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McKiernan, Sharmaine; Chiarelli, Pauline; Warren-Forward, Helen "Professional issues in the use of diagnostic ultrasound biofeedback in physiotherapy of the female pelvic floor" Radiography Vol. 19, Issue 2, p. 117-124 (2013)

Available from: <http://dx.doi.org/10.1016/j.radi.2013.01.006>

Accessed from: <http://hdl.handle.net/1959.13/1055487>

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Journal: Radiography, Vol 19, pp 117-124, 2013
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ABSTRACT

The usage of diagnostic ultrasound equipment has expanded into physiotherapy. The aim of this paper is to deliver to both the ultrasound and physiotherapy professions an understanding of the use of diagnostic ultrasound for biofeedback in physiotherapy of the female pelvic floor and the issues related to competent and safe practice, including accessing suitable training. This has been evaluated using a qualitative research paradigm with data gathered via focus groups of Australian physiotherapists. The target group were pelvic floor physiotherapists as this is one of the main uses of diagnostic ultrasound within physiotherapy and the main area physiotherapists would like to be trained in. Two focus groups were run with a total of sixteen physiotherapists. Focus group participants reported their training in diagnostic ultrasound to be largely self directed. They also reported they were learning on their patients. Despite very limited training, participants demonstrated some familiarity with images and equipment settings. Participants felt the modality had a role within physiotherapy as an adjunct to their current practices. The main need raised by participants during the focus groups was related to patient expectations and the fact that the physiotherapist may miss evidence of pathology.

INTRODUCTION

In recent years diagnostic ultrasound usage has expanded outside the traditional areas into other health professions such as physiotherapy (McKiernan, Chiarelli, & Warren-Forward, 2010). In 2004, diagnostic ultrasound use in physiotherapy was reported to be an emerging field (Frost & Clarke, 2004) however this can still be considered the case today. The aim of this paper is to deliver to both the ultrasound and physiotherapy professions an understanding of the use of diagnostic ultrasound for biofeedback in physiotherapy of the female pelvic floor and the issues related to competent and safe

practice, including accessing suitable training. This has been evaluated using a qualitative research paradigm with data gathered via focus groups of Australian physiotherapists.

Physiotherapists are using diagnostic ultrasound to give both the therapist and patient visual feedback on such areas as transversus abdominis and the pelvic floor. This visual feedback is referred to as biofeedback and is used as a part of motor re-learning in which a patient learns what is required and how to perform a task. With time and practise, the aim is that gradually the task will become automatic and hopefully beneficial to the patients' problem.(Baessler, et al., 2008; Frost & Clarke, 2004; Teyhen, et al., 2005) Several studies have shown that diagnostic ultrasound biofeedback is a useful method of assisting patients to learn to contract muscles and can be reliably used in the clinical setting (Pressler, Heiss, Buford, & Chidley, 2006; Teyhen, et al., 2005; Van, Hides, & Richardson, 2006).

Physiotherapists can train patients to perform an abdominal drawing in manoeuvre which involves activation of the transversus abdominis muscles to stabilise the trunk (Teyhen, et al., 2005). Also patients who present with pelvic floor muscle dysfunction can be trained to perform a pelvic floor muscle contraction which elevates the pelvic floor. This elevation lifts the urinary bladder and can be seen, assessed and measured using diagnostic ultrasound.(Whittaker, Thompson, Teyhen, & Hodges, 2007)

The Australasian Society for Ultrasound in Medicine (2008), B8 statement, on the use of diagnostic ultrasound by medical practitioners states that diagnostic ultrasound is highly operator dependant and its use requires training and experience. Users should be adequately trained and the training should be designed to meet their needs and requirements including both theory and practise. They support and encourage the involvement of the ultrasound profession in such training. While this statement is for medical practitioners, it can be extrapolated to physiotherapists.

Currently many physiotherapists are purchasing diagnostic ultrasound machines and using them with very little to no training in the modality. There is a lack of continuing

professional development provision specifically for the use of diagnostic ultrasound biofeedback in physiotherapy of the pelvic floor. Access to ultrasound training for physiotherapists is variable; for example within Australia the University of Sydney has units of study in the visualisation and assessment of musculoskeletal structures (The University of Sydney, 2008). Australian universities are teaching diagnostic ultrasound to their undergraduate physiotherapy students to ensure emerging practitioners have basic skills in the modality (Charles Sturt University, 2008; Curtin University, 2000; Frost & Clarke, 2004; La Trobe University, 2006; Monash University, 2008; The University of Newcastle, 2008; The University of Sydney, 2008). This however leaves a large gap for qualified physiotherapists. A similar situation can be found within the United Kingdom where there are short introductory courses and modularised university based masters level courses (Edwards, 2010). The Dynamic Ultrasound Group within the UK are currently looking into formalising training requirements and guidelines (Dynamic Ultrasound Group, 2006).

METHODOLOGY

Focus groups are used in the health field to provide insight (Bender & Ewbank, 1994; Sim, 1998). A small group of people discuss a focused topic and information may be obtained that is beneficial to the researcher and potentially different to that expected (Britten, 1995). Focus groups may also provide information that may not be extracted from a questionnaire and allow for participant interaction which is not obtained from more time intensive interviews. They allow for interpretation of words and they may potentially provide new information and a broader view for research.(Bender & Ewbank, 1994)

Bender and Ewbank(1994) recommend that the topics discussed by groups should be narrowly focused and of interest to all group members who should be encouraged to interact with each other. The role of the facilitator is to guide the discussion with questions, probing where necessary and refocusing when conversations go astray. Participants must feel comfortable talking to all and should be encouraged to contribute to the discussions and express their views. The facilitator should not be looking for standardised responses but rather explore the detail in responses.

