation and a range of questionnaires.

The quality of included studies varied widely with findings of the quality appraisal presented in Tables 3 and 4. Several of the studies met the majority of the appraisal tool criteria whilst others only met a few. It was unclear in a number of studies whether certain criteria were met due to the insufficient detail provided. Common weaknesses within the studies included: little or no critical examination of the relationship between researcher and participant (e.g. critically examining their own pre-conceptions and potential for that to influence the formulation of research questions, data collection and interpretation of findings) and the failure to mention whether saturation was met in the qualitative research. Strengths included clear description of aims, consideration of ethical issues and clear statement of study findings.

Thematic analysis of the included papers identified several factors perceived to help or hinder engagement in stroke rehabilitation. These included goal setting, therapeutic connection, personalised rehabilitation, paternalism versus independence, patient centred practice, knowledge is power and feedback and achievement. These themes are described in more detail below.

### *Goal Setting*

Goal setting was considered an essential component of an effective rehabilitation programme by those who suffered from stroke and their therapists offering an opportunity to motivate and engage a person in their rehabilitation (Bendz 2003, Maclean et al 2000, Marklund et al 2010, Wottrich et al 2004). A patient centred approach was perceived to be the most effective form of goal setting; an example of this was demonstrated by Bendz (2003). This paper looked at the perspectives of patients with stroke and their therapists within the first year of their rehabilitation and found that goals set within the rehabilitation setting can differ between the patient and therapist. A key finding of Bendz (2003) was the importance of personally relevant goals that are based on mutual understanding, negotiation and interaction.

Further studies have observed enhanced patient motivation towards their rehabilitation when clear goals are established prior to treatment (Bendz 2003, Maclean et al 2000, Marklund et al 2010, Wottrich et al 2004). Maclean et al (2000) and Marklund et al (2010) found that goal setting and establishing a goal orientated work ethic were important factors believed to increase patient motivation. Furthermore, MacLean et al (2000) identified that patients were more likely to achieve goals when they understood the therapeutic reasoning behind their goals. This suggests that involving a patient in the goal setting process may enhance their engagement in their rehabilitation. This may be due to their increased understanding of the therapeutic reasoning for their rehabilitation pathway and/or due to identification of patient centred goals individualised to the patient's needs.

### *Therapeutic Connection*

The therapeutic relationship between patient and therapist has been suggested to possibly influence the process of engagement within stroke rehabilitation. Literature identified three key ways in which the therapist appeared to influence engagement: 1) through their manner; 2) the level of support they provided patients; and 3) their level of involvement as perceived by the patient (Ewan et al 2010, Gillot et al 2003, Maclean et al 2000, Proot et al 2000a, Proot et al 2000b, Reid and Hirji 2004, Wottrich et al 2004).

The therapist's manner towards their patient seemingly affected the strategies they adopted, both positively and negatively. It also appeared to impact on the patient's ability to engage within their rehabilitation. A study by Proot et al (2000) identified that patients believed therapists should portray consistency, attentiveness, respect and a supportive manner; these were considered key characteristics of an effective therapist. These characteristics were required to ensure appropriate support was provided to enhance an individual's self-determination and self-confidence. Proot et al (2000b) observed that a lack of therapist attentiveness could result in unattainable goals being established and unrealistic patient expectations.

The level of therapist support was another factor perceived to influence an individual's perception of their therapist's attitude.

