2020 | VOLUME 48 | ISSUE 2: 53-100

NZJP

ISSN 0303-7193 (PRINT)
ISSN 2230-4886 (ONLINE)

NEW ZEALAND JOURNAL OF PHYSIOTHERAPY

- Screening and stratification for back pain
- Physiotherapist involvement in concussion services
- Rehabilitation following total shoulder replacement
- Bridging theory and practice for supporting patient self-management

PHYSIOTHERAPY
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2020, VOLUME 48
ISSUE 2: 53-100

New Zealand Journal of Physiotherapy
Official Journal of Physiotherapy New Zealand

ISSN 0303-7193

Physiotherapy New Zealand
PO Box 27 386, Wellington 6141
Level 6, 342 Lambton Quay, Wellington 6011
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Phone: +64 4 801 6500
pnz@physiotherapy.org.nz
pnz.org.nz/journal

Physiotherapists Adapting to a Changing World

The world has forever been changed by the COVID-19 pandemic in ways that we may not fully appreciate until it is eventually under control worldwide. Healthcare professionals in different parts of the world have been battling for months to save lives from a highly contagious virus that has affected the way we live and think about the world. In these changing times, physiotherapists must learn to adapt and continue to provide the same quality of care we always have despite the challenges we are facing in this pandemic (Fauci et al., 2020). Physiotherapists are constantly updating their knowledge of treatment techniques, equipment, and effective patient care strategies using evidence-based guidelines as part of a lifelong commitment to continuing education within our field. We often play a critical role within interdisciplinary healthcare teams to ensure patients are receiving the best care possible so they may return to their highest level of functional potential. Whether we work in hospitals, aged care facilities, outpatient services or other settings, our overall goal is the same: to provide evidence-based treatment and individualised goals to improve health, function, and quality of life for our patients. A critical part of adaptation in this changing world is our contribution to interdisciplinary teamwork, which has always been vital to effectively and comprehensively plan patient care, but is now, perhaps, more important than ever.

The news regarding the COVID-19 pandemic and its effects around the world seems to change daily. For example, some countries, including New Zealand, have effectively decreased infection rates, while in other parts of the world, including the United States, the virus is claiming lives and infecting people in record numbers. While there is debate among public health officials and political leaders regarding the ways in which to address these growing numbers, our priority continues to be providing effective and quality care to our patients. In some cases, providing quality care is made more difficult by barriers we never could have imagined before the pandemic. In New Zealand, officials provided residents with clear guidelines and strategies for combatting the virus. However, in the United States, this has not been the case. One of the challenges healthcare workers have faced is a lack of adequate personal protective equipment (PPE). PPE is necessary to keep healthcare workers and patients safe, and without this, we are putting ourselves and our patients at risk. Other barriers and likely contributors to rising COVID-19 infection rates include a lack of understanding among the general public about ways they can help to prevent the spread of the infection, in particular cough and sneeze etiquette, wearing a mask, socially distancing at least 2 m apart, and hand washing. The high infection and hospitalisation rates have also affected hospital policies regarding visitors. Around the world there are many examples of family members not being allowed to visit sick relatives in order to limit their exposure to outside people, in some cases, contributing to feelings of isolation and fear.

Interdisciplinary teamwork is critically important in these times. We are challenged not only to care for patients infected with COVID-19, but also for other patients who are hospitalised or are within an inpatient setting and living in quarantine conditions due to the contagiousness of the virus. I have been a member of interdisciplinary healthcare teams for 25 years, firstly as a physiotherapist working in a variety of settings that have included rehabilitation centres, nursing facilities, and home settings. More recently, I returned to university for training to become a nurse (Bachelor of Science in Nursing), working in rehabilitation settings in both roles (physiotherapist and registered nurse) at different times/shifts. Throughout the years, the interdisciplinary teamwork I have been part of has contained different elements depending on the setting. For example, co-treatments with occupational therapists were common in nursing facilities, whereas in home settings, interdisciplinary communication might take the form of a written note or a phone call with a physical functioning update to a patient’s nurse or other healthcare provider. The common element within any setting, however, was the importance of healthcare team communication to promote safety/continuity of care, for example between providers and between settings for discharge from acute care to home environments.

In adapting to the changing world, we as healthcare professionals can draw upon lessons learned from past medical crises. One example is the HIV/AIDs crisis when it began several decades ago. In the early days, little was known about how this virus was spread and who might be at risk of contracting it. Back then, healthcare professionals were on the front lines of caring for those patients, just like we are on the front lines caring for COVID-19 patients. Interdisciplinary team communication was critical to providing quality care for patients while also ensuring the safety of healthcare providers who may be exposed to bodily fluids, for example. Team members communicated in ways that were necessary and vital to the overall functioning of that healthcare environment. Another example is the response to the H1N1 pandemic a few years ago (Wong et al., 2012). Healthcare workers were challenged to contribute to the care and safety of these patients using the same effective communication strategies to keep both patients and healthcare workers safe. In today’s crisis, we can apply these same lessons since we are facing the effects of a highly contagious virus. Among the ways we can adapt is by embracing different forms of communication, such as telehealth. This topic was discussed in the last editorial of this journal (Woodley, 2020) and was recently explored as a specific way of navigating the uncharted territory of the pandemic we are currently facing (Hollander & Carr, 2020).

In this ever-changing world, interdisciplinary teamwork and communication has never been more important (Eklof & Ahlborg, 2016). The consequences of a lack of good communication are compounded by this disease being highly infectious and poorly understood. We are seeking to fully understand the nature of transmission and why the disease affects different people in sometimes vastly different ways. Unfortunately, we are also facing the reality that there is not yet a vaccine or standardised treatment. We as physiotherapists must do our part as healthcare team members to adapt to our changing world.

Jennifer Rowland *PhD, PT, MS, MPH, BSN, RN*
Physiotherapist and nurse, Memorial Hermann Hospital and University of Houston–Clear Lake, Texas, United States
Editorial Advisory Board member, New Zealand Journal of Physiotherapy

Email: jenrow19@gmail.com

https://doi.org/10.15619/NZJP/48.2.01

REFERENCES

Eklof, M., & Ahlborg, G. (2016). Improving communication among healthcare workers: A controlled study. *Journal of Workplace Learning, 28*, 81–96. https://doi.org/10.1108/JWL-06-2015-0050

Fauci, A. S., Lane, C., & Redfield, R. R. (2020). Covid-19 – Navigating the uncharted. *New England Journal of Medicine, 382*, 1268–1269. https://doi.org/10.1056/NEJMe2002387

Hollander, J. E., & Carr, B. G. (2020). Virtually perfect? Telemedicine for Covid-19. New England Journal of Medicine, 382, 1679–1681. https://doi.org/10.1056/NEJMp2003539

Wong, E. L., Wong, S. Y., Lee, N., Cheung, A., & Griffith, S. (2012). Healthcare workers' duty concerns of working in the isolation ward during the novel H1N1 pandemic. *Journal of Clinical Nursing, 21*(9–10), 1466–1475. https://doi.org/10.1111/j.1365-2702.2011.03783.x

Woodley, S. (2020). Communication – An essential tool in extraordinary times. *New Zealand Journal of Physiotherapy, 48*(1), 5–6. https://doi.org/10.15619/NZJP/48.1.01

Exploring Physiotherapists' Use of Clinical Practice Guidelines, Screening, and Stratification Tools for People with Low Back Pain in New Zealand

Julia Hill *PhD*
Department of Physiotherapy; Active Living and Rehabilitation: Aotearoa New Zealand, School of Clinical Sciences, Auckland University of Technology, Auckland, New Zealand

John Bedford *BHSc*
Department of Physiotherapy, School of Clinical Sciences, Auckland University of Technology, Auckland, New Zealand

David Houston *BHSc*
Department of Physiotherapy, School of Clinical Sciences, Auckland University of Technology, Auckland, New Zealand

Duncan A. Reid *DHSc*
Department of Physiotherapy; Active Living and Rehabilitation: Aotearoa New Zealand, School of Clinical Sciences, Auckland University of Technology, Auckland, New Zealand

G. David Baxter *TC, BSc(Hons), DPhil, MBA, FCSP*
Centre for Health, Activity and Rehabilitation Research, School of Physiotherapy, University of Otago, Dunedin, New Zealand

Richard Ellis *PhD*
Department of Physiotherapy; Active Living and Rehabilitation: Aotearoa New Zealand, School of Clinical Sciences, Auckland University of Technology, Auckland, New Zealand

ABSTRACT

Low back pain (LBP) is a leading cause of disability in New Zealand and is associated with significant treatment and societal costs. Clinical practice guidelines (CPGs) for LBP increasingly recommend the use of screening and stratification tools to aid the early identification of psychosocial factors that can contribute to chronic LBP. This survey of New Zealand physiotherapists examined their use of CPGs, screening, and stratification tools in clinical practice, and identified their perceived barriers to using these tools. In total, 228 physiotherapists completed the survey. Over half of the respondents (53%) regularly used CPGs for LBP in clinical practice, with the Accident Compensation Corporation's New Zealand Acute Low Back Pain Guide being the most commonly used guideline (84%). Most (94%) respondents reported screening people with LBP for psychosocial factors; 37% used formal screening tools and 22% used risk stratification tools. Key perceived barriers to using CPGs, screening, and stratification tools included lack of training and exposure, time constraints, and lack of resources. An analysis using chi-square tests revealed significant associations ($p < 0.05$) between the use of screening tools, and postgraduate qualifications and years of experience. Further research is required to better understand whether a stratified model of care for LBP may be implemented in New Zealand and the supports required to ensure the success of such a model.

Hill, J., Bedford J., Houston, D., Reid, D. A., Baxter, G. D., & Ellis, R. (2020). Exploring physiotherapists' use of clinical practice guidelines, screening, and stratification tools for people with low back pain in New Zealand. *New Zealand Journal of Physiotherapy, 48*(2), 59–69. https://doi.org/10.15619/NZJP/48.2.02

Key Words: Low Back Pain, Physiotherapy, Stratified Care, Clinical Guidelines, Screening Tools

INTRODUCTION

Spinal disorders are the leading specific cause of health loss (as measured by disability adjusted life years) for those aged 15-64 years in New Zealand (Ministry of Health, 2016). The prognosis for acute low back pain (LBP) is generally positive, with pain and disability often improving within 6 weeks of onset (Artus et al., 2014; Green et al., 2018; Menezes Costa et al., 2012). However, a review of prospective studies investigating the prognosis of recent onset LBP reported that 65% of people were still experiencing LBP at their 12-month follow-up appointment, indicating that the prognosis is often not as favourable as suggested in clinical guidelines (Itz et al., 2013). Moreover, the traditional concept of LBP as discreet, unrelated episodes has been challenged, and LBP is increasingly considered a long-lasting condition with a variable course (Dunn et al., 2013). This pattern of recurrence and the disability that ensues in some cases of chronic LBP may be explained by the complex interrelationship of biomedical, psychological, and social factors that can contribute to LBP (Foster & Delitto, 2011; O'Sullivan et al., 2016; Ramond et al., 2011).

Treatment expenditure for LBP is increasing, and much of this cost is absorbed by the disability related to chronic LBP. It is estimated that 80% of direct public healthcare expenditure in New Zealand relates to chronic LBP (National Health Committee, 2015). Further, costs associated with loss of income and productivity attributable to LBP have been estimated at $2.6 billion (National Health Committee, 2015). These estimates demonstrate the substantial societal costs of chronic LBP and highlight the importance of early identification of people who are at risk of developing a disability related to chronic LBP.

Clinical practice guidelines (CPGs) are formal, evidence-based recommendations that seek to optimise health outcomes and are considered fundamental to improving health care (Lin et al., 2019). Early physiotherapy treatment that adheres to CPGs for LBP has been shown to significantly reduce the use of imaging, lumbar injections, surgery, and opioids as well as reducing total treatment costs (Childs et al., 2015). CPGs increasingly recommend using validated prognostic screening tools to help identify psychosocial factors, often referred to as "yellow flags", and guide the management of LBP (Oliveira et al., 2018). The Accident Compensation Corporation (ACC) published the latest edition of the *New Zealand Acute Low Back Pain Guide* in 2004, which covered the assessment and management of acute LBP. This guideline recommends administering the Örebro Musculoskeletal Pain Screening Questionnaire (ÖMPSQ) if patients do not make the expected progress in the first 2-4 weeks (Accident Compensation Corporation, 2004).

Stratified care targets treatment based on biological or other prognostic risk factors that are evident in subgroups of patients (Hingorani et al., 2013). This supports clinical decision-making and increases the efficiency of healthcare provision while maximising patient outcomes (Foster et al., 2013; Hingorani et al., 2013). Validated prognostic screening tools are available that assess a combination of factors and help predict future outcomes; such tools are integral to stratified care (Steyerberg et al., 2013). LBP is considered well suited to stratified care because of the heterogenous populations, large variations in prognosis, and the multitude of treatment options that have varying risks and costs (Foster et al., 2013; Hodges, 2019). There are three broad approaches to stratified care for LBP. These are based on: 1) underlying mechanisms, 2) treatment responsiveness, and 3) risk for persistent disability (Foster et al., 2013). The United Kingdom National Institute for Health and Care Excellence (NICE) guidelines for LBP recommend the use of risk stratification tools, such as the STarT Back Screening Tool (SBST), at the first contact for each new LBP episode (National Institute for Health and Care Excellence [NICE], 2016). In the UK primary care context, use of the SBST resulted in reduced levels of disability, increased health-related quality of life, and cost savings compared with usual care (Foster et al., 2014; Hill et al., 2011).

Several studies have investigated the degree to which New Zealand physiotherapists use CPGs for LBP. Tumilty et al. (2017) reviewed treatment records from private physiotherapy clinics in New Zealand and found that despite reducing pain and improving function, the most commonly applied treatments (e.g. joint mobilisations, specific exercises, and massage) lacked support from CPGs. A survey of New Zealand physiotherapists by Hendrick et al. (2013) found that although the majority of respondents provided advice consistent with CPGs (e.g. returning to activity and work, and avoiding bedrest), adherence to CPGs was influenced by the therapists' level of education and the extent of their biomedical beliefs. An earlier study by Copeland et al. (2008) found that the use of LBP outcome measures by New Zealand physiotherapists was relatively low (40%), although that study did not include screening or stratification tools, such as the ÖMPSQ or SBST.

To date, no research has investigated the extent to which (and how) screening and stratification tools are used by physiotherapists in clinical practice for the assessment and management of people with LBP in New Zealand. Furthermore, if there are barriers to physiotherapists using these tools, these barriers have not been clearly identified. Therefore, the aim of this study was to survey registered physiotherapists practicing in New Zealand who regularly treat people with LBP to investigate:

1. The extent to which New Zealand physiotherapists use CPGs, screening, or stratification tools (collectively, "the tools") in assessing and treating people with LBP.
2. For those physiotherapists using the tools, which tools are being used, how they are used to assess/treat people with LBP, and their perceived importance.
3. For those physiotherapists not using the tools, the perceived barriers to using the tools.

METHODS

This study used a cross-sectional observational design, with data gathered through an internet-based survey of New Zealand registered physiotherapists. The survey comprised three main phases: 1) survey development, 2) face validity testing through expert consultation, and 3) survey distribution and data collection.