This methodology was chosen as the researchers hypothesised that use of diagnostic ultrasound for biofeedback in physiotherapy of the female pelvic floor would be limited and there appears to be very little accessible training available to physiotherapists, which seems to be a barrier to the expansion of the use of the modality within the profession. Physiotherapists are therefore seeking help from those within the ultrasound profession for training and advice on use of the modality within their profession. To provide this, ultrasound professionals need to understand their use of the modality and the needs of physiotherapists. The researchers wanted to be able to talk to the physiotherapists and explore the situation in depth; as such focus groups were the best approach.

Research Paradigm

The researchers used qualitative descriptive analysis to identify the themes that emerged during the focus groups (Sandelowski, 2010). Two reviewers were used and independently assessed the transcription and undertook the clustering of all comments into themes. Regular meetings were held to compare themes, look for similarities, ensure each theme was mutually exclusive and make sure responses could fit into a theme. During meetings, if there was disagreement, discussion led to consensus.

Ethics Approval

The study received ethical approval from Hunter New England Human Research Ethics Committee and the University of Newcastle Human Research Ethics Committee.

METHOD

Two focus groups were run with ten people in the first group and six in the second group. The first focus group lasted for sixty minutes and the second, forty five minutes. On arrival at the focus group, participants were given a name tag, sheet outlining the ethics of focus group behaviour for them to read and then they signed a consent form agreeing to participate in the research. Participants were then invited to obtain some light refreshments and encouraged to interact and feel comfortable with each other before the focus group commenced.

At the commencement of each focus group the facilitator gave a brief introduction explaining the ethics of focus groups and obtaining participant consent for the session to be recorded. An interactive and comfortable environment was created for the participants and questions were sequenced to encourage group members to participate in an uninhibited way. Initially all participants introduced themselves, giving their name, place of work and interest in diagnostic ultrasound.

For the section of the focus group covering familiarity with images and equipment settings, participants were shown images on a PowerPoint presentation and asked to write their answers onto an answer sheet. In this way responses from all participants could be analysed rather than just having one participant giving an answer to the group.

Participants

Focus group participants were sought from physiotherapists who have used, or are using, diagnostic ultrasound as part of their work for assessment of the pelvic floor. This group of participants were selected as assessment of the pelvic floor is one of the main uses of diagnostic ultrasound and the main area physiotherapists would like to be trained in. (McKiernan, Chiarelli, & Warren-Forward, 2011)

Invitations to participate were sent to physiotherapists in the Hunter/Central Coast area via a postal invitation; their details were obtained from the local yellow pages phone directory. Invitations were also sent via e-mail to physiotherapists registered on two databases of physiotherapists across Australia, who had attended workshops, ordered texts or who regularly attend seminars held at the University of Newcastle. Invitations were also sent via e-mail to physiotherapists scheduled to attend professional development workshops at the University of Newcastle.

Questions

On arrival at the focus group, participants were asked to complete a thirteen question demographics questionnaire (Table 1). This covered their age, place of work and ultrasound machine ownership, use and training received.

Table 1: The 13 items of the demographic questionnaire

What is your age group?

Do you work in the private or public system?

Do you own an imaging ultrasound machine?

Are you using imaging ultrasound regularly?

Have you had any training in imaging ultrasound?

If yes how long was this training for?

Who provided this training?

What brand is your imaging ultrasound machine?

Does your imaging ultrasound machine have Doppler and Colour capabilities?

What transducers do you have?

How long have you been using Imaging Ultrasound?

What imaging ultrasound procedures do you perform?

How many times a day on average, would you use imaging ultrasound?

The focus group questions started with more generic information about participant diagnostic ultrasound equipment and then gradually moved to explore more personal experiences and participant feelings (Table 2). Questions delved into participant familiarity with diagnostic ultrasound images and equipment settings and finally into their perceived needs in relation to diagnostic ultrasound.

Table 2: The focus group question template

Introduction

What led you to believe you needed an imaging ultrasound machine?

When the machine was delivered what information were you given?

How much practise time did you have before you used it on your first patient?

How did you feel when you used it on your first patient?

Do you feel any different now?

How important do you see imaging ultrasound in your practice today?

And in the future?

Are you happy with the outcomes you are currently getting with imaging ultrasound?

Equipment

Your patient is a forty year old female. You wish to scan her Transversus Abdominis.

How could the image in front of you be improved? *(these images were shown as a PowerPoint presentation)*

Image one – depth and focal zone position

Image two - TGC

Image three – overall gain

Image four - blurry

Future

What would you like to know more about?

In what format would you like this extra information delivered?

What scanning procedures would you like to learn more about?

Transcription

Participants gave their written consent for the focus group sessions to be recorded, understanding that the recording would be transcribed. The recordings were transcribed into written form with all transcriptions anonymised. The transcript was coded and themes identified.

RESULTS

The demographic questionnaire revealed that participants of the focus groups were from both private and public practices, urban and rural areas and from throughout Australia. They were between 30 and 50 years of age. Of the participants, 88% (14) were currently using ultrasound in practice and 12% (2) had used it in the past but currently had no access to an ultrasound machine. Two participants (12.5%) had used it for three to four years; however most (12, 75%) had less experience with two years or less. Two participants stated they were using diagnostic ultrasound regularly, but most reported they used it less than once a day. A variety of ultrasound machines were being used, some being recently purchased, while others used older superseded models obtained from local hospitals and radiology practices. The focus group questions resulted in the identification of five main themes and eleven sub themes (Table 3).