**Table 2: Characteristics of included studies**

| Author | Aim of Study | Design | Method of data collection | Perspective | Participants |
|---|---|---|---|---|---|
| Bendz (2003) | To investigate different understandings of the implications of having a stroke from the perspective of those who have had a stroke and heir health care professionals. | Qualitative: Phenomenographic design | Interviews using open ended questions and transcripts from health care professionals recorded during first year post stroke | Health professional and patient perception | Health Professionals (n=not stated) and stroke patient (n=15); aged less than 65. 10 had had a stroke for the first time and 5 had experienced one or more strokes were recruited from a Swedish hospital over a one year period |
| Daniels et al (2002) | To explore and gain an understanding of Occupational therapists experiences of therapy with patients in inpatient stroke rehab | Qualitative: Explorative design | Two focus group semi structured interviews using a case sample.<br>Analysis using Kvale's description of meaning interpretation | Therapist (occupational therapist) perception | Occupational therapists (n=13) recruited from twelve departments of rehabilitation (community and hospital based) in the Netherlands and Belgium. Therapist experience ranged from an average of 8-19 years. |
| Ewan et al (2010) | To explore 8 peoples experiences and responses to taking part in a personalised observation based intervention for stroke rehab | Qualitative observation based design | Semi-structured interviews (based on an interview guide)<br>Analysed using the inductive content analysis approach | Patient perception | Stroke patients (n=8); aged 44-70 ranging from 12-102 months post stroke. Recruited from three UK-based stroke support groups and scored higher than 70 on the modified Mini-Mental State Examination. |
| Gillot et al (2003) | To explore and describe perceptions and experiences of 2 stroke survivors who took part in a Constraint Induced Movement Therapy home rehab program | Multimethod approach: phenomenological design. In depth case studies were used to investigate qualitative themes and a within-subject design to obtain quantitative information regarding the participants functional performance. | Five meetings (interviews based on interview guide)<br>Minnesota rate of manipulation test (MRMT), Arm motor ability test (AMAT) & COPM<br>Analysis (open coding, axial coding & selective coding) | Patient perception | Convenience sample stoke patients (n=2); aged 42-65 identified through community referrals. Time since stroke ranged from 2-9 years |
| Higgins et al (2005) | To investigate the delivery of an arts based intervention to stroke patients and sought users and professionals views of perceived barriers | Qualitative: Exploratory and descriptive design | Participant observations &<br>In-depth semi-structured interviews (based on an interview topic guide)<br>Analysis using the framework method | Therapist and Patient perception | Participants were recruited from the stroke rehabilitation ward of a London teaching hospital.<br>Purposive sample of therapists (n=8)<br>Purposive sample of Stroke patients (n=21); aged 32-87 |

|  |  |  |  |  |  |
|---|---|---|---|---|---|
| Leach et al (2010) | To describe current practices in goal setting within a sub acute rehab setting from the perspective of Occupational Therapists, Physiotherapists and Speech and Language Therapists | Qualitative design | Semi structured email interviews (7 semi structured open ended questions) with incorporation of case studies | Therapist (occupational therapist, speech therapists and physiotherapist) | Active participants: Therapists from the Geriatric Assessment and Rehabilitation Unit within a public metropolitan Australian Hospital setting.<br>Purposive sampling - Stroke patients in case studies (n=5); aged 49-68 |
| Lewis et al (2011) | To evaluate the feasibility and users perspectives of a novel Virtual Reality game based rehab intervention for people with stroke | Mixed methods: Prospective feasibility design | Fugl-Meyer Assessment, Box & block test<br>Post intervention questionnaire<br>Semi-structured interview<br>Analysed using the content analysis approach | Patient perception | Stroke patients (n=6); aged 55-75 ranging between 1.4-9.5 years post stroke who had upper limb hemiparesis |
| Maclean et al (2000) | To explore the attitudes and beliefs of patients with stroke identified by professionals as having high or low motivation for rehab | Qualitative design | Semi-structured interviews.<br>Analysed using content analysis approach | Patient perception | Extreme case sampling of stroke patients currently undertaking rehabilitation (n=22) –high motivation (n=14) and low motivation (n=8); on average 6 weeks post stroke. Recruited from the stroke unit of an inner city teaching hospital |
| Marklund et al (2010) | To describe patients with stroke experiences of training with lower extremity CIMT | Qualitative: Inductive design | Interviews (based on interview guide)<br>Analysis -content analysis approach | Patient perception | Patients with stoke (n=7); aged 35-74 ranging from 3-16 years post stroke. Recruited from a rehabilitation department in Sweden. |
| Proot et al (2000) | To determine facilitating and constraining factors regarding patient autonomy at discharge from nursing homes | Qualitative longitudinal design - Grounded theory approach | Open ended interviews based on interview guide<br>Analysis using the constant comparative method | Patient perception | Consecutive patients with a diagnosis of stoke (n=20); aged 50-85<br>Recruited from rehabilitation wards of three nursing homes in Limberg, Netherlands. |
| Proot et al (2000) | To determine facilitating or constraining factors regarding patient autonomy during rehab in nursing homes | Qualitative longitudinal design - Grounded theory approach | Open ended interviews based on interview guide<br>Analysis using the constant comparative method | Patient perception | Consecutive patients with a diagnosis of stroke (n=17); aged 50-85. Recruited from rehabilitation wards of three nursing homes in Limberg, Netherlands. |
| Proot et al (2007) | To explore patients with stroke experiences of health professionals approach toward autonomy in a longitudinal way | Qualitative longitudinal design - Grounded theory approach | Open ended interviews<br>Analysis using the constant comparative method | Patient perception | Consecutive patients with a diagnosis of stoke (n=22); aged 50-85<br>Recruited from rehabilitation wards of three nursing homes in Limberg, Netherlands. |