Survey development

The 39-item survey contained four sections: 1) participants' consent and professional background, 2) CPGs, 3) screening tools, and 4) stratification tools. For the purposes of this study, we defined general LBP questionnaires/outcome measures, such as the Oswestry Low Back Pain Disability Questionnaire, as screening tools, because these tools can be used by clinicians to identify people at risk of chronicity through to slow recovery or poor outcomes. Although the Oswestry Low Back Pain Disability Questionnaire and similar tools were not specifically designed as screening and/or stratification tools, they help practitioners in their decision-making about treatment pathways.

The last three sections of this study followed a similar pattern of assessing individual selection of the tools, exploring how the tools guided clinical practice, and where relevant, any associated barriers to the use of the tools.

Face validity testing via an expert panel

The face validity of the survey was assessed by a panel of four experts in the field of assessment and treatment of people with LBP. As the survey aimed to understand the New Zealand context, three of these experts were based in New Zealand. The fourth expert was from the UK to provide an international perspective.

The survey initially combined screening and stratification tools in the same section. However, following feedback from the panel, these types of tools were separated to allow clarity between screening for psychosocial barriers and stratification into treatment pathways. Other modifications included removing questions or response options deemed not applicable and adding the option to provide qualitative explanations for certain items.

Survey distribution and data collection

The final survey was distributed through SurveyMonkey®, an internet-based survey site. Participation in the survey was anonymous and no identifying data were collected from participants. The survey was advertised via newsletters, clinical meetings, and relevant social media platforms operated by Physiotherapy New Zealand and its associated special interest groups. Participant recruitment was enhanced by a snowballing method, whereby participants were encouraged to promote the survey to other physiotherapists. Eligibility to participate in the survey was limited to physiotherapists registered in New Zealand who regularly assess and treat people with LBP. Ethical approval to conduct this study was obtained from the Auckland University of Technology Ethics Committee (reference number 19/72). The survey was open for responses from 10 April to 23 September 2019. All participants provided consent to participate in the study.

Data analysis

Data were exported from SurveyMonkey®and analysed using SPSS version 23.0 (IBM Corp., Armonk, NY, USA). Data for closed or multiple-choice questions were presented as frequencies and percentages, based on the number of valid responses per item. For the open-ended questions, two researchers (JB and DH) independently reviewed all responses. Through consensus agreement, they grouped similar responses into like categories, and then frequencies and percentages were calculated for the valid responses in each category. Non-parametric chi-square analyses were used to compare demographic and professional details of physiotherapists who used CPGs, screening, and stratification tools (termed “users”) with physiotherapists who did not use these tools (termed “non-users”). The level of significance was set at $p<0.05$.

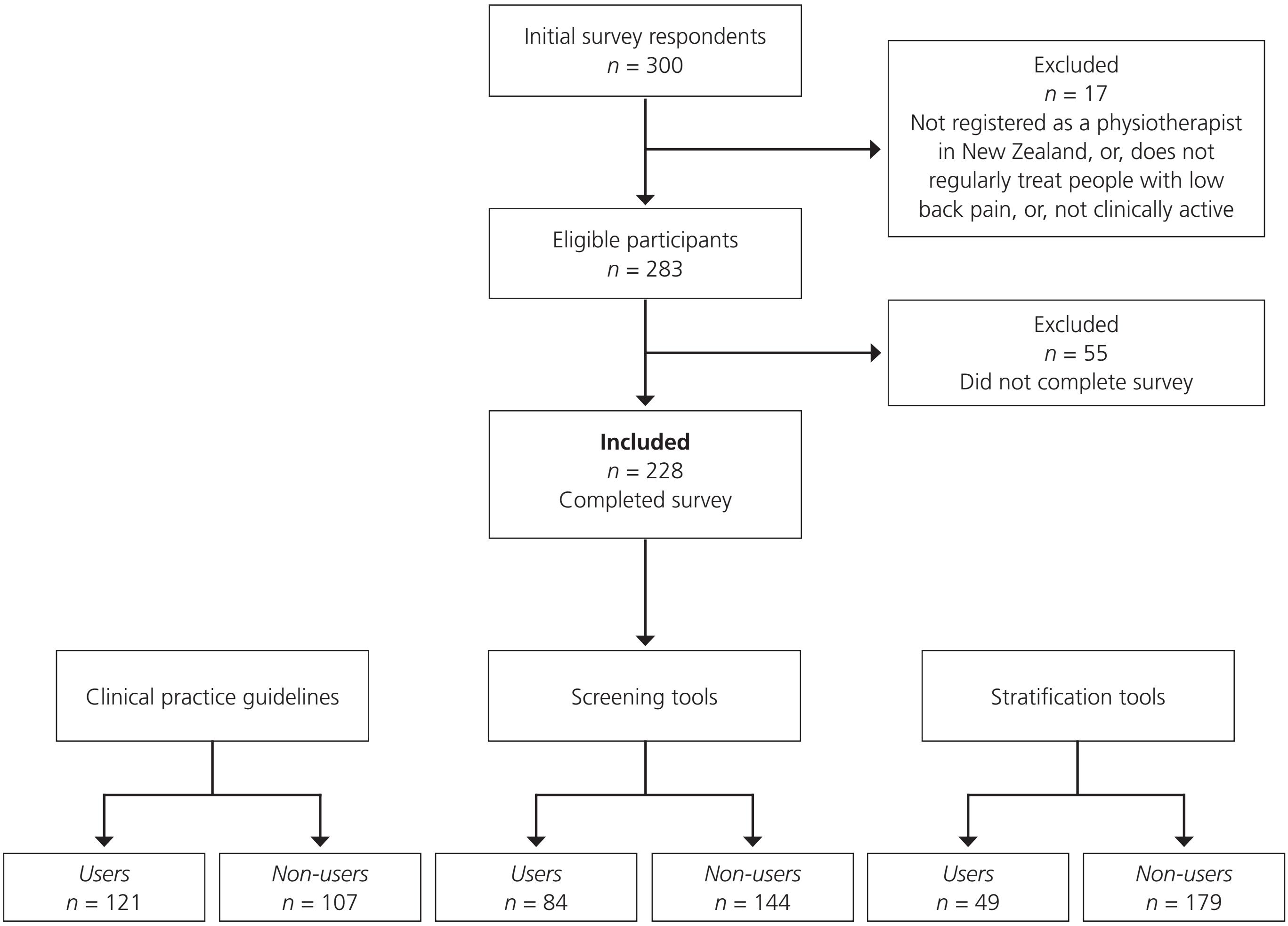
RESULTS

Survey responses

Of the 300 participants who responded to the survey, 17 did not meet the inclusion criteria (Figure 1). A further 55 participants were excluded because they did not complete the survey in full. This left complete responses from 228 participants for inclusion in the analysis.

Figure 1

Prototypical STARD Diagram of the Flow of Participants Through the Study



Professional and demographic details

Over half of the participants were aged 20-39 years (138/228; 61%), with 47% (107/228) having ≤10 years of clinical experience (Table 1). A graduate degree in physiotherapy was the highest qualification for 47% (108/228) of participants, and the majority of participants had obtained their qualification from New Zealand institutions (184/228; 81%). The survey allowed participants to select multiple areas and settings of clinical practice; most participants indicated that they worked in musculoskeletal physiotherapy (218/228; 96%) and in a private practice setting (201/228; 88%) (Table 1).

Use of CPGs

Over half of the participants reported regular use of CPGs during their assessment and treatment of people with LBP (121/228; 53%). The mean importance rating for use of CPGs was 6 out of 10 (zero = "not at all important" and 10 = "very important"). The most frequently used CPGs were the New Zealand Acute Low Back Pain Guide (101/121; 84%) and the NICE Guidelines (30/121; 25%) (Table 2). Aspects of CPGs that were most commonly used in the assessment of people with LBP included screening for red flags (98/121; 81%), guidance on referral for diagnostic imaging (79/121; 65%), and screening for yellow flags (69/121; 57%). The components of CPGs most commonly used to guide treatment methods were guidance on conservative treatment modalities (84/121; 69%), onwards referral to other treatment modalities (59/121; 49%), and referral for surgery (61/121; 50%).

Of the participants that reported they did not use CPGs regularly (107/228; 47%), the main reasons identified were a lack of necessity due to personal knowledge and training (32/107; 30%), no training in or exposure to the guidelines (35/107; 33%), the lack of relevance to rehabilitation pathways (19/107; 18%), and that guidelines were out of date/not evidence based (16/107; 15%) (Table 3). The most commonly reported ways to potentially reduce barriers to using CPGs included attending informal training courses (72/107; 67%) and updating the applicable clinical guidelines (50/107; 47%) (Table 4).

Table 1

Participant Demographics by use of Clinical Practice Guidelines, Screening and Stratification Tools: Users Versus Non-users

Participant demographics	CPGs			Screening tools		Stratification tools	
	n (%)						
Age (years)							
20–29	69 (30.3)	43 (35.5)	26 (24.3)	22 (26.2)	47 (32.6)	13 26.5)	56 (31.3)
30–39	69 (30.3)	29 (24.0)	40 (37.4)	29 (34.5)	40 (27.8)	16 32.7)	53 (29.6)
40–49	46 (20.2)	25 (20.7)	21 (19.6)	19 (22.6)	27 (18.8)	11 22.4)	35 (19.6)
50–59	29 (12.7)	16 (13.2)	13 (12.1)	8 (9.5)	21 (14.6)	6 (12.2)	23 (12.8)
60–69	15 (6.6)	8 (6.6)	7 (6.5)	6 (7.1)	9 (6.3)	3 (6.1)	12 (6.7)
70+	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Work experience (years)							
0–5	70 (30.7)	39 (32.2)	31 (29.0)	15 (17.9)	55 (38.2)	13 (26.5)	57 (31.8)
6–10	37 (16.2)	23 (19.0)	14 (13.1)	20 (23.8)	17 (11.8)	12 (24.5)	25 (14.0)
11–15	40 (17.5)	17 (14.0)	23 (21.5)	16 (19.0)	24 (16.7)	9 (18.4)	31 (17.3)
16+	81 (35.5)	42 (34.7)	39 (36.4)	33 (39.3)	48 (33.3)	15 (30.6)	66 (36.9)
Further qualification							
None	108 (47.4)	53 (43.8)	55 (51.4)	28 (33.3)	80 (55.6)	17 (34.7)	91 (50.8)
Postgraduate	76 (33.3)	42 (34.7)	34 (31.8)	32 (38.1)	44 (30.6)	17 (34.7)	59 (33.0)
Master's	41 (18.0)	23 (19.0)	18 (16.8)	22 (26.2)	19 (13.2)	14 (28.6)	27 (15.1)
Other	3 (1.3)	3 (2.5)	0 (0)	2 (2.4)	1 (0.7)	1 (2.0)	2 (1.1)
Area(s) of work							
Musculoskeletal	218 (95.6)	115 (95.0)	103 (96.3)	79 (94.0)	139 (96.5)	45 (91.8)	173 (96.6)
Sports physiotherapy	105 (46.1)	59 (48.8)	46 (43.0)	37 (44.0)	68 (47.2)	18 (36.7)	87 (48.6)
Multidisciplinary	36 (15.8)	19 (15.7)	17 (15.9)	29 (34.5)	7 (4.9)	14 (28.6)	22 (12.3)
Occupational health	25 (11.0)	18 (14.9)	7 (6.5)	15 (17.9)	10 (6.9)	8 (16.3)	17 (9.5)
Other	27 (11.8)	14 (11.6)	13 (12.1)	8 (9.5)	19 (13.2)	4 (8.2)	23 (12.8)
Setting(s) of work							
Public hospital	22 (9.6)	13 (10.7)	9 (8.4)	10 (11.9)	12 (8.3)	5 (10.2)	17 (9.5)
Private practice	201 (88.2)	104 (86.0)	97 (90.7)	71 (84.5)	130 (90.3)	41 (83.7)	160 (89.4)
Private organisation	7 (3.1)	3 (2.5)	4 (3.7)	3 (3.6)	4 (2.8)	3 (6.1)	4 (2.2)
Sports institute	40 (17.5)	26 (21.5)	14 (13.1)	10 (11.9)	30 (20.8)	6 (12.2)	34 (19.0)
Other	8 (3.5)	3 (2.5)	5 (4.7)	1 (1.2)	7 (4.9)	0 (0)	8 (4.5)

Note. CPGs = clinical practice guidelines.

Table 2

Clinical Practice Guidelines Used in Clinical Practice

Clinical practice guidelines	*n* (%)
New Zealand acute low back pain guide (Accident Compensation Corporation)	101 (83.5)
Low back pain and sciatica in over 16s: Assessment and management (National Institute for Health and Care Excellence guideline, UK)	30 (24.8)
Management of non-specific back pain and lumbar radicular pain (Best Practice Advocacy Centre New Zealand [BPACNZ])	14 (11.6)
Acute low back pain (Best Practice Advocacy Centre New Zealand [BPACNZ])	12 (9.9)
Diagnosis and treatment of low back pain: A joint clinical practice guideline (American College of Physicians and the American Pain Society, USA)	12 (9.9)
Guideline for the evidence-informed primary care management of low back pain (College of Family Physicians, Canada)	6 (5.0)
Low back pain: Clinical practice guidelines linked to the International Classification of Functioning, Disability and Health (Orthopaedic Section of the American Physical Therapy Association, USA)	4 (3.3)
Other	12 (9.9)

Note. *N* = 121.

Table 3

Barriers for not Using Clinical Practice Guidelines, Screening and Stratification Tools

Barriers	CPGs (*n* = 107)	Screening tools (*n* = 13)	Stratification tools (*n* = 179)
		n (%)	
No interest	4 (3.7)	5 (3.8)	14 (7.8)
No training or exposure	35 (32.7)	32 (24.4)	123 (68.7)
I don't understand the potential use	13 (12.1)	10 (7.6)	39 (21.8)
No need due to personal knowledge	32 (29.9)	15 (11.5)	19 (10.6)
Out of date/not evidence based	16 (15.0)	N/A	N/A
Not individualised to patient	4 (3.7)	3 (2.3)	4 (2.4)
Don't feel competent despite recieving training	4 (3.7)	5 (3.8)	10 (5.6)
Lack of support from management	12 (11.2)	18 (13.7)	21 (11.7)
Lack of confidence	7 (6.5)	16 (12.2)	17 (9.5)
Lack of relevance to rehabilitation pathway	19 (17.8)	16 (12.2)	15 (8.4)
I am aware of them but don't use them	11 (10.3)	N/A	N/A
Lack of awareness/not front of mind	N/A	6 (4.6)	2 (1.2)
Lack of resources to administer and collate data	N/A	36 (27.5)	33 (18.4)
Patients not willing to complete	N/A	19 (14.5)	9 (5.0)
Time constraints	N/A	86 (65.6)	61 (34.1)
Other	2 (1.8)	5 (3.8)	8 (4.5)

Note. CPGs = clinical practice guidelines; N/A = not applicable. Participants able to select more than one option.

Table 4

Potential Ways to Reduce Barriers to Using Clinical Practice Guidelines, Screening and Stratification Tools

Ways to reduce barriers	CPGs (*n* = 107)	Screening tools (*n* = 131)	Stratification tools (*n* = 179)
	n (%)		
Attending formal training courses	36 (33.6)	30 (22.9)	55 (30.7)
Attending informal training courses	72 (67.3)	62 (47.3)	117 (65.4)
Use of "clinical champions" to promote use	19 (17.8)	21 (16.0)	27 (15.1)
Profesional body engagement and endorsement	37 (34.6)	26 (19.8)	45 (25.1)
Funding providers mandating use	15 (14.0)	25 (19.1)	34 (19.0)
Update of applicable clinical guidelines	50 (46.7)	N/A	N/A
Longer patient appointment times	N/A	61 (46.6)	51 (28.5)
More assistance to administer and collate data	N/A	61 (46.6)	58 (32.4)
Further evidence to support use	3 (2.8)	41 (31.3)	58 (32.4)
Other	6 (5.6)	5 (3.8)	11 (6.1)

Note. CPGs = clinical practice guidelines; N/A = not applicable.