Table 3: Major and Sub Themes

Current clinical use of diagnostic ultrasound

Biofeedback for pelvic floor and transversus abdominis

Training in the use of diagnostic ultrasound

Limited

Equipment supply companies providing some training

Superseded hospital machines

Problem of being employed by a practice that has a machine

Practise in the use of diagnostic ultrasound

Practise on themselves, other physiotherapists, the patient

Perceived importance of diagnostic ultrasound in clinical practice

Adjunct

Needed to retain and attract patients

Needs in respect to diagnostic ultrasound

Training

Missing pathologies

Patient expectations

Major Theme - Current clinical use of diagnostic ultrasound

The main sub theme that emerged in the clinical use of diagnostic ultrasound was for biofeedback. Participants stated diagnostic ultrasound was a useful tool for biofeedback in all female patients with pelvic floor muscle dysfunction. Its use is also invaluable in cases where the physiotherapist was precluded from performing vaginal or anal assessments, such as, children, patients with a history of abuse, the elderly, patients with pelvic pain, patients who have had surgery and have vaginal fibrosis and those who have had radiation therapy. All participants also agreed that as physiotherapists, they find diagnostic ultrasound an invaluable tool for biofeedback and the assessment of transversus abdominis muscle function.

General comments that arose during the focus groups about the clinical application of diagnostic ultrasound were that it is, “good for visual feedback and patient

motivation”(P4) and could be “used to see stabilisation”(P2). Physiotherapists value diagnostic ultrasound because “if a patient can’t feel the contraction they can see it on the screen”(P1). “Male patients also love the technology aspect, which helps them feel comfortable with its use”(P8). Diagnostic ultrasound “provides another level of feedback and is a good adjunct to treatment that won’t hurt the patient”(P11).

Focus group participants stated they find diagnostic ultrasound allows more “objective definitive measures”(P3) and is “useful to confirm diagnoses”(P1) by allowing, the physiotherapist to “really know and see what is going on and gives direction to both the patient and therapist”(P1). One participant stated observing good results using diagnostic ultrasound to successfully retrain dysfunctional muscle activation patterns in patients with a long history of problems. “What works for one patient doesn’t necessarily work for the next, so diagnostic ultrasound provides another tool to help”(P7). Another participant reported diagnostic ultrasound to be valuable in the initial assessment of a patient by, “providing feedback and a baseline from which to work”(P6).

Major Theme - Training in the use of diagnostic ultrasound

The first sub theme that emerged in relation to training was that it is very limited. The majority of the participants of the focus groups had diagnostic ultrasound machines available for use at their place of work. In all of these cases, the equipment was owned by the practice. The training the physiotherapists received when the diagnostic ultrasound machine was delivered to the practice, varied from “none at all”(P5), to, “reading the manual that came with the machine”(P9) and “finding it hard to understand with the sales person quickly explaining the function of various buttons, but being unable to demonstrate the practicalities of how to scan”(P9).

The second sub theme indicated that most of the equipment supply companies who sell the machines appear aware that there is a need for some basic level of instruction. One participant employed in a practice with a number of other physiotherapists, had trialed a machine for a week and they were told that if they purchased a machine, the company would send a few of the practice physiotherapists to a training course. Others that had

trialled machines had been offered in-service training, from a one-on-one thirty minute demonstration with the individual staff members, who intended using the new machine, to a two hour workshop conducted by an experienced physiotherapist.

The third sub theme was raised by a participant who worked in a multi therapist rural private practice and had a machine that was a superseded hospital model. The machine came without a manual and the physiotherapists taught themselves how to use the machine by experimenting with the buttons. Reportedly new employees “are given a ten minute instruction on how to use the machine by existing employees”(P7). This participant commented that they did not feel comfortable using diagnostic ultrasound, even though they had used it on several occasions over an eighteen month period.

The final sub theme was raised by a participant who began employment at a practice that already had a diagnostic ultrasound machine. This participant stated that they did not feel “able to use the machine after being given a cursory ten minute instruction session explaining the function of the various machine buttons”(P8), so the company that sold the machine to the practice, returned and spent further time training the staff.

Major Theme - Practise in the use of diagnostic ultrasound

Diagnostic ultrasound is considered a user dependent modality but does require both training and experience to be used effectively (Australasian Society for Ultrasound in Medicine, 2008; Glazebrook, Manahan, & Chater, 2005; Goldberg, 2003). Focus group participants were asked if they had practised using the diagnostic ultrasound machine, before they used it on their first patient. While some said they had practised on themselves or other physiotherapists, the main theme that arose was that participants had no practise (Figure 1) and neither did they inform the patient that this was the first time they had used the machine. Participants repeatedly stated that diagnostic ultrasound “would not hurt the patient”(P14), so they saw no justification for the need to practise or become competent.

Figure 1: Practise in the use of diagnostic ultrasound

One participant reported “extending the patient’s treatment time by ten minutes”(P10), to allow them to practise with the diagnostic ultrasound. This participant stated that, “most patients were happy with this”(P10). Most focus group participants found patients to be easy going about the use of the equipment when it was explained to be a diagnostic tool. The general feeling from the focus group participants was that you just needed to, “explain to the patient and get their permission”(P12) to use it; just ask the patient “if they mind if you have a look”(P13) with the diagnostic ultrasound machine.

Major Theme - Perceived importance of diagnostic ultrasound in clinical practice

The emerging sub theme was that diagnostic ultrasound was an adjunct to practice rather than a critical component. They also felt that it was a costly adjunct. One participant had used ultrasound imaging for about four years, but did not own a machine. After the machine was returned to its owner, this participant missed having access to it, as it “did do some things that I could not do with my hands”(P3), but reported “the cost of purchasing a machine is a real barrier”(P3).