| | | | | | |
|---|---|---|---|---|---|
| Reid & Hirji (2003) | To explore the use of a virtual reality leisure intervention programme in adult stroke survivors | Mixed method<br>Exploratory cross-sectional design w/ observation | Volitional Questionnaire version 3.0, demographic questionnaire, satisfaction with life scale, mini-mental state exam, the centre for epidemiological studies depression scale and videotaping of sessions | Patient perception | Patients with stroke (n=16); aged 49-86 and lived independently in the community. Recruited by convenience sampling through stroke organizations, agencies and community centers within the Greater Toronto area. Patients had only one stroke; mean number of years post stroke was 7.38 years |
| Roding et al (2003) | To describe and analyses how younger stroke patients experienced the rehab process and to develop a hypothesis of their after stroke life situation | Qualitative design | Thematised in-depth interviews (based on interview guide)<br>Analysis using the grounded theory/ constant comparison approach | Patient perception | Purposive sample- patients with stroke (n=5); aged 37-54 ranging from 1-1.5 years post stroke. Recruited through a convenience sample from northern Sweden. |
| Schouten et al (2011) | To identify group member and staff perceptions of their involvement in a post acute, multidisciplinary stroke rehabilitation programme | Qualitative: Interpretive descriptive design | Semi structured interviews (based on interview guide)<br>Analysis (In depth thematic analysis) | Therapist (occupational therapist and physiotherapist) & Patient | Recruited through non-probability purposive sampling Staff clinicians (n=3) and stoke patients (n=4); aged 65-85 ranging 18 months-18 years post stroke who were receiving acute care in a hospital setting |
| Talvitie & Pyoria (2006) | To describe the communication actions (structures, functions and discourses) of physiotherapists and patients in counseling sessions. | Qualitative: Discourse analysis design | Videotaped measurement and counseling sessions<br>Discourse analysis conducted on transcriptions of these sessions | Therapist and patient perception | Physiotherapist (n=15) were recruited from a hospital, rehabilitation center, and three health centers in the district of East Savo, Finland., patients with stroke (n=7 female); aged 68-87 were recruited from an experimental group participating in an ongoing controlled study of stroke therapy and were in differing stages of stroke rehabilitation, Caregiver (=3) |
| Wottrich et al (2004) | To explore, describe and compare the characteristics of physiotherapy sessions with stroke patients from two different perspectives (patient and physiotherapist) in relation to observed behavior | Qualitative- Descriptive and comparative design | Observations and semi-structured interviews | Therapist (physiotherapist) and Patient perception | Physiotherapists (n= 10) with on average 4 years of professional experience (2.5 specifically working in stroke rehab) and stroke patients (n=9); aged 45-88 ranging from 6-48 months post stroke. Participants were recruited from differing rehabilitation units within the Stockholm area. |

A number of papers acknowledged the importance of therapist support in the patient maintaining a positive mood state and achieving a high degree of volition within their rehabilitation (Bendz 2003, Ewan et al 2010, Proot et al 2000b, Reid and Hirji 2004, Wottrich et al 2004). With encouragement, attention and support, patients were observed to become more receptive to both mentally and physically engaging tasks (Ewan et al 2010). In addition, Proot et al (2000b) found that positive verbal encouragement helped patients become more actively involved in their rehabilitation and deal with their disabilities in a more positive light.

The final component is the patients' perception of therapist involvement and preparation within their rehabilitation, the time constraints within each session and the multidisciplinary team (MDT) input. Time constraints were seen as a perceived barrier, influencing the way the therapist deliberated with others and delivered the therapy. Gillot et al 2003, Proot et al (2000b) and Proot et al (2007) observed time constraints within rehabilitation caused a drop in the patient's perceived effectiveness of therapy and reduced patient autonomy. Furthermore, the lack of a multidisciplinary approach was observed to cause confusion and reduce an individual's ability to 'attend' their rehabilitation, possibly influencing engagement (Proot et al 2000b). In MacLean et al (2000) one patient stated that receiving contradicting advice from health professionals regarding their rehabilitation decreased their motivation to complete their exercises and actively participate.

### *Personalised Rehabilitation*

Rehabilitation individualised to the needs and requirements of the patient has been seen as a key factor that may influence patient engagement in rehabilitation. Reid and Hirji (2003) looked at a virtual reality intervention and the factors influencing patient motivation within the stroke population. The study observed enhanced levels of self-motivation when patients were placed in a rehabilitation environment where they were able to express their creativity and personal identity. In addition, the competitive component of the virtual reality intervention resulted in engagement being sustained throughout the therapy session.