Use of screening tools

Regular screening for yellow flags and psychosocial factors in people with LBP was reported by most participants (215/228; 94%). Of these participants, approximately two-thirds did not use formal questionnaires or screening tools (131/215; 61%). Other ways that participants reported incorporating screening into assessment included targeted questions within the subjective interview (197/215; 92%), screening based on previous history of pain and disability (116/215; 54%), and the patient not improving within expected timeframes (103/215; 48%).

The most commonly used screening tools were the ÖMPSQ – Short Form and the Oswestry Low Back Pain Disability Questionnaire (Table 5). Of the screening tool users (84/215; 39%), 60% (50/84) reported being selective when incorporating these tools in assessment (i.e. based on clinical reasoning rather than for every patient). Common factors that influenced participants' decisions to administer screening tools were indicators of low mood (47/50; 94%) and the patient's responses in the subjective interview (41/50; 82%). Other indicators were past history of chronic pain or disability (32/50; 64%), past history of LBP (16/50; 32%), and if the patient did not show improvements within an expected timeframe (28/50; 56%). Respondents were also asked to report on the purpose, situational context, and how they were introduced to using screening tools (Table 6). The mean score for the importance of screening tools in informing the assessment and treatment of people with LBP was 7 out of 10.

The non-users of screening tools (131/215; 61%) were asked to identify barriers preventing the use of these tools (Table 3) and to suggest potential ways to reduce these perceived barriers (Table 4). Common barriers included time constraints (86/131; 66%), lack of resources to administer and collate data (36/131; 28%), and lack of training (32/131; 24%). Common suggestions for reducing barriers included attending informal training courses (62/131; 47%), assistance to administer and collate data (61/131; 47%), longer patient appointment times (61/131; 47%), and further evidence to support the use of screening tools (41/131; 31%).

Use of stratification tools

Regular clinical use of stratification tools was reported by 22% of participants (49/228), with the most commonly used tools being the SBST (28/49; 57%) and ÖMPSQ – Short Form (27/49; 55%) (Table 7). The mean score for the importance of stratification tools was 7 out of 10. Most commonly, participants reported that these tools were used as needed, based on clinical judgment (22/49; 45%). The majority of stratification tool users reported the purpose of using these tools was to inform the treatment approach (41/49; 84%) and inform the need for an escalated level of treatment management (38/49; 78%). Other reasons included monitoring treatment progress and recovery (26/49; 53%), and informing subjective and/or objective assessment (23/49; 47%) (Table 6).

The majority of participants (179/228; 79%) reported that they did not use stratification tools on a regular basis. The most common perceived barriers were no training (123/179; 69%), time constraints (61/179; 34%), not understanding the potential uses in clinical practice (39/179; 22%), and lack of resources to administer and collate data (33/179; 18%) (Table 3). Potential ways to reduce barriers included attending informal training courses (117/179; 65%), more assistance to administer and collate data (58/179; 32%) (Table 4), further evidence to support the use of stratification tools (58/179; 32%), and longer patient appointment times (51/179; 29%).

The results of the chi-square analyses (Table 8) showed there were significant associations between the use of screening tools and participants' level of education and years of work experience. No significant associations were found for the use of CPGs or stratification tools. However, there was a significant association between participants who used CPGs and those who used stratification tools.

Table 5

Screening Tools and Outcome Measures Used in Clinical Practice

Screening tools and outcome measures	*n* (%)
Örebro Musculoskeletal Pain Questionnaire (ÖMPQ) – Short Form	52 (61.9)
Oswestry Low Back Pain Disability Questionnaire	39 (46.3)
Depression, Anxiety and Stress Scales (DASS-21)	33 (39.3)
Pain Catastrophising Scale	33 (39.3)
Pain Self-Efficacy Questionnaire (PSEQ)	31 (36.9)
STarT Back Screening Tool (SBST)	26 (31.0)
electronic Persistant Pain Outcomes Collaboration (ePPOC)	25 (29.8)
Tampa Scale for Kinesiophobia (TSK)	20 (23.8)
Roland-Morris Low Back Pain and Disability Questionnaire (RMQ)	19 (22.6)
Fear Avoidance Beliefs Questionnaire (FABQ)	18 (21.4)
Örebro Musculoskeletal Pain Questionnaire (ÖMPQ) – Long Form	10 (11.9)
Short Form-36 (SF-36)	10 (11.9)
Central Sensitisation Inventory	9 (10.7)
Back Pain Inventory (BPI)	5 (6.0)
Hospital Anxiety and Depression Questionnaire (HADs)	5 (6.0)
Other	12 (14.3)

Note. $N = 84$.

Table 6

Purpose, Situational Context and Introduction to Screening and Stratification Tools

Variable	Screening tools (*n* = 84)	Stratification tools (*n* = 49)
	n (%)	
Purpose		
To inform the subjective and/or objective assessment	38 (45.2)	23 (46.9)
To inform treatment approach	59 (70.2)	41 (83.7)
To monitor treatment progress and recovery	61 (72.6)	26 (53.1)
To inform the need for an escalated level of treatment management	68 (81.0)	38 (77.6)
Research	6 (7.1)	3 (6.1)
Situation		
During first consultation only	11 (13.1)	11 (22.4)
Every consultation	2 (2.4)	3 (6.1)
During first and final consultation only	25 (29.8)	13 (26.5)
Sporadically/as needed based on clinical judgment	43 (51.2)	22 (44.9)
Other	3 (3.6)	0 (0)
Introduction to tools		
Included in university degree	42 (50.0)	19 (38.8)
Formal training course	0 (0)	0 (0)
Informal training course	33 (39.3)	17 (34.7)
Personal ongoing professional development	39 (46.4)	19 (38.8)
Clinical requirement of current/previous employer	31 (36.9)	15 (30.6)
Clinical requirement of a treatment provider	42 (50.0)	13 (26.5)
Reccomended by a colleague	17 (20.2)	9 (18.4)
Knowledge of clinical guidelines	23 (27.4)	9 (18.4)
Other	4 (4.8)	0 (0)

Table 7

Stratification Tools and Outcome Measures Used in Clinical Practice

Stratification tools and outcome measure	*n* (%)
STarT Back Screening Tool (SBST)	28 (57.1)
Örebro Musculoskeletal Pain Questionnaire (ÖMPQ) – Short Form	27 (55.1)
electronic Persistant Pain Outcomes Collaboration (ePPOC)	12 (24.5)
Örebro Musculoskeletal Pain Questionnaire (ÖMPQ) – Long Form	6 (12.2)
Other	6 (12.2)

Note. $N = 49$.

Table 8

Associations Between Participants' Level of Education and Years of Work Experience With the Use of Screening Tools

Variable			
Variable 1	Variable 2	Statistic	*p* value
Postgraduate vs. non-postgraduate	CPG user vs. non-user	$\chi^2(1) = 1.028$	0.311
Postgraduate vs. non-postgraduate	Screening tool user vs. non-user	$\chi^2(1) = 9.636$	0.002*
Postgraduate vs. non-postgraduate	Stratification tool user vs. non-user	$\chi^2(1) = 3.400$	0.065
Years of experience	CPG user vs. non-user	$\chi^2(3) = 3.267$	0.352
Years of experience	Screening tool user vs. non-user	$\chi^2(3) = 12.558$	0.006*
Years of experience	Stratification tool user vs. non-user	$\chi^2(3) = 3.427$	0.330
CPG user vs. non-user	Screening tool user vs. non-user	$\chi^2(1) = 2.653$	0.103
CPG user vs. non-user	Stratification tool user vs. non-user	$\chi^2(1) = 7.533$	0.006*

Note. CPG = clinical practice guideline.

*$p < 0.05$.

DISCUSSION

The 228 complete surveys included in this analysis represented approximately 4.3% of the estimated 5,346 physiotherapists in New Zealand who held an Annual Practicing Certificate (APC) in 2019, or 7.3% if only APC holders who worked in private practice were included (Physiotherapy Board of New Zealand, 2019). Of all participants, 60.6% were aged ≤39 years, and 30.3% were aged ≤29 years. This is broadly comparable with the average age (36.4 years) of New Zealand registered physiotherapists employed in private practice (excluding those who were self-employed) (Physiotherapy Board of New Zealand, 2019). However, our participants were notably younger compared with the paper-based survey on LBP outcome measures mailed to practice owners by Copeland et al. (2008). The younger demographic in this study may be attributable to the survey being electronic and promoted via social media platforms, which often attracts younger respondents compared with mailed surveys or other recruitment methods (Dykema et al., 2013; Topolovec-Vranic & Natarajan, 2016).

The qualification level among our participants was higher than that of New Zealand registered physiotherapists overall, with 53% of our participants holding a postgraduate qualification compared with 45% of the wider physiotherapy population (Physiotherapy Board of New Zealand, 2019). The majority of participants in this study worked in private practice (88%), compared with 58% of all 2019 APC holders. However, this higher proportion was expected given the survey's focus on LBP, which is commonly treated in private practice. Our participants were comparable with those of the previous survey by Hendrick et al. (2013), which investigated New Zealand physiotherapists' knowledge and use of CPGs for LBP (92% in private practice).

The survey found that 53% of participants regularly used CPGs in their practice, which was consistent with the 52% reported by Hendrick et al. (2013). A lack of training and exposure to CPGs was perceived as a major barrier to using CPGs. Often, participants used their clinical experience and individualised approach guided their assessment and treatment of patients, rather than using CPGs. Both this identified barrier and the proportion of regular users in our study were consistent with a survey by Bernhardsson et al. (2014) that investigated the determinants of the use of CPGs by Swedish physiotherapists. That study found that 47% of respondents frequently used CPGs but also identified lack of time to refer to CPGs (68%) and uncertainty on how to access them (45%) as key barriers to the use of CPGs. Participants in this study indicated that attending formal or informal training courses and endorsement by professional organisations may reduce the barriers to the use of CPGs. Of the non-users, 47% believed that updating the guidelines with current evidence would encourage greater use of CPGs.

Several participants emphasised how patients' treatment expectations and biomedical beliefs about LBP dictated the treatment approach adopted, which was often not supported by CPGs. However, some of these clinicians may have had biomedical beliefs and perspectives, which have previously been shown to influence patients' expectations, and the treatment approach and education that clinicians provide to their patients (Darlow et al., 2012; Hendrick et al., 2013). Large-scale public education programmes have been implemented in several countries to change patient beliefs about LBP. However, these programmes have largely been unsuccessful, possibly because of the reinforcement of biomedical perspectives by health practitioners (Zusman, 2013).

Almost all participants in this study indicated that they screened patients for yellow flags, but the methods used lacked consistency. Although 37% of participants reported using formal screening tools, 51% of these participants indicated they used clinical judgement to guide when and with whom they were used, rather than routinely using screening tools with all patients. The interrater agreement between expert clinicians' clinical judgement for patient risk allocation and the risk allocation determined by the SBST has been shown to be "fair" (Hill et al., 2010; Miki et al., 2020). Therefore, this inconsistency in patient screening is of concern and shows that clinical judgement is probably not the best basis for deciding when/if to screen for psychosocial risk factors (Miki et al., 2020). A systematic review of qualitative studies by Synnott et al. (2015) found that although physiotherapists recognised psychosocial factors in LBP patients, they preferred to treat the mechanical aspects of LBP and may stigmatise people based on psychosocial factors. Furthermore, physiotherapists often indicated they lacked the training and skillset to effectively address psychosocial factors in clinical practice (Karstens et al., 2018; Synnott et al., 2015).

Stratification tools, such as the SBST, aim to identify subgroups of patients and support clinical decision-making, thereby reducing harms, increasing the efficiency of healthcare provision, and maximising patient outcomes. Stratification is about ensuring appropriate matched treatment for all subgroups, not just the high-risk subgroup of patients. A key finding of this study was that only 21% of participants used stratification tools in clinical practice. This was unsurprising, as risk-based stratification is a relatively new area of focus in LBP research and few formal acute treatment pathways currently exist for high-risk patients in New Zealand. Notably, of those who reported using stratification tools, 45% used them in a sporadic/inconsistent manner based on their clinical judgement. This indicated that the use of stratification tools was often not consistent with the way they were designed and validated. This barrier to the correct implementation of stratification tools may be attributed to a lack of training. Time constraints and lack of resources to administer and collate results from stratification and screening tools were other identified barriers. This was consistent with the previous survey investigating the use of LBP outcome measures by Copeland et al. (2008), which found that private practitioners often felt pressured to see as many patients as possible to stay financially viable, with the additional time required to use outcome measures not being remunerated by funders. This could potentially be a barrier to implementing tools into practice that stratify patients into a category that means they receive less treatment than they may have done without stratification. Some patient's treatment is funded by ACC and some is not. This has the potential to also affect a patient's choices for treatment practitioner. Concern about lack of financial incentives to adopt stratified care for LBP was identified in a qualitative study of German physiotherapists (Karstens et al., 2018), which also reported participants felt they did not have the necessary skills to deliver psychosocially informed treatment. Given these challenges, it is likely that the adoption of a stratified model of care for LBP requires an approach tailored to each country to ensure it is fit for purpose and acceptable to multiple stakeholders (Sowden et al., 2018).

Study limitations

This study had several limitations. Firstly, the use of an Internet-based survey promoted via multiple platforms and organisations meant it was not possible to calculate a response rate at the onset. Although participants' demographics were broadly representative of the target population, the 228 complete responses represented approximately 4.3% of all potential participants, which may limit the generalisability of the results. Secondly, the results and demographics of this survey may have been impacted by self-selection bias, which is a recognised disadvantage of online surveys (Khazaal et al., 2014). For example, recent graduates might have had more exposure to CPGs, screening, and stratification tools, and therefore be more likely to respond than clinicians who graduated earlier. Furthermore, the results might be skewed towards participants who use social media or other digital platforms through which the survey was predominantly advertised (Topolovec-Vranic & Natarajan, 2016). Further research may benefit from more targeted recruitment methods. Finally, the results of this survey reflect participants' self-reported behaviours, which may not accurately represent their actual clinical practice; a situation which is in line with other similar studies conducted in New Zealand and internationally.

Analysis of the open-ended responses for specific questions indicated that some participants might have misunderstood some items. For example, some participants appeared confused by the definition of CPGs, and when asked which CPGs they used, responded with the McKenzie Mechanical Diagnosis and Therapy model and STarT Back, neither of which are CPGs. In these and similar instances, we did not change or correct any responses, but classified these answers as "other". These examples suggested that there is a general lack of understanding of CPGs, screening, and stratification tools, and supported the study's finding that further training and exposure is required to increase understanding, awareness, and clinical use of these tools.