A general sub theme emerged, that in the future, if physiotherapy practices do not have a diagnostic ultrasound machine that “patients will go elsewhere where there is one”(P3). They felt the old saying that you “need to keep up with the Joneses”(P3) was very much applicable to diagnostic ultrasound in physiotherapy. Diagnostic

ultrasound has “become a good marketing tool”(P5) but from participant experience, “it doesn’t necessarily give a better outcome for the patient”(P1). Physiotherapists who use diagnostic ultrasound need to be “aware of the limitations of the modality; for example, it doesn’t show squeeze pressure in the pelvic floor assessment; and not replace good technique with diagnostic ultrasound, just use it as an adjunct to their technique”(P1).

While participants stated that they could practice adequately as physiotherapists without diagnostic ultrasound, they have found it “most useful for biofeedback”(P10) and “also good for patients who present with incontinence and those in denial”(P13). “If you had a diagnostic ultrasound machine you would use it because it was there”(P3). “If I had the money I would buy a machine, as I feel I need it”(P16). “For distressed patients to be able to see the improvement using diagnostic ultrasound provides encouragement and motivation”(P11). It also “encourages patients to be more compliant”(P12).

Major Theme - Needs in respect to diagnostic ultrasound

There were three main sub themes in this area of discussion, the first being in relation to training, the second missing pathologies and the third patient expectations. All participants agreed the best training for them, would be one-on-one, with the trainer looking over their shoulder while they were using the diagnostic ultrasound machine. They wanted this person to be, “able to point out the relevant anatomy”(P5) and show them, “how they could adjust the machine slightly to get a better image”(P9). While they felt the technical aspects of diagnostic ultrasound could be put into a training manual, participants wanted “one-on-one time for the fine detail”(P14). As a resource, they felt the need for “examples of good images and bad images, with clear descriptions of how these images had been improved”(P8). “A line drawing next to an image with anatomy labelled would also be useful”(P4). Participants acknowledged that there are numerous textbooks available with such content but they wanted a resource specifically for physiotherapists and the anatomy and images they encounter.

Focus group participants were generally not satisfied with the quality of images and outcomes they were obtaining with their diagnostic ultrasound machines. They asked for more information on how to interpret the images in relation to such things as,

“patterns of muscle function”(P1) and “how to better recognise specific muscles”(P9). They expressed desire for more information on, “the limitations of diagnostic ultrasound in practice and image quality”(P15). “How might I achieve a good transperineal image of the pelvic floor and how do I calculate a bladder volume”(P13)? They also expressed interest in information related to scanning the hip flexors, psoas muscles, knees, bursae, shoulders, ankle and the Achilles and patella tendons.

In relation to training, focus group participants suggested a workshop with real patients, containing both normal and abnormal cases. They suggested that workshop participants could scan each other first to see normal. They recognised the need for demonstrations and to “see lots of different images next to each other to be able to begin to recognise patterns”(P12). The words most used were feel and see. Focus group participants were very aware that “you can think you are seeing things”(P7) and “it is easy to make assumptions”(P2) so you “need someone to correct you”(P10). One participant suggested inclusion of “a practical exam at the end of the workshop which would require you to do such things as find the bladder, observe if a pelvic floor contraction occurred and comment on the findings, which would then be given feedback by the instructor”(P15). It was felt that this might “give the physiotherapist confidence and peace of mind that they could go back into their work environment and use the equipment”(P11).

One focus group participant highlighted some of the challenges physiotherapists face in rural areas and pointed out that any workshop would “need to be relevant and take into consideration time, distance and costs”(P7). They recommended initially “a flexible theoretical base would be good so the physiotherapist could get their head around the theory before they came to a workshop”(P7). “Web based training can pose difficulties to physiotherapists in rural areas due to limited web access and drop out”(P7).

The second and third sub themes raised during this section of the focus groups were that, participants were worried that, they might be “blamed for missing pathologies such as ovarian cancer”(P16). They felt that “the general public might expect us to be able to make such diagnoses”(P12) and might not understand that “physiotherapists are not

producing scans for the same reasons as those being done in the radiology departments by expert sonographers”(P14). Participants asked how they might best educate and inform their patients of this difference. Also “how does a physiotherapist know they are looking at something that they need to refer on and how should such a referral be made”(P4)? “We do not want to worry the patient unnecessarily”(P8).

Participants in the first focus group suggested that the Australian Physiotherapy Association should develop guidelines on diagnostic ultrasound use by physiotherapists. This led the group into a discussion on the use of consent forms for patients who are to have diagnostic ultrasound scanning as part of their physiotherapy assessment and treatment.

Familiarity with diagnostic ultrasound images and equipment settings

Ultrasound images were deliberately manipulated for the participants, to represent incorrect adjustment of the various parameters used to optimise an image. Participants were shown five different versions of the same ultrasound image of a transverse scan of the transversus abdominis taken from a forty year old female, with different equipment settings on each image. For each image presented, participants were asked if they felt the image could be improved and if so, how would they proceed to do this.

In the first image shown to participants, (Figure 2b), the depth of the image needed to be reduced, to make the anterior abdominal muscles look bigger. Also, the focal zone needed to be moved up, to be positioned over the muscles. The arrow at the side of the image should be placed at the level of the structure of interest, to display this structure the best (Gent, 1997). While all group participants (100%) recognised the need for the change of depth, none commented on the focal zone position.

Figure 2: Ultrasound images of Transversus Abdominis; a. Control image, b. Requires a change in depth and focal zone position, c. Requires an adjustment to the TGC, d. Requires an increase in overall gain, e. Requires a decrease in overall gain, f. Requires a reduction in motion.

In the second image shown to participants, (Figure 2c), the Time Gain Compensation (TGC) has been set erratically, giving a striped appearance to the image. The TGC is a series of buttons each controlling a different level of the image. These allow the operator to compensate for attenuation with depth so a uniform image can be obtained (Gent, 1997; Sanders & Winter, 2007). The buttons of the TGC needed to be adjusted to give a uniform appearance over the entire image. None of the focus group participants were able to determine the cause of the poor image.