There is evidence to suggest that the familiarity and perceived importance of tasks is an integral component of engagement. Several studies found that patients were less motivated to actively participate in their rehabilitation when given tasks that were unfamiliar and not meaningful to them (Ewan et al 2010, Proot et al 2000a, Proot et al 2007, Röding et al 2003, Wottrich et al 2004). Proot et al (2007) concluded that rehabilitation needs to be personalised to the individual to whom it is being delivered, helping the patient regain a 'sense of self' and possibly enhancing their level of engagement. In another study, Ewen et al (2010) carried out an observation based intervention involving DVDs that were based on activities that the patients had valued pre-stroke. After taking part in this intervention a participant described how their motivation to take a more active role in their therapy had increased when the therapist based their rehabilitation around activities on his DVD. If individuals believed their rehabilitation was not meaningful, functional or personalised to their needs they may become disengaged from their rehabilitation (Ewan et al 2010, Proot et al 2000a).

### *Paternalism versus Independence*

The patient's degree of autonomy during their rehabilitation has been seen in present studies to possibly influence patient engagement (Maclean et al 2000, Proot et al 2000a, Proot et al 2000b, Proot et al 2007). Proot et al (2000a) indicated that as patient autonomy increases, patients often take on a more

**Table 3: Critique of current literature – Qualitative design**

| Author/ Date | Clear Aims | Was qualitative methodology appropriate? | Research design appropriate to address aims? | Recruitment strategy appropriate to the aims? | Appropriate Data collection | Relationship between researcher and participants has been adequately considered? | Ethical issues considered? | Data Analysis | Clear statement of findings? | How valuable is the research? |
|---|---|---|---|---|---|---|---|---|---|---|
| Bendz 2003 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | × | ✓ | × |
| Daniels et al 2002 | ✓ | ✓ | ✓ | × | ✓ | ✓ | × | ✓ | ✓ | ✓ |
| Ewen et al 2010 | ✓ | ✓ | × | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Higgans et al 2005 | ✓ | ✓ | × | ✓ | × | × | ✓ | × | ✓ | × |
| Leach et al 2010 | ✓ | ✓ | × | × | ✓ | × | ✓ | ✓ | ✓ | × |
| MacLean et al 2000 | ✓ | ✓ | × | ✓ | ✓ | ✓ | × | × | ✓ | ✓ |
| Marklund et al 2010 | ✓ | ✓ | × | × | ✓ | ✓ | ✓ | ✓ | ✓ | × |
| Proot et al 2000a | ✓ | ✓ | ✓ | × | ✓ | × | ✓ | ✓ | ✓ | ✓ |
| Proot et a. 2000b | ✓ | ✓ | ✓ | ✓ | ✓ | × | ✓ | ✓ | ✓ | ✓ |
| Proot et a. 2007 | ✓ | ✓ | ✓ | ✓ | ✓ | × | ✓ | × | ✓ | ✓ |
| Roding et al 2003 | ✓ | ✓ | × | × | ✓ | × | × | ✓ | ✓ | × |
| Schoulten et al 2011 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Talvitie et al 2006 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Wottrich et al 2004 | ✓ | ✓ | × | ✓ | ✓ | × | ✓ | ✓ | × | ✓ |

**Table 4: Critique of current literature – Mixed method design**

| | Qualitative | | | | Quantitative | | | Mixed Method | |
|---|---|---|---|---|---|---|---|---|---|
| Author/Date | Sources of data relevant to research question | Analysing process relevant to address the research question? | Appropriate consideration given to how findings relate to the context? | Is appropriate consideration given to how findings relate to researchers influence – through their interactions with participants? | Sampling strategy relevant to address question | Sample representative of population | Measurements appropriate | Research design relevant to address questions | Is the integration of qualitative and quantitative relevant to address the research question? |
| Gillot 2003 | ✗ | ✓ | ✗ | ✗ | ✓ | ✗ | ✓ | ✓ | ✗ |
| Lewis et al 2011 | ✓ | ✓ | ✗ | ✗ | ✗ | ✓ | ✗ | ✗ | ✗ |
| Reid & Hirji 2003 | ✓ | ✓ | ✗ | ✓ | ✓ | ✗ | ✓ | ✗ | ✗ |

active role within their rehabilitation. It was identified that a paternalistic approach portrayed by therapists was valued by individuals when making treatment-based decisions on admission to rehabilitation. Proot et al (2007) highlighted that this approach needed to be followed by provision of information and an opportunity for evaluation and deliberation. However, therapists who displayed a prolonged paternalistic approach were observed to be a constraining factor for patient autonomy, specifically self-determination and independence (Proot et al 2000b). In McLean et al (2000) patients reported feeling stupid and incapable when they were overprotected by their therapists. Motivation levels were seen to be affected by the way the patients were able to link the goal of independence to their progress.