CONCLUSION

This study was the first to investigate New Zealand physiotherapists' use of CPGs, screening, and stratification tools for LBP, as well as the perceived barriers to the use of the tools. Although just over half of the participants reported regularly using CPGs for LBP in clinical practice, the use of screening and stratification tools was much lower. Non-users of

CPGs commonly noted that CPGs were unnecessary because they already knew how to treat people with LBP, they lacked training/exposure to CPGs, and the guidelines were out of date. In contrast, non-users of screening and stratification tools cited time constraints in clinical practice, lack of training/exposure, and lack of resources as key barriers to using these tools. Significant associations were found between the use of screening tools and participants' level of qualification and years of experience, but no such associations were found for the use of CPGs or stratification tools. However, use of CPGs was significantly associated with use of stratification tools. Further research is required to better understand whether a stratified model of care for LBP may be implemented in New Zealand and whether this will improve outcomes, and additionally, what supports might be required to ensure implementation is successful.

KEY POINTS

1. Use of CPGs for LBP was reported by 53% of participants. Reasons for not using CPGs included participants relying on their clinical reasoning and knowledge to guide patient management, a lack of training/exposure, and the perception that CPGs needed to be updated with current evidence.
2. Although screening for psychosocial factors was nearly always incorporated into clinical practice, only 37% of participants regularly used screening tools, and there were inconsistencies in how these were used. Time constraints and lack of training/exposure were key barriers to their use.
3. Only 21% of participants reported using stratification tools in clinical practice, with lack of awareness, training, and time constraints identified as key barriers to their use.
4. Further research is required to better understand whether a stratified model of care for LBP may be implemented in New Zealand and what supports might be required to ensure implementation is successful.

DISCLOSURES

There are no conflicts of interest which may be perceived to interfere with or bias this study.

PERMISSIONS

Ethical approval was gained from the Auckland University of Technology Ethics Committee (reference number 19/72).

ACKNOWLEDGEMENTS

We would like to thank the following people: all participants for their time in completing the survey; Steve Ellery, Dr. Ramakrishnan Mani, and Kay Stevenson for reviewing the survey; and the Faculty of Health and Environmental Studies, Auckland University of Technology, and Keele University, United Kingdom, for providing funding for this research. We also acknowledge contributions made by the New Zealand STarT Back Group (a collaboration between the Auckland University of Technology and University of Otago).

ADDRESS FOR CORRESPONDENCE

Dr Julia Hill, Department of Physiotherapy, School of Clinical Sciences, Auckland University of Technology, Private Bag 92006, Auckland, New Zealand.

Email: julia.hill@aut.ac.nz

REFERENCES

Accident Compensation Corporation. (2004). *New Zealand acute low back pain guide*. https://www.healthnavigator.org.nz/media/1006/nz-acute-low-back-pain-guide-acc.pdf

Artus, M., van der Windt, D., Jordan, K. P., & Croft, P. R. (2014). The clinical course of low back pain: A meta-analysis comparing outcomes in randomised clinical trials (RCTs) and observational studies. *BMC Musculoskeletal Disorders, 15*, 68. https://doi.org/10.1186/1471-2474-15-68

Bernhardsson, S., Johansson, K., Öberg, B., Nilsen, P., & Larsson, M. E. (2014). Determinants of guideline use in primary care physical therapy: A cross-sectional survey of attitudes, knowledge, and behavior. *Physical Therapy, 94*(3), 343–354. https://doi.org/10.2522/ptj.20130147

Childs, J. D., Fritz, J. M., Wu, S. S., Flynn, T. W., Wainner, R. S., Robertson, E. K., Kim, F. S., & George, S. Z. (2015). Implications of early and guideline adherent physical therapy for low back pain on utilization and costs. *BMC Health Services Research, 15*, 150. https://doi.org/10.1186/s12913-015-0830-3

Copeland, J. M., Taylor, W. J., & Dean, S. G. (2008). Factors influencing the use of outcome measures for patients with low back pain: A survey of New Zealand physical therapists. *Physical Therapy, 88*(12), 1492–1505. https://doi.org/10.2522/ptj.20080083

Darlow, B., Fullen, B. M., Dean, S., Hurley, D. A., Baxter, G. D., & Dowell, A. (2012). The association between health care professional attitudes and beliefs and the attitudes and beliefs, clinical management, and outcomes of patients with low back pain: A systematic review. *European Journal of Pain, 16*(1), 3–17. https://doi.org/10.1016/j.ejpain.2011.06.006

Dunn, K. M., Hestbaek, L., & Cassidy, J. D. (2013). Low back pain across the life course. *Best Practice & Research Clinical Rheumatology, 27*(5), 591–600. https://doi.org/10.1016/j.berh.2013.09.007

Dykema, J., Jones, N. R., Piché, T., & Stevenson, J. (2013). Surveying clinicians by web: Current issues in design and administration. *Evaluation and the Health Professions, 36*(3), 352-381. https://doi.org/10.1177/0163278713496630

Foster, N. E., & Delitto, A. (2011). Embedding psychosocial perspectives within clinical management of low back pain: Integration of psychosocially informed management principles into physical therapist practice – challenges and opportunities. *Physical Therapy, 91*(5), 790–803. https://doi.org/10.2522/ptj.20100326

Foster, N. E., Hill, J. C., O'Sullivan, P., & Hancock, M. (2013). Stratified models of care. *Best Practice & Research Clinical Rheumatology, 27*, 649–661. https://doi.org/10.1016/j.berh.2013.10.005

Foster, N. E., Mullis, R., Hill, J. C., Lewis, M., Whitehurst, D. G., Doyle, C., Konstantinou, K., Main, C., Somerville, S., Sowden, G., Wathall, S., Young, J., & Hay, E. M; IMPaCT Back Study team. (2014). Effect of stratified care for low back pain in family practice (IMPaCT back): A prospective population-based sequential comparison. *Annals of Family Medicine, 12*(2), 102–111. https://doi.org/10.1370/afm.1625

Green, D. J., Lewis, M., Mansell, G., Artus, M., Dziedzic, K. S., Hay, E. M., Foster, N. E., & van der Windt, D. A. (2018). Clinical course and prognostic factors across different musculoskeletal pain sites: A secondary analysis of individual patient data from randomised clinical trials. *European Journal of Pain, 22*(6), 1057–1070. https://doi.org/10.1002/ejp.1190

Hendrick, P., Mani, R., Milosavljevic, S., Schneiders, A. G., & Bishop, A. (2013). Therapist knowledge, adherence and use of low back pain guidelines to inform clinical decisions – A national survey of manipulative and sports physiotherapists in New Zealand. *Manual Therapy, 18*(2), 136–142. https://doi.org/10.1016/j.math.2012.09.002

Hill, J. C., Vohora, K., Dunn, K. M., Main, C. J., & Hay, E. M. (2010). Comparing the STarT back screening tool's subgroup allocation of individual patients with that of independent clinical experts. *Clinical Journal of Pain, 26*(9), 783–787. https://doi.org/10.1097/AJP.0b013e3181f18aac

Hill, J. C., Whitehurst, D. G., Lewis, M., Bryan, S., Dunn, K. M., Foster, N. E., Konstantinou, K., Main, C. J., Mason, E., Somerville, S., Sowden, G., Vohora, K., & Hay, E. M. (2011). Comparison of stratified primary care management for low back pain with current best practice (STarT Back): A randomised controlled trial. *The Lancet, 378*(9802), 1560–1571. https://doi.org/10.1016/S0140-6736(11)60937-9

Hingorani, A. D., van der Windt, D. A., Riley, R. D., Abrams, K., Moons, K. G., Steyerberg, E. W., Schroter, S., Sauerbrei, W., Altman, D. G., & Hemingway, H; PROGRESS Group. (2013). Prognosis research strategy (PROGRESS) 4: Stratified medicine research. *BMJ, 346:e5793*. https://doi.org/10.1136/bmj.e5793

Hodges, P. W. (2019). Hybrid approach to treatment tailoring for low back pain: A proposed model of care. *Journal of Orthopaedic & Sports Physical Therapy, 49*(6), 453-463. https://doi.org/10.2519/jospt.2019.8774

Itz, C. J., Geurts, J. W., van Kleef, M., & Nelemans, P. (2013). Clinical course of non-specific low back pain: A systematic review of prospective cohort studies set in primary care. *European Journal of Pain, 17*(1), 5–15. https://doi.org/10.1002/j.1532-2149.2012.00170.x

Karstens, S., Wensing, M., Krug, K., Szecsenyi, J., Kuithan, P., Joos, S., Hill, J. C., & Steinhäuser, J. (2018). Physiotherapists' views of implementing a stratified treatment approach for patients with low back pain in Germany: A qualitative study. *BMC Health Services Research, 18*(1), 214. https://doi.org/10.1186/s12913-018-2991-3

Khazaal, Y., van Singer, M., Chatton, A., Achab, S., Zullino, D., Rothen, S., Khan, R., Billieux, J., & Thorens, G. (2014). Does self-selection affect samples' representativeness in online surveys? An investigation in online video game research. *Journal of Medical Internet Research, 16*(7), e164. https://doi.org/10.2196/jmir.2759

Lin, I., Wiles, L., Waller, R., Goucke, R., Nagree, Y., Gibberd, M., Straker, L., Maher, C. G., & O'Sullivan, P. (2019). What does best practice care for musculoskeletal pain look like? Eleven consistent recommendations from high-quality clinical practice guidelines: Systematic review. *British Journal of Sports Medicine*, *54*(2), 79–86. https://doi.org/10.1136/bjsports-2018-099878

Menezes Costa, L. D. C., Maher, C. G., Herbert, R. D., Hancock, M. J., McAuley, J. H., & Costa, L. O. P. (2012). The prognosis of acute and persistent low-back pain: A meta-analysis. *Canadian Medical Association Journal, 184*(11), 613–624. https://doi.org/10.1503/cmaj.111271

Miki, T., Kondo, Y., Takebayashi, T., & Takasaki, H. (2020). Difference between physical therapist estimation and psychological patient-reported outcome measures in patients with low back pain. *PLoS One, 15*(1), e0227999. https://doi.org/10.1371/journal.pone.0227999

Ministry of Health. (2016). *Health loss in New Zealand 1990-2013: A report from the New Zealand burden of diseases, injuries and risk factors study*. https://www.health.govt.nz/system/files/documents/publications/health-loss-in-new-zealand-1990-2013-aug16.pdf

National Health Committee. (2015). *Low back pain: A pathway to prioritisation*. https://www.health.govt.nz/system/files/documents/publications/nhc-lbp-pathway-to-prioritisation.pdf

National Institute for Health and Care Excellence. (2016). *Low back pain and sciatica in over 16s: Assessment and management. NICE guideline [NG59].* https://www.nice.org.uk/guidance/ng59

O'Sullivan, P., Caneiro, J. P., O'Keeffe, M., & O'Sullivan, K. (2016). Unraveling the complexity of low back pain. *Journal of Orthopaedic & Sports Physical Therapy, 46*(11), 932–937. https://doi.org/10.2519/jospt.2016.0609

Oliveira, C. B., Maher, C. G., Pinto, R. Z., Traeger, A. C., Lin, C-W. C., Chenot, J. F., van Tulder, M., & Koes, B. W. (2018). Clinical practice guidelines for the management of non-specific low back pain in primary care: An updated overview. *European Spine Journal, 27*(11), 2791–2803. https://doi.org/10.1007/s00586-018-5673-2

Physiotherapy Board of New Zealand. (2019). *Annual report 2019.* https://www.physioboard.org.nz/wp-content/uploads/2019/09/V6-Physio-Annual-Report-2019.pdf

Ramond, A., Bouton, C., Richard, I., Roquelaure, Y., Baufreton, C., Legrand, E., & Huez, J. F. (2011). Psychosocial risk factors for chronic low back pain in primary care – A systematic review. *Family Practice, 28*(1), 12–21. https://doi.org/10.1093/fampra/cmq072

Sowden, G., Hill, J. C., Morso, L., Louw, Q., & Foster, N. E. (2018). Advancing practice for back pain through stratified care (STarT Back). *Brazilian Journal of Physical Therapy, 22*(4), 255–264. https://doi.org/10.1016/j.bjpt.2018.06.003

Steyerberg, E. W., Moons, K. G., van der Windt, D. A., Hayden, J. A., Perel, P., Schroter, S., Riley, R. D., Hemingway, H., & Altman, D. G; PROGRESS Group. (2013). Prognosis research strategy (PROGRESS) 3: Prognostic model research. *PLoS Medicine, 10*(2), e1001381. https://doi.org/10.1371/journal.pmed.1001381

Synnott, A., O'Keeffe, M., Bunzli, S., Dankaerts, W., O'Sullivan, P., & O'Sullivan, K. (2015). Physiotherapists may stigmatise or feel unprepared to treat people with low back pain and psychosocial factors that influence recovery: A systematic review. *Journal of Physiotherapy, 61*(2), 68–76. https://doi.org/10.1016/j.jphys.2015.02.016

Topolovec-Vranic, J., & Natarajan, K. (2016). The use of social media in recruitment for medical research studies: A scoping review. *Journal of Medical Internet Research, 18*(11), e286. https://doi.org/10.2196/jmir.5698

Tumilty, S., Adhia, D. B., Rhodes, R., & Mani, R. (2017). Physiotherapists' treatment techniques in New Zealand for management of acute nonspecific low back pain and its relationships with treatment outcomes: A pilot study. *Physical Therapy Reviews, 22*(1-2), 95–100. https://doi.org/10.1080/10833196.2017.1282073

Zusman, M. (2013). Belief reinforcement: One reason why costs for low back pain have not decreased. *Journal of Multidisciplinary Healthcare, 6*, 197–204. https://doi.org/10.2147/JMDH.S44117

Physiotherapist Involvement in Concussion Services in New Zealand: A National Survey

Sophie Maxtone *BPhty(Hons)*
Centre for Health, Activity and Rehabilitation Research, School of Physiotherapy, University of Otago, Dunedin, New Zealand

Megan Bishop *MHSc*
Centre for Health, Activity and Rehabilitation Research, School of Physiotherapy, University of Otago, Dunedin, New Zealand

Cathy Chapple *PhD*
Centre for Health, Activity and Rehabilitation Research, School of Physiotherapy, University of Otago, Dunedin, New Zealand

Steve Tumilty *PhD*
Centre for Health, Activity and Rehabilitation Research, School of Physiotherapy, University of Otago, Dunedin, New Zealand

Dusty Quinn *MMpty*
Back In Motion, Dunedin, New Zealand

Ewan Kennedy *PhD*
Centre for Health, Activity and Rehabilitation Research, School of Physiotherapy, University of Otago, Dunedin, New Zealand

ABSTRACT

The purpose of this study was to describe physiotherapist involvement in concussion services in New Zealand. This would enable a comparison with international recommendations for concussion care, and evaluation of physiotherapy concussion care in New Zealand to help determine what is successful and what could be improved. The study involved a national online survey of physiotherapists distributed via Physiotherapy New Zealand (PNZ) branches and special interest groups. The responses of 175 participants were analysed, representing approximately 5% of PNZ members. Respondents were commonly involved in the recognition (107; 61%), assessment (133; 76%), and management (154; 88%) of concussion in a wide range of primary care concussion services in various settings/contexts and under different funding schemes. Respondents reported frequently assessing and managing disorders in the physiological brain, vestibulo-ocular, and cervicogenic sub-systems. Overall, physiotherapists currently provide a wide range of primary care services for people with concussion that aligns with international recommendations, especially in early active rehabilitation and screening for concurrent injuries. Key challenges highlighted by this research include people presenting late to physiotherapy, continuity of care, and the frequency of persistent or recurrent symptoms.