In the next image, (Figure 2d), the overall gain had been manipulated; it needed to be increased as the image is too dark. The overall gain is a single button, which when turned makes the whole image brighter or the whole image darker (Gent, 1997; Sanders & Winter, 2007). While all focus group participants recognised that the image was too dark, only two (12.5%) recognised that it was a problem with overall gain.

In the fourth image shown to participants, (Figure 2e), the overall gain was manipulated again, but in the opposite direction to Figure 2d. The overall gain needed to be decreased because the image is too light. Again, while all of the focus group participants thought that the image was too light, the same two (12.5%) participants who recognised the gain problem in Figure 2d recognised it was an overall gain problem here.

In the final image, (Figure 2f), movement has occurred, as the image is blurry. The patient may need to hold their breath or stop talking to rectify this. Six (37.5%) of the focus group participants thought that the image was blurry or fuzzy, while 2 others (12.5%) thought more contact gel was required.

While participants demonstrated some familiarity, they lacked confidence in their responses and understanding of how to improve the images. No one participant was able to identify the problem on all images however all participants were able to recognise a need for a change in depth and that images were too light or dark. One participant stated that “you just play with the buttons until you can see something”(P8) and that, “if this does not work then just give up”(P8).

DISCUSSION

The researcher’s hypothesis was correct; the use of diagnostic ultrasound for biofeedback in physiotherapy of the female pelvic floor is limited, there is little accessible training available to physiotherapists, which is a barrier to the expansion of the use of the modality within the profession. Participant physiotherapists are seeking help from those within the ultrasound profession for training and advice on how to use the modality. The researchers suggest that the information obtained could now be used

to develop a questionnaire which could be distributed to a larger group of physiotherapists and those using diagnostic ultrasound in areas other than biofeedback of the pelvic floor.

It is evident from the focus group participants that diagnostic ultrasound is only slowly being integrated into pelvic floor physiotherapy practice with participants having only four years or less experience. Other studies have reported 11.6%, 47% and 64% of participants using ultrasound while in this study 88% of participants were using ultrasound (Jedrzejczak & Chipchase, 2008; McKiernan, et al., 2011; Potter, Cairns, & Stokes, 2011). A large barrier identified by participants was the costs associated with purchase of equipment. Despite this barrier, participants felt the need to have a machine or patients would go elsewhere. If this is indeed the perception within the profession, more physiotherapists will be purchasing machines in the future, so the ultrasound profession needs to understand diagnostic ultrasound within physiotherapy and provide help where needed and the physiotherapy profession needs to be aware of the need for guidelines on training, competence, examination limits and patient education.

For those physiotherapists using diagnostic ultrasound in practice, they are not using it very often with most reporting it to be used less than once a day. This perhaps could be due to lack of training, competence and confidence in use of the modality within their profession. Other studies have also reported low use such as five times a week or less and one to two times a day (Jedrzejczak & Chipchase, 2008; McKiernan, et al., 2011).

The participants reported receiving very limited training; it was mostly self directed and they are practising on their patients. Similar findings have been reported by others such as 80.5% of participants receiving training but it being for two hours or less (Jedrzejczak & Chipchase, 2008); 61% received training but for 67% of this 61%, it had lasted for only several hours (McKiernan, et al., 2011) and finally, 52% receiving formal training but finding it inadequate leaving them with unmet training needs (Potter, et al., 2011). This study also found that the opportunities, resources and mentors for training were not available (Potter, et al., 2011). No practise and limited to no training may be the reason that the modality is not being used very often in practice. If this

situation is compared to a trainee sonographer, they do practise on patients however this is done under supervision of a qualified sonographer and with theoretical studies to back this practise. Physiotherapy participants lack not only theoretical training but the guide of a qualified sonographer to know if they are competent in the use of diagnostic ultrasound.

Other professions have gone through similar experiences with the introduction of diagnostic ultrasound use into their professions and can perhaps be used as a guide for training and guideline formation. Doctors within the emergency department are using diagnostic ultrasound on trauma patients known as FAST – Focused Assessment for the Sonography of Trauma or Focused Abdominal Sonography for Trauma (Australasian College for Emergency Medicine, 2008; Freitas, Frangos, & Frankel, 2006; Glazebrook, et al., 2003; Scalea, et al., 1999). The FAST exam is used to identify evidence of injury (Scalea, et al., 1999); FAST examinations have been shown to improve diagnostic accuracy and optimise patient care (Lapostolle, et al., 2006). For training the literature recommends a combination of lectures and scanning. The lectures varied from one hour to forty hours and the scanning from one to twenty hours or up to one hundred and fifty examinations performed.(Costantino, Satz, Stahmer, & Dean, 2003; Counselman, et al., 2003; Durham, 1996; Gracias, et al., 2002; Han, Rozycki, Schmidt, & Feliciano, 1996; Heller, Melanson, Patterson, & Raftis, 1999; Ma, et al., 1995; Mandavia, Aragona, Chan, Chan, & Henderson, 2000; Mateer, et al., 1994; McLaughlin, Collum, McGovern, Martyn, & Bowra, 2005; McManus, 2007; Salem, et al., 2001; Scalea, et al., 1999; Shackford, et al., 1999; Thomas, et al., 1997) The American College of Emergency Physicians(2008) has a policy statement on emergency ultrasound guidelines which is official recognised in most countries. For qualified physicians to use ultrasound they must complete a 16-24 hour training course with hands on practical sessions. This then progresses to an experiential component where at least 25 examinations performed should be reviewed followed by a competency component of testing where at least 150 examinations are required. These guidelines apply to becoming proficient in several core examinations not just the FAST scan.