Proot et al (2000a) highlighted the importance of encouraging patient independence. As rehabilitation progressed towards discharge, independent self cares increased and the level of support provided to the patients was adjusted to facilitate their independence. A participant in this study commented on how increased independence enhanced their autonomy:

> "At the beginning you only had to say a word. They helped you right away; physically they were there for you, emotionally as well. Now they tend to say: You can do that. I experience that as positive…" (p.280).

Proot et al (2007) concluded that the level of support provided to patients often needed to decrease for their autonomy to increase. Patients felt that increased independence gave them an opportunity to discover their own abilities and take on more responsibility in their rehabilitation. Although not explicitly explored, these findings suggest that enhanced patient autonomy may be a key determining factor for level of patient engagement.

### *Patient Centred Practice*

Proot et al (2000a, 2000b, 2007) established that patient centred practice within rehabilitation was enhanced through informing patients and giving them an opportunity to deliberate treatment plans and goals. Patient centred practice facilitated patient autonomy and enabled patients to better accept and deal with their impairments (Proot et al 2000a). In a study by Roding et al (2003), patients felt they were "walking alongside the process" when they were not adequately educated on their stroke or were not actively included in their rehabilitation.

> "I was referred to the rehabilitation ward rather quickly after the stroke but I really did not understand what I was meant to do there. Perhaps it was a waste of money, I don't know. I didn't believe I needed it." (Roding et al 2003 p.870)

Daniels et al (2002) noted enhanced motivation levels within the stroke population when patient centred practice was adopted and patient choice respected. Furthermore the physiotherapist population within a study by Wottrich et al (2004) stressed the importance of creating a client centred rehabilitation programme that was structured around the interests, goals and choices of the patient. This was seen to empower and encourage individuals to take a more active role. The patient population indicated that while therapists were often effective in treating specific impairments, they often did not adapt treatment to incorporate the unique characteristics of their patient. A patient reported, "I do not think that my personal qualifications have been taken into account nor has what I knew and did before" (p.1202). Bendz (2003) described patient centred rehabilitation to be based on shared understandings of the patient and therapist thus enabling achievable goals to be established and appropriate treatments provided to patients.

### *Knowledge is Power*

Educating patients on their stroke and consequent rehabilitation may enable them to become more engaged and contribute more in the decision making process. A lack of information was seen to limit a patient's independence, autonomy and their level of motivation to take part in rehabilitation (Proot et al 2000a). MacLean et al (2000) looked at the factors that influenced motivation levels within the stroke population. Patients described how they were more motivated to take a more active role in their rehabilitation when they were educated on their stroke and provided with reasoning for rehabilitation choices. A so-called 'high motivation patient' stated:

> "I'm determined, yes. The physios are very good here, they're very encouraging and they explain things to you. Cos you don't know what the plan is, do you, unless they tell you. So then you know all the pain and everything is worth it" (p.1052).

Patients believed to have low motivation described how a lack of information often resulted in feeling anxious about the future and afraid to take part in their rehabilitation. In Roding et al (2003), patients expressed a lack of information as frustration and the feeling that they were just waiting around with nothing to aim for.

### *Feedback and Achievement*

The provision of feedback is thought to positively influence an individual's motivation to engage within their rehabilitation. In Reid and Hirji (2003) participants partaking in the virtual reality intervention were provided with constant visual feedback by viewing their scores onscreen. Participants felt that this feedback motivated them to achieve their personal best by beating their previous scores. Lewis et al (2011) again looked at a virtual reality intervention and as in Reid and Hirji (2003), found that the constant visual feedback of their score gave them real time feedback of their progress and performance, encouraging them to beat their score. Participants in Ewen et al (2010) reported unconscious movements associated with the visual content in their video playback intervention. Participants found it beneficial to see the task being undertaken to remind them of how they should feel and to gain a better understanding of the movement parameters. These studies have shown that feedback can lead to an increase in patient motivation, possibly enhancing the level that they can engage in their rehabilitation.

When looking at achievement Marklund et al (2010) observed an increase in self-esteem and motivation when patients achieved goals and succeeded in various rehabilitation activities. A patient in Gillot et al (2003) commented, "I've always been competitive, and being competitive, you want to get better… It's not what happens to you, it's how you handle it in your mind" (p. 172). This quote highlights the patient had increasing motivation in response to recognising functional gains. The feedback gathered acted as positive reinforcement.