Maxtone, S., Bishop, M., Chapple, C., Tumilty, S., Quinn, D., & Kennedy, E. (2020). Physiotherapist involvement in concussion services in New Zealand: A national survey. *New Zealand Journal of Physiotherapy, 48*(2), 70–79. https://doi.org/10.15619/NZJP/48.2.03

Key Words: Brain Concussion, Physiotherapy, Rehabilitation, Healthcare

INTRODUCTION

Concussion is a complex problem. While widely defined as a form of mild traumatic brain injury (McCrory et al., 2017), the potential for concurrent cervical spine, vestibular, and oculomotor injuries is increasingly recognised (Elkin et al., 2016; Ellis et al., 2015; Leslie & Craton, 2013; Schneider et al., 2014; van der Walt et al., 2019). Reflecting this evolving understanding, current best practice in concussion care involves a review of multiple systems followed by an active approach to rehabilitation, and often multiple professions (Schneider, 2019a, 2019b). Concussion can be classified into physiological (brain), vestibulo-ocular, and cervicogenic post-concussion disorders (Ellis et al., 2015). This approach recognises the heterogeneous nature of concussion, and encourages evaluation and management of impairments in each subsystem. The traditional model of rest is increasingly recognised as unhelpful beyond the first 24-48 hours following injury (McCrory et al., 2017; Schneider et al., 2013), with an active approach to recovery increasingly recommended (Leddy et al., 2016; Leddy et al., 2019; Willer et al., 2019). These developments present challenges for primary care concussion services, but also an opportunity for physiotherapists to take a greater role in people's recovery.

Physiotherapists are well positioned to contribute to concussion care, with a diverse and unique skill set in active rehabilitation as well as the evaluation and management of cervical spine and vestibulo-ocular disorders (Schneider, 2019a). In New Zealand, physiotherapists are well-established primary healthcare providers, with direct access to services without a referral. Physiotherapists are present in sporting contexts and in the community where concussion injuries are commonly sustained, are well-established providers of rehabilitation for people with neurological conditions, and members of multidisciplinary concussion services. Recent work indicates that within a multidisciplinary concussion service, physiotherapy treatment of cervical spine and vestibulo-ocular issues was recommended in 86% of cases (van der Walt et al., 2019). These data exclude the key worker role, which is often also performed by physiotherapists, so could under-represent physiotherapy involvement. This highlights the large contribution physiotherapists could make to concussion rehabilitation. The extent to which physiotherapists are involved in concussion care outside this multidisciplinary service is less clear.

Providers of concussion services must be able to explore a range of potential symptom sources and provide active individualised rehabilitation. While physiotherapists are well positioned to contribute to concussion care, the extent to which they are currently involved is not clear. In order to benefit from the considerable potential of physiotherapists to contribute to people's recovery from concussion, a better understanding of physiotherapist involvement is necessary. This understanding must encompass a wide range of potential involvement in concussion recognition, assessment, and management under a range of health services. In New Zealand, many concussion services are partially or fully funded by the Accident Compensation Corporation (ACC), a national funder of accident-related injuries, including concussion. The aim of this study was to understand physiotherapist involvement in the recognition, assessment, and management of concussion in New Zealand. This would enable a comparison between current practice and international recommendations, evaluation of areas of success, and identification of areas that could be improved.

METHODS

This study involved a cross-sectional online survey completed by New Zealand physiotherapists with a current annual practicing certificate involved in the care of people with concussion. Ethics approval was granted by the University of Otago Human Ethics Committee (D19/187).

Survey development

The online survey was created using specialised survey software (Qualtrics^{XM}), available via the University of Otago. Survey questions were developed by the research team and organised into a series of six "blocks": survey information and consent, demographics, recognition, assessment, management, and continuity of care. Survey flow logic was utilised so that respondents would be directed to answer questions within the blocks relevant to their involvement in concussion care. This would reduce the survey time for those with lower levels of involvement in concussion care.

The demographic block was aligned with the workforce survey conducted annually by the Physiotherapy Board of New Zealand (Physiotherapy Board of New Zealand, 2018). It included questions regarding the experience of physiotherapists involved in concussion care and their work characteristics. Respondents were then asked if they were involved in the recognition, assessment, and/or management of concussion, and based on this, directed to other relevant questions. "Recognition" was defined as "the *identification* of an individual with suspected concussion". This block included questions about the context of recognition, the tools and skills used when recognising concussion, and the subsequent care of people with a recognised concussion. "Assessment" was defined as "the *evaluation* of an individual with suspected/confirmed concussion". This block included questions about how physiotherapy services are accessed and funded; what sub-systems are being assessed; the timeframe for initial presentation for assessment, referral and other aspects of subsequent management; and the context/setting of assessment. The management block included questions about the setting up and funding of services, the sub-systems managed by the service, the frequency of people returning with persistent problems, and the typical number and timeframe of appointments. All respondents then concluded the survey by completing the "continuity of care" block. Survey questions were typically multiple choice, with "other" responses available. Selected questions requested an open text response.

The survey questions and flow were developed in an iterative process, beginning with development and trials within the research team, followed by a peer-review process and then trials with a small number of local physiotherapists. Each iteration improved the clarity and flow of the questions and the survey design.

Survey distribution

This research involved a national survey of a cross-section of registered physiotherapists involved in the recognition, assessment, and/or management of concussion in New Zealand. The link to the online survey was distributed electronically via email, social media, websites, and other online platforms via professional physiotherapy networks, including Physiotherapy New Zealand (PNZ) branches and special interest groups, and professional contacts of the research group.

Invitations to participate in the survey were distributed in June 2019 and remained open for an 8-week period (June-August 2019). Access to the survey was via an anonymous electronic link; those that were interested in participating were directed to an information sheet at the start of the survey. Participation was voluntary and responses were self-reported.

Data extraction and analysis

The data set was exported from Qualtrics^{XM} to Microsoft Excel, and was limited to survey responses collected during the 8-week period. Responses from those who declined to proceed or that were evidently incomplete (e.g. only the first few questions were answered) were excluded from the data set. The remaining responses were formatted and transferred to IBM SPSS® Statistics 25 for analysis. The data analysis primarily involved descriptive statistics utilising IBM SPSS Statistics. The open text responses were analysed with a conventional content analysis (Hsieh & Shannon, 2005) by consensus between two members of the research team (SM and EK). Responses were categorised and described with minimal abstraction (Vaismoradi et al., 2016), consistent with the level of content in the relatively short text responses. Consideration of wider themes based on all the quantitative and qualitative results framed the discussion.

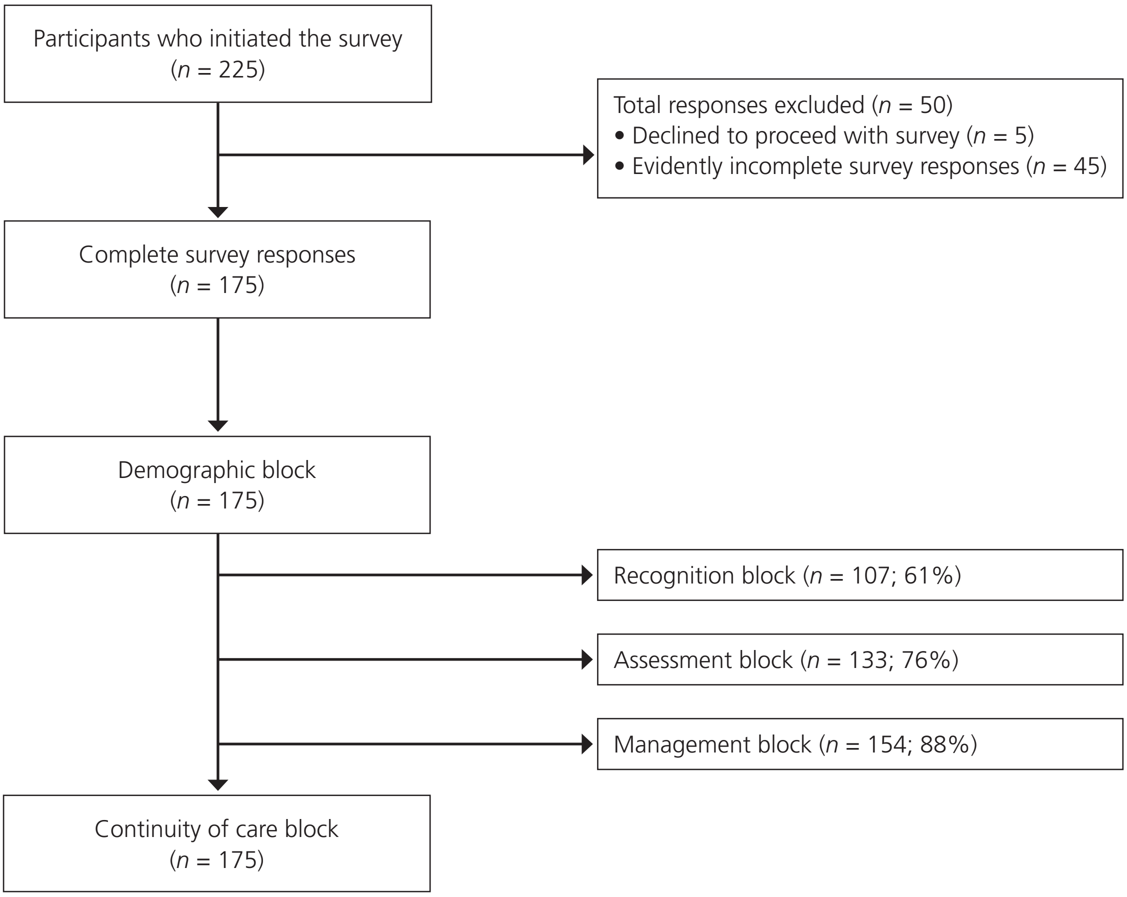
RESULTS

Response rate

Responses to the survey are shown in Figure 1. Of the 3,538 PNZ members at the time of the survey (Physiotherapy New Zealand, 2019), 175 completed the survey in full, representing approximately 5% of PNZ members.

Figure 1

Survey Responses



Demographics, work characteristics, and involvement in concussion care

The demographic and work characteristics of respondents are provided in Table 1. Of the respondents, physiotherapists were most commonly involved in the management of concussion (154; 88.0%), followed by assessment (133; 76.0%), and recognition (107; 61.1%), as outlined in Table 2. A majority of respondents (140; 80%) were involved in more than one area of concussion care, with 43 (24.6%) involved in assessment and management, and 77 (44.0%) involved in recognition, assessment, and management.

Recognition of concussion

The contexts in which respondents were involved in the recognition of concussion were primary care (71; 66.4%), affiliation to a sports team or athlete (62; 57.9%), or less commonly, an acute setting (15; 14.0%). "Other" text responses (6; 5.6%) indicated that recognition also occurred within the ACC concussion service.

Table 1

Respondent Characteristics

Characteristic	Frequency (%)
Gender	
Male	49 (28)
Female	126 (72)
Age bracket (years)	
20–34	64 (37)
35–44	59 (34)
45–54	37 (21)
55–64	14 (8)
65+	1 (1)

Characteristic	Frequency (%)
Ethnicity	
New Zealand European	133 (76)
Māori	8 (5)
Chinese	8 (5)
Indian	4 (2)
Other	32 (18)
Highest qualification	
Diploma or graduate diploma	12 (7)
Bachelor’s degree	70 (40)
Postgraduate diploma or certificate	62 (35)
Master’s degree	28 (16)
Doctoral degree	3 (2)
District Health Board region [a]	
Auckland	20 (12)
Counties Manukau	12 (7)
Waikato	26 (15)
Bay of Plenty	16 (9)
Capital and Coast	10 (6)
Other, North Island [b]	28 (16)
Canterbury	31 (18)
Southern	25 (15)
Other, South Island [b]	3 (2)
Experience working with people with concussion (years)	
1–3	67 (38)
4–6	43 (25)
7–9	9 (5)
10+	56 (32)
Time per week working with people with concussion (hours)	
1–10	151 (86)
11–30	22 (13)
31+	2 (1)
Main area of practice working with people with concussion	
Musculoskeletal outpatients	54 (31)
Sports physiotherapy	60 (34)
Adult neurology	26 (15)
Community/domiciliary	10 (6)
Occupational health	6 (3)
Other [c]	25 (14)

Note. N = 175.

[a] Three responses missing. [b] Areas with < 5% of respondents (Hawke’s Bay, Hutt Valley, Lakes, MidCentral, Nelson Marlborough, Northland, South Canterbury, Taranaki, Wairarapa, Waitematā, West Coast, Whanganui). [c] Areas with < 3% of respondents (cardiovascular/pulmonary inpatient, cardiovascular/pulmonary outpatient, continuing care, mental health, management, older adult, other paediatric, oncology, paediatric neurology).

Table 2

How People With Concussion Most Commonly Access Physiotherapy Services

Method of access	Frequency (%)
Referral directly from ACC or ACC concussion service provider	60 (45)
Referral by medical practitioner following concussion diagnosis	21 (16)
Person self-refers for concussion-specific problems	19 (14)
Person self-refers for other problems, but upon assessment, physiotherapist suspects concussion	16 (12)
Other	17 (13)

Note. N = 133. ACC = Accident Compensation Corporation.

Clinical judgement (80; 74.8%) and the Sports Concussion Assessment Tool (76; 71.0%) were commonly utilised in the recognition of concussion. "Other" tools and skills specified more than once in text responses included Vestibular-ocular Motor Screening (VOMS), the Rivermead Post-Concussion Symptom Questionnaire, and the Buffalo Concussion Treadmill Test.

A large proportion of respondents indicated that, following recognition, they were involved in that person's subsequent care (93; 86.9%). When prompted to describe how they were involved, respondents described referral to general practictioners (GPs), concussion services or other physiotherapists; monitoring return to play/sport/work/school; cervical spine treatment; and vestibulo-ocular rehabilitation. Those who reported not being involved in subsequent care following recognition (14; 13.1%) commonly referred people to their GP or concussion services for subsequent care.

Assessment of concussion

Table 2 presents the way people with concussion most commonly accessed physiotherapy services for assessment. "Other" responses (17; 12.8%) described access via a sports team or other sporting environment. The setting in which physiotherapy assessment was provided is shown in Table 3.

The funding scheme(s) respondents used to provide concussion assessment and the respective sub-system are shown in Figure 2. Comparatively, participants most commonly performed vestibulo-ocular assessment under the ACC concussion service (81%), and cervical spine or other musculoskeletal assessment under a fee-for-service scheme (96%). Less than half of the

Table 3

Settings Where Physiotherapy Services for Concussion Assessment and/or Management are Provided

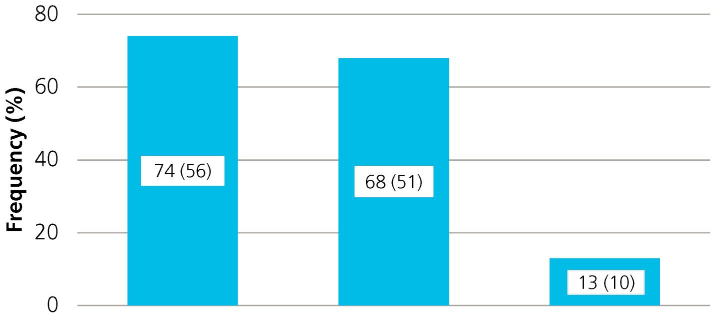
Setting	Frequency (%)	
	Assessment (n = 133)	Management (n = 119) [a]
Person's home and/or their local community	37 (28)	36 (30)
Clinic setting	108 (81)	100 (84)
Hospital setting	5 (4)	3 (3)
Sporting grounds or facilities	48 (36)	28 (24)
Other	2 (2)	4 (3)

Note. Respondents could select more than one answer.