Diagnostic ultrasound is also being used by rheumatologists in clinical practice. It is being used for assessment of the musculoskeletal system for both diagnosis of conditions such as arthritis, tendinopathy and tendon tears and intervention such as joint aspirations and injections (Wakefield & D'Agostino, 2010). For training the literature also recommends a combination of lectures and scanning. The lectures varied from three to eight hours and the scanning up to twenty four hours and forty two examinations.(Backhaus, et al., 2001; Balint & Sturrock, 2001; D'Agostino, et al., 2004; Filippucci, Unlu, Farina, & Grassi, 2003) The European Federation of Societies for Ultrasound in Medicine and Biology(2011) have minimum training requirements for the practice of musculoskeletal diagnostic ultrasound. At least level one competence should be obtained which requires completion of an 18 hour theoretical course and performance of a minimum of 300 supervised examinations in a year. To maintain competence at this level, 300 examinations each year should be performed.

It is acknowledged that the above two professions use diagnostic ultrasound in different ways to physiotherapists. However even within physiotherapy, diagnostic ultrasound is being used in different ways. This study has investigated its use for biofeedback of the pelvic floor and perhaps limited training in this area could be provided as a continuing professional development course but a more extensive programme of study may be required for some of the other examinations identified by the participants to be of interest to them. By investing in providing a continuing professional development course, including evaluation of a physiotherapists competence, to extend the practice of physiotherapists treating the female pelvic floor, higher education providers may be attracting learners who may go on to study further to enable advanced practice in diagnostic ultrasound within physiotherapy.

With the introduction of training in diagnostic ultrasound to the undergraduate physiotherapist in biofeedback of the pelvic floor, transversus abdominis and multifidus, perhaps in the future diagnostic ultrasound could be treated the same as electrotherapy and electromyography which are both routinely taught to physiotherapists at an undergraduate level and considered basic competencies for a graduate physiotherapist. For both of these, the Australian Physiotherapy

Association(2012) has standards documents for their use and accepted level of practice. The Australian Physiotherapy Association should be encouraged to produce such standards documents for diagnostic ultrasound with input from the ultrasound profession. They could include competence, safety and examination limits and give guidance on further advanced training and continuing professional development courses.

It was good to see that with familiarity with diagnostic ultrasound images and equipment settings, all participants were able to recognise a need for a change in depth and that images were too light or dark. This section did however highlight the very limited understanding participants had and their need for training in the modality. Focus group participants wanted training; they were generally not satisfied with the quality of images and outcomes they were obtaining with their diagnostic ultrasound machines. This again is a positive finding and opens the door for the ultrasound profession to become involved in and develop specific training programs for physiotherapists.

The issues raised in relation to missing pathologies and patient expectations, highlight the newness of this modality within the profession and the need for physiotherapists to seek guidance and be guided by the ultrasound profession in the area. It is important for physiotherapists to make a record of how and why diagnostic ultrasound was used and to state the limitations of the examination; for example diagnostic ultrasound was used specifically to provide biofeedback of the pelvic floor and does not constitute a diagnostic pelvic ultrasound examination. If they educate and inform their patients about their use of diagnostic ultrasound and obtain informed consent from their patients these issues should be alleviated. The UK Society of Radiographers(2012) have guidelines which state that it is important that the patient understands the role and scope of the diagnostic ultrasound examination and that informed consent is obtained to proceed with the examination. They state that this consent can be verbal. They also recommend that literature explaining the scope of the examination be made available for the patient prior to the examination.

Similarly, the British Medical Ultrasound Society(2008) has a statement on patient information and informed consent. It states that it is not legally required to have written consent prior to an ultrasound examination. For good practice they recommend the patient should be fully informed of the nature and conduct of the exam so they can give verbal consent. They also state this information should be available in written format. These are useful models for physiotherapists to consider when they approach how to handle the ethical issues that arise from use of the modality within their profession. The ultrasound profession can also be guided by these in their help of physiotherapists and in the development of any training programs or patient education literature.

CONCLUSION

These focus groups gave an understanding to both the ultrasound and physiotherapy professions of the use of diagnostic ultrasound for biofeedback in physiotherapy of the female pelvic floor and the issues related to competent and safe practice, including accessing suitable training. Focus group participants felt that diagnostic ultrasound had a role within physiotherapy but clearly as an adjunct to their current practices. Their main concerns were related to patient expectations and the fact that they may miss evidence of pathology. Perhaps with this greater understanding and help from the ultrasound community, more appropriate and tailored training, including understanding of the role and limitations of diagnostic ultrasound within physiotherapy practice could be developed and the modality could become an invaluable additional tool for the physiotherapist. Perhaps with development of patient information brochures, to ensure patients know the limitations of a physiotherapy scan, physiotherapists could be more confident in adopting diagnostic ultrasound routinely into their clinical practice as a biofeedback tool to improve patient assessment and rehabilitation.