## DISCUSSION

The aim of this review was to gain a more in depth understanding of the barriers and facilitators to engagement in rehabilitation following stroke. Engagement has been identified as an important factor by many clinicians throughout literature in achieving positive treatment outcomes in the rehabilitation of neurological conditions (Lequerica et al 2009, Lequerica and Kortte 2010). Engagement has been linked with improved rates of attendance, adherence, functional improvement and a greater level of function after discharge (Kortte et al 2007, Lequerica and Kortte 2010). Interestingly though, despite there being an increasing interest in engagement in rehabilitation, no papers were identified which explicitly set out to explore engagement in stroke rehabilitation. Rather, the papers included tended to explore experiences of rehabilitation following stroke and in doing so, offer insight into the barriers and facilitators to engagement. This both has implications for interpretation of findings from this review, as well as highlighting an important weakness in the evidence base.

Seven main themes were identified from included papers. Goal setting was seen to possibly influence the way an individual engages in their rehabilitation and was considered most effective when patients were actively involved in the goal setting process and when goals were based on mutual understanding, negotiation and interaction. The therapist's manner, the level of support they provided and their perceived level of involvement in the rehabilitation process were all factors suggested to influence patient engagement. Patients were observed to be most engaged when both the rehabilitation intervention and environments were personalised to the patient. The level of familiarity and perceived importance of rehabilitation was considered a key component in the level to which an individual involves themselves in their rehabilitation. When patients perceived their rehabilitation to be non-meaningful and non-functional, they appeared more likely to disengage. In addition it was identified that the level of patient autonomy can have a direct effect on the degree that they actively involve themselves, with increased autonomy resulting in enhanced motivation. Patient centred practice was seen to possibly affect patient autonomy, with the importance of shared decision making and respecting patient choice observed within the literature. Rehabilitation structured around the interests, goals and choices of the patient was seen to empower and encourage individuals to take on a more active role in their rehabilitation. It was identified that educating patients about their stroke and reasoning for rehabilitation choices may encourage them to take on a more central role within rehabilitation based decisions. Finally the provision of feedback was seen to possibly affect patient engagement in specific rehabilitation interventions, providing patients with positive reinforcement and enhancing motivation.

The findings of this review should be interpreted with caution given that none of the included studies explicitly set out to explore engagement in rehabilitation. This review does however offer some important insight into perceived barriers and facilitators to engagement in stroke rehabilitation.

## CONCLUSION

Although several studies have acknowledged the key role that engagement plays in successful rehabilitation outcomes, (Kortte et al 2007, Lequerica and Kortte 2010) few studies to date have applied a qualitative lens to investigate the key factors that can affect engagement from the patients' perspective. Furthermore there are no studies that have investigated the complexities of patient engagement within the stroke population. Further research is needed to explore this topic in more depth from the perspective of key stakeholders. A deeper understanding of engagement within the stroke population may help to enhance rehabilitation processes and better equip rehabilitation providers with the clinical skills to best facilitate engagement and enhance the effectiveness of rehabilitation interventions.

## KEY POINTS

- Despite engagement being seen to play a key role in achieving positive treatment outcomes in the rehabilitation, no studies were identified which explicitly seek to explore engagement in stroke rehabilitation
- Evidence exploring experience of stroke rehabilitation offers some insight into factors that may serve to help or hinder engagement such as the importance of the therapeutic connection between patient and provider and a tailored, patient centred approach to rehabilitation
- Further research is required to further develop the understanding of the key factors that affect an individual's engagement specifically within the stroke population

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## ADDRESS FOR CORRESPONDENCE

Nicola M Kayes, AUT University, Private Bag 92006, Auckland 1142, New Zealand; nkayes@aut.ac.nz Phone (09) 921 9999 extn 7309 Fax (09) 921 9620

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# Fractures in children with cerebral palsy: a total population study

*Uddenfeldt Wort U, Nordmark E, Wagner P, Duppe H, Westborn L (2013) Fractures in children with cerebral palsy: a total population study. Developmental Medicine and Child Neurology 55: 821 – 826. (Abstract prepared by Gaela Kilgour)*

## Objective

To determine factors associated with fractures in children with cerebral palsy (CP) of varying mobility levels as classified by the Gross Motor Function Classification System (GMFCS I-V).