[a] 35 responses missing.

Figure 2

Funding Scheme for Physiotherapy Assessment of Concussion and Respective Sub-System Assessed



	ACC concussion service	Fee for service	Other
Physiological brain injury	50 (68)	49 (72)	12 (92)
Cervical spine or other musculoskeletal dysfunction	58 (78)	65 (96)	10 (77)
Vestibulo-ocular system	60 (81)	30 (44)	8 (62)
Other	7 (9)	4 (6)	3 (23)

Note. N = 133. Data are frequency (%). Respondents could select more than one answer. The left column outlines the respective sub-systems. ACC = Accident Compensation Corporation.

respondents typically conducted their initial assessment within 1 week of the sustained concussion (50; 37.6%), with other respondents conducting this assessment within 2 weeks (22; 16.5%), within 4 weeks (36; 27.1%) or beyond 4 weeks (25: 18.8%).

The majority of respondents (115; 86.5%) were involved in the subsequent management of a person's concussion following assessment. The 18 (13.5%) respondents not typically involved in subsequent management, most commonly referred people to a GP or concussion services/clinic for subsequent management.

Management of concussion

The funding scheme(s) respondents accessed to provide concussion management and the respective sub-system being managed is provided in Figure 3. "Other" responses (14; 9.1%) included providing services under funding from sports teams/organisations, non-ACC private physiotherapy or from a hospital setting. Aspects of concussion management frequently specified in "other" text entry responses included sleep hygiene and rehabilitation for functional independence.

A majority of respondents (120; 77.9%) involved in the management of concussion reported that people returned with persistent problems (Table 4). The nature of these problems is presented in Figure 4, with "other" text responses specifying repeat concussion injury, and ongoing difficulty with memory, fatigue, and concentration as reason for returning for further treatment.

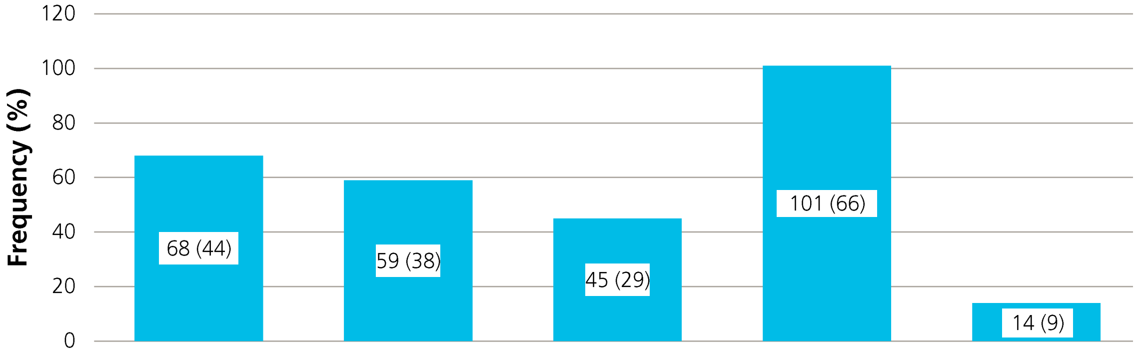
The settings in which respondents provided concussion management services are presented in Table 3. The typical number and timespan of appointments prior to discharge are presented in Table 5. During concussion management, 67.3% (103) of respondents reported people did not attend follow-up appointments at least "sometimes".

Continuity of care

Over half of respondents (112; 65.5%) reported that the same health professionals involved in the recognition and assessment of a person's concussion are typically involved in the management of that person's concussion, while 59 (34.5%) reported that this was not the case. Respondents who indicated

Figure 3

Funding Scheme for Physiotherapy Management of Concussion and Respective Sub-System Managed



	ACC concussion service	ACC training for independence	ACC stay at work	Fee for service	Other
Physiological brain injury					
Education	58 (85)	51 (86)	35 (78)	87 (86)	13 (93)
Progressive aerobic exercise	56 (82)	51 (86)	34 (76)	70 (69)	11 (85)
Graduated return to sport/school/work	47 (69)	46 (80)	42 (93)	73 (72)	11 (85)
Other	7 (10)	4 (7)	3 (7)	4 (4)	1 (8)
Cervical spine					
Cervical spine management	50 (74)	38 (64)	29 (64)	95 (94)	11 (85)
Other	6 (9)	3 (5)	1 (2)	1 (1)	1 (8)
Vestibulo-ocular system					
Vestibular rehabilitation	56 (82)	44 (75)	18 (40)	40 (40)	7 (54)
Oculomotor rehabilitation	54 (79)	42 (71)	15 (33)	30 (30)	6 (46)
Balance retraining	58 (85)	50 (85)	22 (49)	60 (59)	10 (77)
Other	5 (7)	3 (5)	1 (2)	1 (1)	1 (8)

Note. N = 154. Data are frequency (%). Respondents could select more than one answer. The left column outlines the respective sub-systems and management. ACC = Accident Compensation Corporation.

Table 4

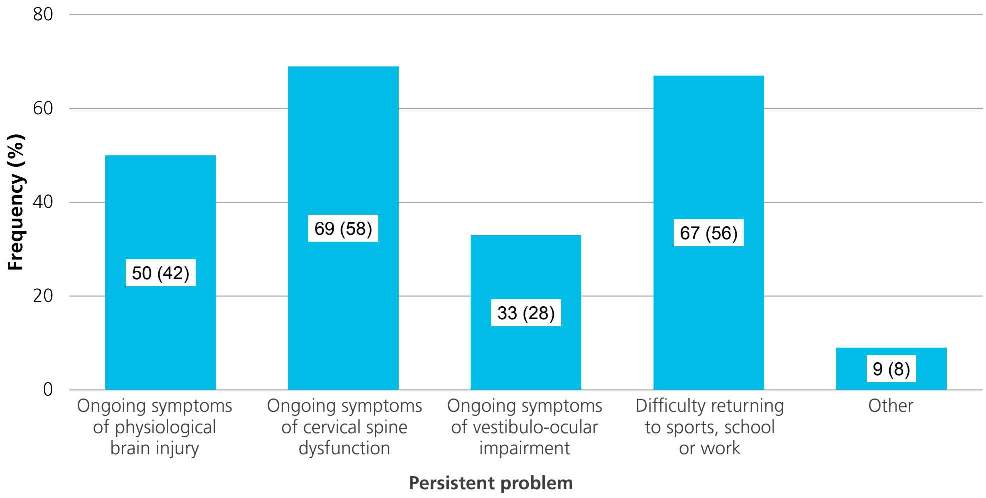
Frequency People Return for Further Management due to Persistent Problems Related to Their Concussion, Following Discharge From Physiotherapy Services

Frequency of return	Frequency (%)
Always	3 (2)
Most of the time	2 (1)
About half the time	4 (3)
Sometimes	111 (72)
Never	34 (22)

Note. N = 154.

Figure 4

Persistent Problems of Those Returning for Further Management of Concussion Following Initial Discharge



Note. N = 120. Respondents who indicated that people "never" returned with persistent symptoms (as shown in Table 4) were not displayed in this figure.

Table 5

Number and Timespan of Appointments Prior to Discharge

Appointments	Frequency (%)
Typical number, prior to discharge (*n* = 152) [a]	
1–4	36 (24)
5–9	100 (66)
10+	16 (11)
Typical timespan for reschedule (*n* = 151) [b]	
Within 1 week	23 (15)
Within 2 weeks	22 (15)
Within 4 weeks	39 (26)
> 4 weeks	67 (44)

Note. N = 154.

[a] Two missing responses. [b] Three missing responses.

that this was not the case were asked to further describe how people transitioned between health professionals. Responses described the need for people to access multiple services (such as medical care and the concussion service) and care from multiple health professionals with relevant expertise (such as GPs, occupational therapists, and physiotherapists with expertise in the cervical spine or vestibulo-ocular system). Numerous transitions between health professionals to receive concussion care were described.

In response to the question "Are you involved in the prevention of concussion?", 121 participants (70%, 3 missing responses) answered "no". Those who answered "yes" (51; 30%) were most commonly involved in providing education that addressed concussion risks to coaches, sporting teams or groups, parents, GPs, and schools. Other forms of involvement included neck strengthening, addressing sporting technique such as in tackling, and advising on protective equipment.

DISCUSSION

This study aims to contribute to a better understanding of New Zealand physiotherapist involvement in concussion recognition, assessment, and management. Respondent demographics are comparable with the demographics of New Zealand physiotherapists as reported by the Physiotherapy Board of New Zealand (Physiotherapy Board of New Zealand, 2018), encompassing a wide range of regions, areas of practice, and levels of experience. These data would enable a discussion about how New Zealand physiotherapists contribute to concussion services, if their approach reflects international best practice in concussion care, and whether current services could be improved.

The study's findings highlight that physiotherapists in New Zealand are involved in a wide range of services for people with concussion. Physiotherapy involvement encompasses a variety of purposes (recognition, assessment, and management), settings, stages post injury, types of concussion services, areas of assessment, and management. It is clear that physiotherapists have a far more complex role than the recognition of concussion and referral to a medical doctor, as is implied in some publications (Accident Compensation Corporation, 2016). Illustrating this point, 80% of respondents were involved in more than one area of recognition, assessment or management of concussion. Most of those involved in the recognition of concussion (87%) were typically involved in that person's subsequent care, going on to provide further assessment and management as well as onward referral as appropriate. In other words, just 13% of those involved in recognition of concussion described their subsequent involvement as limited to onward referral. Responses were consistent with an early active approach to concussion care, which is now widely recommended (Leddy et al., 2016; Leddy et al., 2018; Leddy et al., 2019; Marshall et al., 2015; McCrory et al., 2017; Reneker et al., 2017; Schneider et al., 2014; Schneider, 2019a, 2019b; Willer et al., 2019). However, this does not mean that physiotherapists are commonly or consistently involved in concussion services. The low overall response rate suggests that although those who are involved in concussion services contribute to a wide range of services, more work is needed to engage a greater number of physiotherapists in the care of people with concussion. Further education and awareness of concussion within the profession is suggested.

Physiotherapists have a diverse skill set that facilitates assessment and management of key sub-systems affected in concussion injuries. Ellis et al. (2015) describe three post-concussion disorders based on the system primarily affected: physiological (brain), cervicogenic, and vestibulo-ocular. Treatment for these disorders is described as an early active sub-symptom threshold exercise for physiological, and targeted neck and vestibulo-ocular rehabilitation. As illustrated in Figures 2-4, physiotherapists report commonly addressing each of these aspects in concussion assessment and management across a variety of services. This highlights the ability of physiotherapists to provide comprehensive concussion assessment and targeted management that aligns with the complex nature of concussion recovery (Schneider, 2019a, 2019b). The management of disturbance to brain physiology as a result of concussion can be addressed with education, progressive aerobic exercise, and graduated return to school/sport/work (Ellis et al., 2015; Leddy et al., 2012; Leddy & Willer, 2013; McCrory et al., 2017). Neck and vestibulo-ocular issues are prevalent in people with persistent symptoms post-concussion (van der Walt et al., 2019), and it is widely accepted that concussion assessment and management should address these systems (Ellis et al., 2015; McCrory et al., 2017; Schneider et al., 2014; Schneider, 2019b), particularly in those with persistent symptoms (Kennedy et al., 2019; Leddy et al., 2012; Leddy et al., 2016; Schneider, 2019a). Low reported involvement in the prevention of concussion (30%) likely reflects a lack of current evidence for proposed strategies (Schneider et al., 2017). Those who did report involvement described strategies consistent with reported literature (Schneider et al., 2017), with an emphasis on education. While this educational approach may lack evidence for primary prevention, it undoubtedly plays a useful role in secondary prevention – reducing the impact of concussion injuries through effective evaluation and management.

The findings highlight several challenges in the provision of concussion services. For nearly half of respondents (45.9%), the initial assessment of a person presenting with symptoms of concussion was conducted later than 2 weeks after the suspected concussion was sustained. At this stage symptoms are considered to be persistent (McCrory et al., 2017), and may warrant a more comprehensive multidisciplinary assessment (Schneider, 2019a). Medical referral for formal confirmation of the diagnosis could further delay physiotherapy care. However, people appear to commonly present to physiotherapy without a medical diagnosis of concussion (up to 39%; see Table 2). This late presentation to physiotherapy may negatively affect people's outcomes, as current evidence indicates that rest beyond 24-48 hours of the injury may lead to poorer outcomes (Leddy et al., 2019; Schneider et al., 2013; Willer et al., 2019). The benefits of early, active rehabilitation require early access to services that would support such an approach. In the New Zealand health context, concussion care is strongly influenced by ACC as the public insurance provider. Therefore, advocacy for policies that facilitate early access to physiotherapy is warranted. Given the management offered by physiotherapists (Figure 3), early access to physiotherapy services would promote an early and active approach to recovery from concussion.

A further challenge is the range of concussion services and providers, which creates significant challenges in continuity of care that may impact on outcomes. Responses highlight that people with concussion often access multiple services, and transitioning in and out of medical, community physiotherapy and specialist services, such as the ACC concussion service, can disrupt continuity of care. While this may be necessary to access relevant expertise, there is emerging evidence that early active rehabilitation may reduce delayed recovery and the need for specialist services (Leddy et al., 2019). Furthermore, while the ACC concussion service is fully funded, other services are not, creating inconsistencies in the cost of different services for individuals. An increased focus on early access to active rehabilitation services in acute concussion may be an effective use of health resources.

Many respondents (120; 77.9%) indicated that at least "sometimes" people returned post discharge for further management of their concussion due to persistent problems. Types of problems identified related to multiple systems (Figure 4) and were sometimes multifactorial. The frequency of persistent symptoms is consistent with New Zealand research (Theadom et al., 2016), and highlights demand for access to physiotherapy services even after receiving an initial package of care. In knowing this, avenues for subsequent management of recurrent or persistent symptoms should be explored, as it is not clear how different services, especially contracted services, facilitate this. It is possible that the recovery rates and outcomes reported for sports-related concussion may differ from those for non-sports-related concussion (Leddy et al., 2012). Persistent problems are reported in only 10% of athletes with concussion (Leddy et al., 2012), while persistent problems in people with non-sports-related concussion recovery have been reported to be as high as 47.9% (Theadom et al., 2016). While multifactorial, this could in part relate to differences in access to health care, in particular access to early active rehabilitation (Leddy et al., 2016).

This study has limitations primarily related to its design. The response rate was limited to approximately 5% of PNZ members, and may not represent the views of the wider profession. The responses were considered broadly representative and suitable for the descriptive purposes of this study. An error in the survey logic led to the question in Table 3 not being displayed to some participants. Results were still considered reflective of the sample and have been presented. Responses are based on self-reported data from physiotherapists describing their involvement in and provision of services for people with concussion. Data are therefore not validated or verified, and represents the views of respondents.

CONCLUSION

This study describes physiotherapist involvement in the recognition, assessment, and management of concussion in New Zealand. The findings reflect that physiotherapists have a unique skill set in concussion care and are contributing to a wide range of services. The concussion care described by respondents strongly aligns with international research evidence, especially the trend towards early active rehabilitation in concussion. Challenges encountered by New Zealand physiotherapists include late presentation to physiotherapy, difficulty providing continuity of care through complex services, and managing people with persistent symptoms.