REFERENCES

- American College of Emergency Physicians (2008). *Emergency Ultrasound Guidelines*. Retrieved 26th October, 2012, from www.acep.org/content.aspx?id=32878
- Australasian College for Emergency Medicine (2008). *Policy on credentialling for ED ultrasonography: trauma examination and suspected AAA*. Retrieved 8th December, 2008, from www.acem.org.au

- Australasian Society for Ultrasound in Medicine (2008). *Statement on the Use of Ultrasound by Medical Practitioners*. Retrieved 25th July, 2012, from www.asum.com.au
- Australasian Society for Ultrasound in Medicine (2008). *Policies and statements*. Retrieved 8th December, 2008, from www.asum.com.au
- Australian Physiotherapy Association (2012). *Standards Documents*. Retrieved 25th October, 2012, from <http://www.physiotherapy.asn.au/>
- Backhaus, M., Burmester, G.-R., Gerber, T., Grassi, W., Machold, K. P., Swen, W. A., et al. (2001). Guidelines for Musculoskeletal Ultrasound in Rheumatology. *Annals of the Rheumatic Diseases*, 60, 641-649.
- Baessler, K., Schussler, B., Burgio, K. L., Moore, K. H., Norton, P. A., & Stanton, S. L. (2008). *Pelvic Floor Re-Education Principles and Practice* (second ed.). London: Springer.
- Balint, P., & Sturrock, R. (2001). Intraobserver Repeatability and Interobserver Reproducibility in Musculoskeletal Ultrasound Imaging Measurements. *Clinical Experimental Rheumatology*, 19, 89-92.
- Bender, D. E., & Ewbank, D. (1994). The Focus Group as a Tool for Health Research: Issues in Design and Analysis. *Health Transition Review*, 4(1), 63-79.
- Britten, N. (1995). Qualitative Research: Qualitative Interviews in Medical Research. *British Medical Journal*, 311, 251-253.
- Charles Sturt University (2008). *Charles Sturt University*. Retrieved 16th December, 2008, from www.csu.edu.au
- Costantino, T. G., Satz, W. A., Stahmer, S. A., & Dean, A. J. (2003). Predictors of Success in Emergency Medicine Ultrasound Education. *Academic Emergency Medicine*, 10(2), 180-183.
- Counselman, F. L., Sanders, A., Slovis, C. M., Danzl, D., & et, a. l. (2003). The Status of Bedside Ultrasonography Training in Emergency Medicine Residency Programs. *Academic Emergency Medicine*, 10(1), 37-42.
- Curtin University (2000). *School of physiotherapy 2000 annual report*. Retrieved 12th December, 2008, from www.physiotherapy.curtin.edu.au
- D'Agostino, M. A., Maillefert, J. F., Said-Nahal, R., & al., E. (2004). Detection of Small Joint Synovitis by Ultrasonography: The Learning Curve of Rheumatologists. *Annals of the rheumatic Diseases*, 63, 1284-1287.
- Durham, B. (1996). Emergency Medicine Physicians Saving Time With Ultrasound. *American Journal of Emergency Medicine*, 14(3), 309-313.

- Dynamic Ultrasound Group (2006). *Association of Physiotherapists using Ultrasound Imaging*. Retrieved 7th October 2010, from <http://dynamicultrasound.org/>
- Edwards, H. (2010). Let's all Jump on the Ultrasound Bandwagon: Further Debate on the Use of Ultrasound. *Ultrasound*, 18, 4-7.
- European Federation of Societies for Ultrasound in Medicine and Biology (2011). *Minimum Training Requirements for the Practice of Medical Ultrasound in Europe*. Retrieved 26th October, 2012, from <http://www.efsumb-portal.org/ep/article.php?id=43>
- Filippucci, E., Unlu, Z., Farina, A., & Grassi, W. (2003). Sonographic Training in Rheumatology: A Self Teaching Approach *Annals of the Rheumatic Diseases*, 62, 565-567.
- Freitas, M. L., Frangos, S. G., & Frankel, H. L. (2006). The Status of Ultrasonography Training and Use in General Surgery Residency Programs. *Journal of the American College of Surgeons*, 202(3), 453-458.
- Frost, N., & Clarke, J. (2004). Ultrasound for Biofeedback in Physiotherapy. *Sound Effects*, 4, 10-13.
- Gent, R. (1997). *Applied Physics and Technology of Diagnostic Ultrasound*. South Australia: Milner publishing.
- Glazebrook, R., Manahan, D., & Chater, A. B. (2005). Evaluation of an Ultrasound Program (Intermediate Obstetric and Emergency Medicine) for Australian Rural and Remote Doctors. *Australian Journal of Rural Health*, 13(5), 295-299.
- Goldberg, B. B. (2003). International Arena of Ultrasound Education. *Journal of Ultrasound in Medicine*, 22(6), 549-551.
- Gracias, V. G., Frankel, H. L., Gupta, R., Reilly, P. M., Gracias, F., Klein, W., et al. (2002). The Role of Positive Examinations in Training for the Focused Assessment Sonogram in Trauma (FAST) Examination. *The American Surgeon*, 68(11), 1008-1011.
- Han, D. C., Rozycki, G. S., Schmidt, J. A., & Feliciano, D. V. (1996). Ultrasound Training During ATLS: an Early Start for Surgical Interns. *The Journal of Trauma Injury, Infection and Critical Care*, 41(2), 208-213.
- Heller, M., Melanson, S., Patterson, J., & Raftis, J. (1999). Impact of Emergency Medicine Resident Training in Ultrasonography on Ultrasound Utilization. *American Journal of Emergency Medicine*, 17(1), 21-22.
- Jedrzejczak, A., & Chipchase, L. S. (2008). The Availability and Usage Frequency of Real Time Ultrasound by Physiotherapists in South Australia: an Observational Study. *Physiotherapy Research International*, 13(4), 231-240.