## Methods

An epidemiological study of 536 children with CP born between 1990 to 2005 was undertaken. Children were classified by type of CP and functional ability – those in GMFCS levels I–III were mobile, walking with or without aids (n= 384) and those in GMFCS levels IV–V mobilised via wheelchair (n=152). The following data were collected for 9 years and then analysed: gender, CP type, GMFCS level, gastrostomy, height, weight, use of a standing frame, antiepileptic drug therapy and fractures.

## Results

The risk of fractures was the same for children with CP in GMFCS levels I–III as for typically-developing children, and was not associated with any of the studied risk factors. The risk was similar for males and females and fractures occurred mostly between the ages of 10-14 years in children with CP. The risk of fractures without trauma increased in children in GMFCS levels IV–V who were on antiepileptic drug therapy, had stunted growth, did not use standing devices and were gastrostomy-fed. There was a fourfold reduction in fractures without trauma in those children using standing devices (GMFCS levels IV–V).

## Conclusions

Children with CP have varying risk of fractures based on their GMFCS level. Those in the GMFCS levels I-III had the same incidence and pattern of fractures as those typically developing children compared to those in GMFCS levels IV–V who had increased risk. Weight-bearing and adequate nutritional intake may help prevent fractures in children with CP.

## Commentary

Cerebral palsy is the most prevalent childhood condition associated with low bone mineral density (BMD) and osteoporosis. As a result children with CP are more likely to sustain painful fractures, often associated with minor trauma. These fractures can impair function, alter bony alignment, and significantly affect the quality of life of the child and their family/whanau. The risk is greatest for those children who are least mobile (GMFCS IV and V), have low nutritional and calcium status, less exposure to sunlight, use anticonvulsants, are gastrostomy feed and have lower fat mass (Fehlings et al., 2012). Finding ways to improve BMD and reduce the risk of fractures in CP is essential.

Standing frames are a regular part of physiotherapy treatment plans for children who require support for sustained standing and/or are less able to weight-bear themselves. In children with CP these would most often be prescribed by a physiotherapist for clients who are GMFCS levels IV or V (Palisano et al., 1997). Since standing frames are often prescribed for daily use at home, in preschools, schools and other community settings and the task is carried out by families and their carers, it is essential that we have sufficient evidence to justify their use.

The current evidence for standing frame use is limited. The most recent systematic review aiming to inform evidence-based practice guidelines reported there was insufficient evidence to support any form of weight-bearing activities as an effective intervention to improve BMD in CP (Fehlings et al., 2012). However, of the six weight-bearing studies that met their study criteria, only one involved standing frames. An earlier systematic review by Pin (2007) found that static weight-bearing exercises undertaken by individuals with CP had some effect in increasing BMD and temporarily reducing spasticity. However, these findings need to be interpreted with caution due to the relatively few studies examining the effectiveness of standing frames (2/10), a lack of research rigor, and small numbers of participants. This research also cautioned therapists into making anecdotal claims about the effects of standing frames on improving self esteem, breathing, circulation, communication, bowel and urinary functions as there have been no investigations of these factors.

Since these reviews, the research undertaken by Uddenfeldt Wort and colleagues (2013) provides some evidence for standing frame use based on fracture rates over a nine year period for children with CP of varying types and GMFCS levels. Fracture rates were highest in those least mobile and with the most risk factors, with fractured femurs most common. Children using standing frames showed a significant fourfold reduction in fractures without trauma. However, the “dose” of standing time was not mentioned. If fracture rates can be reduced by daily standing and BMD can be increased, the questions remain – how often, how long and how much weight-bearing is needed to make a difference? These factors are unknown and present a significant challenge to future researchers.

Physiotherapists have an important role in identifying and monitoring those most at risk of fractures, educating families of risk factors and encouraging adequate nutritional intake. It is also essential that all those involved in the care of children with CP are aware that the evidence supporting standing frame use to promote BMD is not conclusive. More research is required in this field if we are to advocate the use of standing frames as part of daily life for children with CP in GMFCS levels IV-V.

Gaela Kilgour, MHSc (AUT), BPHED (Otago), BPhty (Otago)
Clinical Co-ordinator Paediatric Orthopaedics, Canterbury District Health Board

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# Evidence-based practice across the health professionals

*Tammy Hoffman, Sally Bennett, Chris Del Mar (Eds) 2013, Churchill Livingston Elsevier, ISBN 978-0-7295-4135-0, 416 pages. RRP: approx $98*

This textbook is the second edition, with a specific aim at encompassing more topics related to rehabilitation professionals. Easily walking the reader through introductory terminology and theories in the first half of the book, the authors then spend the second half of the book putting these fundamental ideas into practical application for the heath care practitioner.