KEY POINTS

1. New Zealand physiotherapists are involved in a wide range of services for people with concussion. However, further work is needed to engage more of the profession in concussion care.
2. Physiotherapists have a unique skill set and describe care aligned with international recommendations, especially for early active rehabilitation and screening for concurrent injuries. Challenges highlighted include late presentation to physiotherapy, maintaining continuity of care through complex services, and managing people with persistent symptoms.

DISCLOSURES

No funding was received for this research. There are no conflicts of interest which may be perceived to interfere with or bias this study.

PERMISSIONS

Ethical approval was obtained from the University of Otago Human Ethics Committee (D19/187).

ACKNOWLEDGEMENTS

We would like to thank the many representatives of PNZ, including special interest groups and branches, who supported the distribution of the survey. We also thank all survey respondents for contributing to this work.

ADDRESS FOR CORRESPONDENCE

Dr Ewan Kennedy, School of Physiotherapy, University of Otago, Dunedin 9016, New Zealand.

Email: ewan.kennedy@otago.ac.nz

REFERENCES

Accident Compensation Corporation. (2016). *Sport concussion in New Zealand: ACC national guidelines*. https://www.healthnavigator.org.nz/media/1001/acc-sportsmart-sport-concussion-in-new-zealand-acc-national-guidelines.pdf

Elkin, B. S., Elliott, J. M., & Siegmund, G. P. (2016). Whiplash injury or concussion? A possible biomechanical explanation for concussion symptoms in some individuals following a rear-end collision. *Journal of Orthopaedic & Sports Physical Therapy, 46*(10), 874–885. https://doi.org/10.2519/jospt.2016.7049

Ellis, M. J., Leddy, J. J., & Willer, B. (2015). Physiological, vestibulo-ocular and cervicogenic post-concussion disorders: An evidence-based classification system with directions for treatment. *Brain Injury, 29*(2), 238248. https://doi.org/10.3109/02699052.2014.965207

Hsieh, H. F., & Shannon, S. E. (2005). Three approaches to qualitative content analysis. *Qualitative Health Research, 15*(9), 1277–1288. https://doi.org/10.1177/1049732305276687

Kennedy, E., Quinn, D., Chapple, C., & Tumilty, S. (2019). Can the neck contribute to persistent symptoms post concussion? A prospective descriptive case series. *Journal of Orthopaedic & Sports Physical Therapy, 49*(11), 845–854. https://doi.org/10.2519/jospt.2019.8547

Leddy, J. J., Baker, J. G., & Willer, B. (2016). Active rehabilitation of concussion and post-concussion syndrome. *Physical Medicine and Rehabilitation Clinics of North America, 27*(2), 437–454. https://doi.org/10.1016/j.pmr.2015.12.003

Leddy, J. J., Haider, M. N., Ellis, M. J., Mannix, R., Darling, S. R., Freitas, M. S., Suffoletto, H. N., Leiter, J., Cordingley, D. M. & Willer, B. (2019). Early subthreshold aerobic exercise for sport-related concussion: A randomized clinical trial. *JAMA Pediatrics, 173*(4), 319–325. https://doi.org/10.1001/jamapediatrics.2018.4397

Leddy, J. J., Sandhu, H., Sodhi, V., Baker, J. G., & Willer, B. (2012). Rehabilitation of concussion and post-concussion syndrome. *Sports Health, 4*(2), 147-154. https://doi.org/10.1177/1941738111433673

Leddy, J. J., Wilber, C. G., & Willer, B. S. (2018). Active recovery from concussion. *Current Opinion in Neurology, 31*(6), 681–686. https://doi.org/10.1097/WCO.0000000000000611

Leddy, J. J., & Willer, B. (2013). Use of graded exercise testing in concussion and return-to-activity management. *Current Sports Medicine Reports, 12*(6), 370-376. https://doi.org/10.1249/JSR.0000000000000008

Leslie, O., & Craton, N. (2013). Concussion: Purely a brain injury? *Clinical Journal of Sport Medicine, 23*(5), 331332. https://doi.org/10.1097/JSM.0b013e318295bbb1

Marshall, S., Bayley, M., McCullagh, S., Velikonja, D., Berrigan, L., Ouchterlony, D., & Weegar, K; mTBI Expert Consensus Group. (2015). Updated clinical practice guidelines for concussion/mild traumatic brain injury and persistent symptoms. *Brain Injury, 29*(6), 688–700. https://doi.org/10.3109/02699052.2015.1004755

McCrory, P., Meeuwisse, W., DvoĀák, J., Aubry, M., Bailes, J., Broglio, S., Cantu, R. C., Cassidy, D., Echemendia, R. J., Castellani, R. J., Davis, G. A., Ellenbogen, R., Emery, C., Engebretsen, L., Feddermann-Dermont, N., Giza, C. C., Guskiewicz, K. M., Herring, S., Iverson, G. L., . . . Vos, P. E. (2017). Consensus statement on concussion in sport – the 5th international conference on concussion in sport held in Berlin, October 2016. *British Journal of Sports Medicine, 51*(11), 838–847. https://doi.org/10.1136/bjsports-2017-097699

Physiotherapy Board of New Zealand. (2018). *Annual report 2018*. https://www.physioboard.org.nz/sites/default/files/PhysiotherapyBoardAnnualReport2018.pdf

Physiotherapy New Zealand. (2019). Retrieved June 10, 2019, from https://pnz.org.nz/

Reneker, J. C., Hassen, A., Phillips, R. S., Moughiman, M. C., Donaldson, M., & Moughiman, J. (2017). Feasibility of early physical therapy for dizziness after a sports-related concussion: A randomized clinical trial. *Scandinavian Journal of Medicine and Science in Sports, 27*(12), 2009–2018. https://doi.org/10.1111/sms.12827

Schneider, D. K., Grandhi, R. K., Bansal, P., Kuntz, G. E., Webster, K. E., Logan, K., Barber Foss, K. D., & Myer, G. D. (2017). Current state of concussion prevention strategies: A systematic review and meta-analysis of prospective, controlled studies. *British Journal of Sports Medicine, 51*(20), 1473–1482. https://doi.org/10.1136/bjsports-2015-095645

Schneider, K. J. (2019a). Concussion – Part I: The need for a multifaceted assessment. *Musculoskeletal Science and Practice, 42*, 140–150. https://doi.org/10.1016/j.msksp.2019.05.007

Schneider, K. J. (2019b). Concussion part II: Rehabilitation – The need for a multifaceted approach. *Musculoskeletal Science and Practice, 42*, 151–161. https://doi.org/10.1016/j.msksp.2019.01.006

Schneider, K. J., Iverson, G. L., Emery, C. A., McCrory, P., Herring, S. A., & Meeuwisse, W. H. (2013). The effects of rest and treatment following sport-related concussion: A systematic review of the literature. *British Journal of Sports Medicine, 47*(5), 304–307. https://doi.org/10.1136/bjsports-2013-092190

Schneider, K. J., Meeuwisse, W. H., Nettel-Aguirre, A., Barlow, K., Boyd, L., Kang, J., & Emery, C. A. (2014). Cervicovestibular rehabilitation in sport-related concussion: A randomised controlled trial. *British Journal of Sports Medicine, 48*(17), 1294–1298. https://doi.org/10.1136/bjsports-2013-093267

Theadom, A., Parag, V., Dowell, T., McPherson, K., Starkey, N., Barker-Collo, S., Jones, K., Ameratunga, S., & Feigin, V. L; BIONIC Research Group. (2016). Persistent problems 1 year after mild traumatic brain injury: A longitudinal population study in New Zealand. *British Journal of General Practice, 66*(642), e16–23. https://doi.org/10.3399/bjgp16X683161

Vaismoradi, M., Jones, J., Turunen, H., & Snelgrove, S. (2016). Theme development in qualitative content analysis and thematic analysis. *Journal of Nursing Education and Practice, 6*(5), 100–110. https://doi.org/10.5430/jnep.v6n5p100

van der Walt, K., Tyson, A., & Kennedy, E. (2019). How often is neck and vestibulo-ocular physiotherapy treatment recommended in people with persistent post-concussion symptoms? A retrospective analysis. *Musculoskeletal Science and Practice, 39*, 130–135. https://doi.org/10.1016/j.msksp.2018.12.004

Willer, B. S., Haider, M. N., Bezherano, I., Wilber, C. G., Mannix, R., Kozlowski, K., & Leddy, J. J. (2019). Comparison of rest to aerobic exercise and placebo-like treatment of acute sport-related concussion in male and female adolescents. *Archives of Physical Medicine and Rehabilitation, 100*(12), 2267–2275. https://doi.org/10.1016/j.apmr.2019.07.003

Rehabilitation Following Anatomic Total Shoulder Replacement for Osteoarthritis

James Blacknall *MSc BSc (Hons)*
Advanced practice shoulder and elbow physiotherapist, Trauma and Orthopaedics Department, Sherwood Forest Hospitals NHS Foundation Trust, Nottinghamshire, United Kingdom

Amit Sharad Bidwai *MBCHB, MRCSEd, FRCS (Tr & Orth)*
Consultant trauma and orthopaedic surgeon, Trauma and Orthopaedics Department, Sherwood Forest Hospitals NHS Foundation Trust, Nottinghamshire, United Kingdom

ABSTRACT

Advances in anatomic total shoulder replacement (TSR) have seen this become an established surgical intervention for patients suffering from glenohumeral osteoarthritis (OA). A growing evidence-base stresses good prosthesis survivorship, low complication rates, and reproducible improvements to patients' quality of life and function. Despite these advances, the rehabilitation of patients undergoing anatomic TSR has received relatively little attention. This clinical commentary discusses a specific clinical method taken to manage patients undergoing anatomic TSR for glenohumeral OA and an intact rotator cuff. It outlines the evaluation-based rehabilitation approach developed between surgeons and physiotherapists at the Sherwood Forest Hospitals NHS Foundation Trust in Nottinghamshire, United Kingdom. It is hoped this commentary will generate further interest in this area and help drive advances in the outcomes and rehabilitation of patients undergoing TSR.

Blacknall, J., & Bidwai, A. S. (2020). Rehabilitation following anatomic total shoulder replacement for osteoarthritis. *New Zealand Journal of Physiotherapy, 48*(2), 80–91. https://doi.org/10.15619/NZJP/48.2.04

Key Words: Rehabilitation, Physiotherapy, Total Shoulder Replacement

INTRODUCTION

Anatomic total shoulder replacement (TSR) has become an established and popular treatment choice for the patient with osteoarthritis (OA) of the shoulder (Denard & Ladermann, 2016; Mueller & Hoy, 2014). As anatomic TSR design and understanding have developed, a growing evidence base has helped inform patient outcomes (Denard & Ladermann, 2016; Razmjou et al., 2014). The risks and benefits of anatomic TSR surgery are increasingly understood and reproducible (Bohsali et al., 2017; Young et al., 2011), with excellent long-term prosthesis survivorship, and improved quality of life and functional independence for patients (Singh et al., 2011; Styron et al., 2015; Werner et al., 2017). However, little attention has been given to the optimal rehabilitation of patients undergoing anatomic TSR, despite a consensus that rehabilitation plays an important role in optimising the outcomes for such patients (Bullock et al., 2019).

This clinical commentary, describing a rehabilitation approach, has been developed based on our experiences and the available science to meet the challenge of striving to optimally manage the patient undergoing anatomic TSR for the management of shoulder OA with an intact rotator cuff. It aims to provide a timely update on anatomic TSR rehabilitation, and describe the principles behind our approach and how these can address some of the inconsistencies noted in TSR rehabilitation guidelines (Bullock et al., 2019). Specifically, we aim to show how we developed our approach to meet the surgical implications of subscapularis exposure, the timing and rationale for rehabilitation progressions, and how the growing understanding of psychosocial factors that influence patients may be considered to ameliorate patient outcomes.

As stated by Bullock et al. (2019), the indications and pathoanatomy of patients undergoing anatomic or reverse TSR are different, making apposite rehabilitation essential. We feel it is imperative to understand the difference between rehabilitation of the anatomic and reverse TSR, making this commentary distinct from guidelines previously presented for reverse TSR (Blacknall & Neumann, 2011).

PRE-OPERATIVE STAGE

There is increasing awareness that patient expectation and experience can significantly impact clinical outcome. For instance, surgical and recovery expectations influence health outcomes, such as quality of life and function (Henn et al., 2011). Furthermore, patients' preoperative expectations of orthopaedic surgery have been shown to vary by diagnosis, sex, education, level of function, and general health status (Henn et al., 2011). Accordingly, the pre-operative clinic provides an ideal opportunity to manage and discuss these aspects whilst also providing the forum to convey to the patient some important aspects of their rehabilitation.

In the pre-operative clinic, we discuss with the patient and demonstrate what their recovery and rehabilitation following surgery will involve in terms of exercise, sling utilisation, recommended sleep positions, and functional dos and don'ts. This allows the patient to practice functional tasks prior to surgery, such as negotiating stairs or using transport, thereby facilitating an understanding of how they will manage in the immediate post-operative phase.

There is a growing body of literature that has identified patient psychological factors and the influence these have on treatment outcomes for patients with chronic shoulder pain (Chester et al., 2018; Gil et al., 2018). Whilst it is beyond the scope of this review to explore these wide-reaching themes in detail, the literature related to shoulder arthroplasty does provide us with some valuable insights that we can incorporate into our rehabilitation strategies (Tokish et al., 2017).

Depression and anxiety (which are treatable conditions), resilience, defined as "the ability to recover from a stressful event" (Tokish et al., 2017, p. 753), and self-efficacy, which refers to "one's belief in one's ability to succeed in specific situations" (Bandura, 1977), have varying effects on outcomes following TSR. Therefore, until further research enlightens the causality between these disorders and the outcome of TSR, caution is required when predicting recovery (Cho et al., 2017; Styron et al., 2015; Werner et al., 2017). However, if we feel these psychological factors are likely to be a barrier to recovery, we pursue medical input with the patient, usually through their general practitioner, where appropriate treatment options can be discussed. A supportive, coaching, and holistic role in the pre-operative clinic with patients and throughout rehabilitation helps to positively influence such factors, as demonstrated by Picha and Howell (2018).

At this stage, we take time to explain to patients how to use problem-solving to manage activities of daily living following surgery to support goal setting, and to outline the benefits of exercise during rehabilitation. We feel that with an empathetic approach, this provides a foundation to empower patients, instil confidence, and improve resilience and self-efficacy. Written information is also given to patients to support this education process and provide a resource that they can refer to during rehabilitation and reflect on with family members and/or friends.

Social support is important for patients, and we are keen to encourage and engage with any family/friends that the patient may want included in the pre-operative clinic and, indeed, throughout rehabilitation. Involving family can help support patients who may feel a sense of helplessness and anxiety about coping following surgery (Picha & Howell, 2018).

THE OPERATION: SURGICAL APPROACH AND INSIGHTS

Irrespective of the chosen anatomic TSR prosthesis, there are some fundamental surgical principles that helped inform our rehabilitation approach.

Surgical approach

Typically, anatomic TSR is performed through the deltopectoral interval (Mueller & Hoy, 2014; Wolff & Rosenzweig, 2017). Through this fascial split the surgeon gains access to the shoulder joint either via a subscapularis division (peel technique or mid-substance tenotomy) or a lesser tuberosity osteotomy (LTO) approach (Armstrong et al., 2016; Choate et al., 2018).