- La Trobe University (2006). *School of physiotherapy newsletter*. Retrieved 12th December, 2008, from www.latrobe.edu.au
- Lapostolle, F., Petrovic, T., Lenoir, G., Catineau, J., Galinski, M., Metzger, J., et al. (2006). Usefulness of Hand-Held Ultrasound Devices in Out-of-Hospital Diagnosis Performed by Emergency Physicians. *American Journal of Emergency Medicine*, 24(2), 237-242.
- Ma, O. J., Mateer, J. R., M, O., Kefer, M. P., Wittmann, D., & Aprahamian, C. (1995). Prospective Analysis of a Rapid Trauma Ultrasound Examination Performed by Emergency Physicians. *Journal of Trauma-Injury Infection & Critical Care*, 38(6), 879-885.
- Mandavia, D. P., Aragona, J., Chan, L., Chan, D., & Henderson, S. O. (2000). Ultrasound Training for Emergency Physicians-- A Prospective Study. *Academic Emergency Medicine*, 7(9), 1008-1014.
- Mateer, J., Plummer, D. W., Heller, M., Olson, D., Jehle, D., Overton, D., et al. (1994). Model Curriculum for Physician Training in Emergency Ultrasonography. *Annals of Emergency Medicine*, 23(1), 95-102.
- McKiernan, S., Chiarelli, P., & Warren-Forward, H. (2010). Diagnostic Ultrasound use in Physiotherapy, Emergency Medicine and Anaesthesiology. *Radiography*, 16, 154-159.
- McKiernan, S., Chiarelli, P., & Warren-Forward, H. (2011). A Survey of Diagnostic Ultrasound Within the Physiotherapy Profession for the Design of Future Training Tools *Radiography*, 17(2), 121-125.
- McLaughlin, R., Collum, N., McGovern, S., Martyn, C., & Bowra, J. (2005). Emergency Department Ultrasound (EDU): Clinical Adjunct or Plaything? *Journal of Emergency Medicine*, 22(5), 333-335.
- McManus, J. (2007). Use of a Simulation Mannequin to Train Combat Medics (91Ws) on the FAST Ultrasound Examination. *Academic Emergency Medicine*, January.
- Monash University (2008). *Monash University*. Retrieved 16th December, 2008, from www.monash.edu.au
- Potter, C. L., Cairns, M. C., & Stokes, M. (2011). Use of Ultrasound Imaging by Physiotherapists: A Pilot Study to Survey Use, Skills and Training. *Manual Therapy*, doi:10.1016/j.math.2011.08.005
- Pressler, J. F., Heiss, D. G., Buford, J. A., & Chidley, J. V. (2006). Between-Day Repeatability and Symmetry of Multifidus Cross-Sectional Area Measured Using Ultrasound Imaging. *Journal of Orthopaedic and Sports Physical Therapy*, 36(1), 10-18.

- Salem, P., O'Connor, R., Passarello, B., Pancu, D., Melanson, S., Arcona, S., et al. (2001). A Comparison of Teaching Models for Trauma Sonography. *The Journal of Emergency Medicine*, 20(4), 421-425.
- Sandelowski, M. (2010). What's in a Name? Qualitative Description Revisited. *Research in Nursing and Health*, 33, 77-84.
- Sanders, R. C., & Winter, T. (2007). *Clinical Sonography A Practical Guide* (fourth ed.): Lippincott Williams & Wilkins.
- Scalea, T. M. M. D., Rodriguez, A. M. D., Chiu, W. C. M. D., Brenneman, F. D. M. D., Fallon, W. F. J. M. D., Kato, K. M. D., et al. (1999). Focused Assessment with Sonography for Trauma (FAST): Results from an International Consensus Conference. *The Journal of Trauma Injury, Infection and Critical Care*, 46(3), 466-472.
- Shackford, S. R., Rogers, F. B., Osler, T. M., Trabulsy, M. E., Clauss, D. W., & Vane, D. W. (1999). Focused Abdominal Sonogram for Trauma: The Learning Curve of Nonradiologist Clinicians in Detecting Hemoperitoneum. *Journal of Trauma-Injury Infection and Critical Care*, 46(4), 553-564.
- Sim, J. (1998). Collecting and Analysing Qualitative Data: Issues Raised by the Focus Group. *Journal of Advanced Nursing*, 28(2), 345-352.
- Society of Radiographers (2012). *General Guidelines*. Retrieved 25th July, 2012, from www.sor.org
- Teyhen, D. S., Miltenberger, C. E., Deiters, H. M., Del Toro, Y. M., Pulliam, J. N., Childs, J. D., et al. (2005). The Use of Ultrasound Imaging of the Abdominal Drawing - in Maneuver in Subjects With Low Back Pain. *Journal of Orthopaedic and Sports Physical Therapy*, 35(6), 346-355.
- The British Medical Ultrasound Society (2008). *Statement on Patient Information and Informed Consent*. Retrieved 25th July, 2012, from www.bmus.org
- The University of Newcastle (2008). *Musculoskeletal Physiotherapy*. Retrieved 12th December, 2008, from www.newcastle.edu.au/course
- The University of Sydney (2008). *Ultrasound for Physiotherapists*. Retrieved 12th December, 2008, from www.usyd.edu.au/courses
- Thomas, B., Falcone, R. E., Vasquez, D., Santanello, S., Townsend, M., Hockenberry, S., et al. (1997). Ultrasound Evaluation of Blunt Abdominal Trauma: Program Implementation, Initial Experience, and Learning Curve. *Journal of Trauma-Injury Infection and Critical Care*, 42(3), 384-388.

- Van, K., Hides, J. A., & Richardson, C. A. (2006). The Use of Real-Time Ultrasound Imaging for Biofeedback of Lumbar Multifidus Muscle Contraction in Healthy Subjects. *Journal of Orthopaedic and Sports Physical Therapy*, 36(12), 92-925.
- Wakefield, R. J., & D'Agostino, M. A. (2010). *Essential Applications of Musculoskeletal Ultrasound in Rheumatology*. Philadelphia: Elsevier.
- Whittaker, J. L., Thompson, J. A., Teyhen, D. S., & Hodges, P. (2007). Rehabilitative Ultrasound Imaging of Pelvic Floor Muscle Function. *Journal of Orthopaedic and Sports Physical Therapy*, 37(8), 487-498.