Chapters 1 and 2 start at the very basics—what evidence based practice is and what are some common misnomers associated with it. Terminology is explained by definitions as well as examples. As the chapters progress, the authors note appropriate search engines and search styles to easily locate specific research material. The appraisal of the research material is discussed in the first half of the book, and is certainly the core of the information. From here, the reader is lead through both a written dialogue about what to look for, as well as applicable examples with question and answer scenarios. The statistical components are meticulous, but presented well so that the reader is able to follow along easily.

The second half of the book addresses several ways to appropriately and realistically implement evidence-based practice into clinical care. Example scenarios are given for an array of rehab professionals and illustrate a comprehensive search of a specific question, the appraisal of the research, and the clinical conclusion that can be reached. Chapter 13 discusses how clinical guidelines can help clinicians make sound decisions and further communicate options and decisions with their patients. Chapter 14 further addresses these communications between provider and patient and this section is certainly a plus of the book. In this chapter, the authors seamlessly transition to ways research can be presented to a patient for education and decision making purposes.

Overall, the layout of the book is thorough and engaging in what could otherwise be a dry and daunting topic to read about. The chapters are engaging, thought-provoking, and very informative. This book offers something for everyone, from the novice student all the way up to the experienced therapist, and applicable to many health care fields. However, given the style it is written in, it would be an especially great addition at the university level for students to gain a firm understanding of the necessity and varied application of evidence-based practice.

*Jessica Povall, BSc, DPT (PhD)*

*Senior Physiotherapist at Southern Rehabilitation Institute*
*Christchurch*

# Fetal behaviour: a neurodevelopmental approach.

*Einspieler, C., Prayer, D., and Prechtl, H.F.R. (2012). Clinics in Developmental Medicine No 189. London: Mac Keith Press. Price $155.00*

Embryology and fetal development are fascinating topics. What this book focuses on is fetal behaviour and movements, from a developmental neurology perspective, providing age-specific documentation of the functional repertoire of the nervous system. The research provided by ultrasound observations of the fetus, over many decades now, has revealed so much that was previously hidden from doctors, obstetricians, midwives and researchers. Heart motion is the first motor activity, occurring at 5-6 weeks post menstrual age; startles, general movements (as defined by Heinz Prechtl) in the entire body and hiccups are present in the embryo from as early as about 8 weeks; fetal breathing movements typically follow 2-4 weeks later; hand to face contact is occurring at about 11 weeks; isolated finger movements can be seen at 13 weeks (that challenges the concept that development is cephalo-caudal); sucking and swallowing is present at 14 weeks. And so the list could go on until we can describe the behaviours and movements that we see in the very preterm infant. Our knowledge of fetal movements has been much enhanced from the observations seen during ultrasound of the embryo and the fetus, and these are documented and extensively referenced in this book.

The eight chapters range over the topics of observation of fetal behaviour, spontaneous motor behaviour, prenatal laterality, fetal behavioural states, fetal responsiveness, fetal behaviour in twins, determinants of fetal behaviour, and functional assessment of the fetal nervous system, linking these observations with many well documented brain malformations, chromosomal abnormalities and lesser known syndromes. Included with this book is a CD of 26 videos of fetal recordings. Interesting detailed research identifies facts such as "embryonic motility is not dependent on sensory input but is centrally generated" (p17); "adequate embryonic and fetal movements are necessary for the proper development of the skeletal, muscular and neural systems" (p19); "the variability and complexity of general movements is an indicator for the integrity of the young nervous system" (p26); "the developing brain permanently interacts with a variety of sensory stimuli" (p91) viz: auditory, tactile, olfactory stimuli in utero, in addition to external stimuli. What is fascinating in this material is the continuum of fetal behaviour, that is then seen in preterm infants, term babies and young infants, as documented in *Prechtl's Method on the Qualitative Assessment of General Movements in Preterm, Term and Young Infants* ((Einspieler, Prechtl, & Bos, 2005). Heinz Prechtl, one of the authors of this book that I am reviewing, was a pioneer in the evaluation of the quality of spontaneous movements during early development, both fetal and after birth.

This book is written for neonatologists, paediatric neurologists, paediatricians, neurophysiologists, neuroscientists, obstetricians, and researchers in fetal development, but would be of considerable interest to neurodevelopmental paediatric physiotherapists who work in neonatal units. It is not an essential read, but one to get out of the library to brush up one's knowledge of embryonic and fetal development, to link up the continuum of the developmental behaviour of healthy fetuses with one's clinical knowledge of preterm infant behaviour, Prechtl's assessment of preterm infant behaviour (Einspieler, Prechtl, & Bos, 2005) and one's ongoing observations.

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