Numerous biomechanical studies have examined the commonly used subscapularis peel (SP), subscapularis tenotomy (ST) or LTO techniques. It is controversial as to which of these techniques is the most advantageous. Of importance, however, is subscapularis function following anatomic TSR. Subscapularis dysfunction is associated with an inferior clinical result, evidenced by pain, weakness or anterior instability (Armstrong et al., 2016; Choate et al., 2018). A recent meta-analysis of the biomechanical data reported the load-to-failure of the initial repair to be stronger for the LTO approach, while there was no statistically significant difference under cyclic load testing between the different SP and ST techniques (Schrock et al., 2016). Clinical results also trend toward supporting the LTO approach, where a recent systematic review found subscapularis healing and integrity appeared to favour the LTO technique, with the rate of intact tendon after surgery for LTO (93.1%) being significantly better than that of the ST (75.7%) or SP (84.1%) technique (Choate et al., 2018).

Rehabilitation, therefore, needs to balance the considerations for optimal tissue healing of the subscapularis repair constructs whilst avoiding the effects of deleterious disuse. The lack of specificity regarding subscapularis management in postoperative rehabilitation following anatomic TSR has recently been highlighted (Bullock et al., 2019).

Soft tissue balance

Soft tissue balancing (the close interplay between the capsular and tendon soft tissue envelope, the bony architecture of the humerus and glenoid, and implant positioning) impacts significantly on postoperative rehabilitation (Mueller & Hoy, 2014; Stephens et al., 2017). Firstly, during surgery, care is taken to release the soft tissue envelope that is often contracted due to OA to ensure an adequate capsular laxity that is required for normal shoulder motion. A long head of biceps tenodesis is often performed, allowing improved external rotation range while not causing any obvious functional loss (Mueller & Hoy, 2014).

Secondly, glenohumeral OA produces consistent bony changes, although the severity will depend upon the disease progression (Malhas et al., 2016; Matsen et al., 2004). Osteophytes must be resected adequately to avoid unwanted motion loss and any glenoid wear, classically posterior. These should be effectively dealt with to achieve normal joint stability and avoid an abnormal length-tension relationship between the subscapularis and infraspinatus (Malhas et al., 2016; Mueller & Hoy, 2014).

Thirdly, the correct implant positioning and placement will ensure the arthroplasty is not "overstuffed" or predisposed to instability, thereby preserving the requisite shoulder motion (Mueller & Hoy, 2014; Stephens et al., 2017).

Information regarding soft tissue balance and post-operative range of movement parameters is invaluable if we are to optimise the patient's functional outcome. Fortunately, there are some helpful approaches that can be used to help advise us in this regard (Matsen et al., 2004).

Testing on the table

The 40/50/60 guideline is a popular method of detailing the soft tissue range of movement following TSR (Matsen et al., 2004). According to this guideline, 40 is the degree of external rotation with the arm at the side following soft tissue approximation, 50 is the percentage of translation in relation to the glenoid width on the posterior drawer test while 60 is the degree of internal rotation with the arm in abduction (Matsen et al., 2004).

Information on subscapularis biomechanics is particularly important, given the poor outcomes associated with its failure (Armstrong et al., 2016; Choate et al., 2018). An understanding of the range of external rotation that is safely available following surgery will inform our exercise prescription (Wolff & Rosenzweig, 2017). While assessing soft tissue balance following anatomic TSR can be a diverse process, it is important that this guidance is communicated to the rehabilitation team by the surgeon(s) to facilitate an optimal and safe postoperative recovery.

Complications and survivorship

Complication rates following anatomic TSR are low, with a large review finding rates for instability of 1% with rotator cuff tear, postoperative fracture, neural injury, and infection all below 1% (Bohsali et al., 2017). Instability typically presents as either anterosuperior escape associated with poor subscapularis function, or as posteroinferior subluxation (Matsen et al., 2004). We should be wary of anterosuperior instability in patients with pain, unexpected poor flexion, and observable or palpable increased anterior translation of the humeral head at rest or during early flexion, particularly if there are any concerns with the integrity of subscapularis. Posteroinferior instability often presents as pain and an observable or palpable posterior translation and "clunk" during flexion movements.

Superior rotator cuff tear (not involving the subscapularis) following anatomic TSR is, again, rare, but a clinical suspicion should be raised in patients who have increasing pain, unexpected loss of movement, and weakness on rotator cuff testing. There is some thought that an "overstuffed" prothesis may increase this risk as the oversized humeral head places more tension and stress on the in-situ rotator cuff tendons (Matsen et al., 2004). Good understanding of these issues will facilitate early identification during rehabilitation and should prompt physiotherapists to discuss these with the surgical team before continuing rehabilitation.

Patients are naturally keen to understand how long their shoulder replacement will last. Singh et al. (2011) reported TSR implant survivorship rates for OA of 95% at 5 years, 91% at 10 years, and 81% at 20 years. Young et al. (2011) reported survivorship rates for patients undergoing TSR for OA of 99.1% at 5 years, 94.5% at 10 years, and 79.4% at 15 years, with glenoid component revision taken as the end point. Survivorship rates with radiological loosening taken as the end point revealed 99.1% at 5 years, 80.3% at 10 years and 33.6% at 15 years.

It is reassuring that implant loosening or migration is rare during the rehabilitation period. However any sudden onset of pain, particularly where associated with loss of movement and crepitus or grating, should prompt immediate discussion with the surgical team. While these survivorships rates are promising and provide useful information for patients, there is some acknowledgment in the literature of risk factors for less favourable rates, namely patients with higher activity levels and who are younger at the time of surgery (Farng et al., 2011).

REHABILITATION PATHWAY

Our rehabilitation pathway is divided into four distinct elements: the pre-operative clinic, as discussed above, followed by the early postoperative phase *"protected mobility"*, the intermediate postoperative phase *"active recovery"*, and the late postoperative phase *"functional reintegration"*.

Early postoperative phase: "Protected mobility"

The philosophy of the early rehabilitation phase is to manage the twin aims of protecting the shoulder tissues whilst avoiding the unwanted effects associated with surgical trauma, pain, and poor patient adherence to rehabilitation recommendations (Ahmad et al., 2015).

"Protected mobility" education and functional advice

Patients are educated on how to avoid forces through the arm. For example, patients are shown how not to use the operated arm when sitting and rising from a chair or getting out of bed to prevent unnecessary stress risers through the arm and loading the subscapularis repair construct.

We find sleep position advice particularly useful. Maintaining the shoulder joint in a neutral position (shown in Figure 1) provides patients with practical steps on how to position themselves comfortably and confidently for sleep while also providing pain relief and, therefore, better quality rest (Wolff & Rosenzweig, 2017) – both important for an optimal recovery (Ahmad et al., 2015). Advice on resting positions is developed to facilitate simple functional tasks, such as washing and dressing, with the sling removed, again helping to ensure patients do not unnecessarily load the arm (Gurney et al., 2016). Emphasising

Figure 1

Sleeping Positions

Note. Left panel: Supine sleep position. Right panel: Side-lying sleep position.

the need to adopt these practical and functional methods in the early phase of rehabilitation minimises repetitive loads on the subscapularis repair that may lead to clinical failure (Choate et al., 2018; Schrock et al., 2016).

This coaching and supportive approach helps patients cope and manage well in the postoperative stages. Self-efficacy and rehabilitation adherence can be improved by empowering patients to perform tasks correctly, setting goals, positively reinforcing the information from the preoperative stage, discussing pain management and how to pace activities, and reducing any fear of failure the patient may harbour (Picha & Howell, 2018).

Education around the need to manage a sling correctly is provided. This is particularly important in vulnerable environments (e.g. shopping/using transport) as high levels of subscapularis activity occur when putting on and taking off a sling (Gurney et al., 2016). Biomechanically the subscapularis repair constructs have been shown to have good load-to-failure strength (average 350 N) and an ability to withstand displacement on cyclic loading (Schrock et al., 2016). Therefore, we feel patients do not need to be routinely immobilised post-surgery.

“Protected mobility” exercise prescription

The early phase of exercises aims to mobilise the shoulder joint, helping promote functional independence; and avoid potential stiffness, contracture, and pain management problems.

Exercises are implemented according to the communication of post-implantation soft tissue balance and any potential complications that the surgical team feel may have implications for rehabilitation, for example avoiding a certain range of external rotation if the subscapularis repair was unduly tensioned or vulnerable in such a position. Patients are taught to perform the exercises with the operated arm as relaxed as possible; in essence, we want the exercise to be as “passive” as possible, ensuring minimal forces across the healing tissues (Edwards et al., 2017; Jung et al., 2016). Anecdotally, patients are far more comfortable and successful with these exercises when they are relaxed than if they are tense and nervous when moving the arm. Again, this reflects the supportive, educative and holistic role physiotherapists inherently take with patients, providing positive feedback, and reassuring and coaching patients as they recover.

There is a reasonably linear relationship between muscle electromyography and force during near isometric and constant velocity contractions (Edwards et al., 2017; Thigpen et al., 2016). The early phase of these exercises show low muscle activity with electromyographic studies, and we are confident that we are not inducing forces through the healing tissues that have been found to cause failure in-vitro (Schrock et al., 2016).

Flexion

Pendulum, supine active-assisted flexion and pulley exercises all show low muscle activity (Edwards et al., 2017; Mazuquin et al., 2018), and in the acute post-operative setting are well tolerated by patients, and carry little risk of unduly loading and stressing the healing tissues (Mazuquin et al., 2018). Patients are encouraged to progress through a range of motion as comfort allows, and this range of motion is not routinely constrained.

External rotation

External rotation is an important movement to regain for normal shoulder motion, with 35° being required for maximal elevation (Browne et al., 1990). Patients with poor external rotation range may be susceptible to subacromial pain syndrome, as the greater tuberosity cannot escape from underneath the acromial arch (Browne et al., 1990; Matsen et al., 2004), a phenomenon to factor into postoperative rehabilitation.

Supine external rotation using a stick with the arm in a supported neutral position shows low muscle activity (Thigpen et al., 2016). However, if injudiciously applied, this will stress the subscapularis repair construct (Edwards et al., 2017; Wolff & Rosenzweig, 2017). Recognising the rehabilitation specificity of the subscapularis approach, careful use of supine external rotation based on the intra-operative soft tissue balance is recommended to ensure the patient does not push into overt pain. (Bullock et al., 2019).

Extension

A standing passive extension using a stick, initiated as patient comfort allows, is again well tolerated by patients with low muscle activity (Thigpen et al., 2016). Care is required to ensure this movement is comfortable.

Exercise dose and technique

We expect patients to perform their exercise programme twice daily to begin with and suggest 10 repetitions for each exercise. However, the repetitions and frequency of performance are modified depending on how the patient is progressing. For example, in the case of a patient whose range of movement is not where it should be, but who is comfortable with the exercise programme, we suggest increasing the range of movement and monitoring the patient.

Patients’ exercise technique and understanding of the follow-up physiotherapy sessions are checked to ensure the exercises are being performed correctly and the functional advice described above is being followed (Ahmad et al., 2015). Again, we are alert to potential barriers or psychosocial factors that may be affecting recovery, as discussed previously (Tokish et al., 2017). For example, group rehabilitation may be appropriate to augment the patient’s home programme if it is felt that the patient would benefit from the peer support in a group environment, either via their own or vicarious experience (Picha & Howell, 2018).

Intermediate postoperative phase: “Active recovery”

In this phase patients continue to follow their active-assisted exercise programme and joint protection advice from the protected mobility phase. Movement re-education and active exercises are introduced through an evaluation-based criterion, developing the active recovery process.

Evaluation-based criteria

The evaluation-based criteria are founded on:

1. Time since surgery.
2. Patient’s tissue quality.

3. Surgical considerations.
4. Patient's rehabilitation progress.
5. Clinical findings.

The first three criteria are evidenced from the operation note and/or surgical team, along with an understanding of any physiological factors that may alter healing and recovery in the patient, be that medical influences, such as diabetes, or lifestyle factors, such as smoking. Criteria 4. and 5. relate to the patient's subjective report of their symptoms and recovery, and objective information from physical testing. The evaluation-based criteria are invaluable for the safe and optimal progression of the patient's rehabilitation.

The biomechanical literature shows some consistency in the subscapularis repair mode of failure, with the majority of LTO failing at the bone interface, while soft tissue failure with suture cut through at the muscle/tendon is seen with tenotomy (SP, ST) repairs (Ahmad et al., 2015; Schrock et al., 2016). The various subscapularis techniques – bone-to-bone (LTO), tendon-to-bone (SP) and tendon-to-tendon (ST) – will have different modes of healing. Therefore, until adequate healing has occurred, there is the spectre of tendon failure, which should be factored into our rehabilitation (Choate et al., 2018; Wolff & Rosenzweig, 2017).

The LTO that does not violate the tendon should theoretically heal quicker than a subscapularis repair, as bone healing takes less time and is more understood and predictable than tendon healing. This allows us to accelerate exercise progressions in these patients and ensures rehabilitation is specific to the subscapularis approach (Bullock et al., 2019).

TSR with an LTO (3-weeks post-surgery)

At three weeks post anatomic TSR, patients with an LTO are progressed if they meet our evaluation-based criteria: they have adequate tissue quality, there are no surgical factors that warrant a more conservative progression, they report minimal pain with their rehabilitation programme to date, and they are pain free on our two clinical progression tests. These two tests (Figures 2–3) are:

1. Supported active internal and external rotation with the elbow flexed to 90° in supine.
2. Active short-lever 0-90° shoulder flexion "forward punch" in supine.

During loaded external rotation, subscapularis demonstrates low levels of activity (Edwards et al., 2017; Thigpen et al., 2016). The supine "forward punch" movement has also shown a low level of subscapularis muscle activity (Wattanaprakornkul et al., 2011), even when loaded, so we feel the unloaded short-lever technique described above is a rational active functional testing position.

Figure 2

Supported Active External to Internal Rotation, Performed in Supine

Note. Left panel: Starting position. Right panel: End position.

Figure 3

Active Short-Lever Flexion (0-90°) "Forward Punch", Performed in Supine

Note. Left panel: Starting position. Right panel: End position.

Patients that satisfy these criteria are progressed to weaning off their sling, commence hand behind the back active-assisted exercise progressions, and can start active range of movement work with an emphasis on good quality motor control.

Not all patients will meet our criteria at this stage. This is usually due to either tissue quality or surgical considerations, or they report poor pain control with their exercises to date and fail our clinical progression tests (namely pain with the active external rotation and "forward punch" test). In this scenario, we are careful to ensure that patients have been following their rehabilitation plans and check for any potential barriers to recovery that may be affecting their progress.

Poor pain management may be one factor to discuss with patients at this stage. Patients can be reluctant to use their prescribed analgesics due to fears of masking pain or, indeed, they may be experiencing unwanted side effects, such as an upset stomach or constipation. Exploring these issues and problem-solving them with patients, and involving the medical team if necessary are important steps for optimising rehabilitation. Again, reinforcing a positive recovery expectation, coaching, and supporting patients with positive feedback, goal setting, and engaging the patient's social support network are all methods to help improve self-efficacy and rehabilitation adherence (Chester et al., 2018; Picha & Howell, 2018).

Patients are reviewed at follow-up physiotherapy sessions until we feel they can progress. Ongoing pain and the inability to complete our clinical tests indicates the need to review the patient's progress with the surgical team.

TSR with an SP or ST (4-weeks post-surgery)

Anatomic TSR patients with an SP or ST approach are evaluated at the four-week postoperative stage. Those fulfilling our evaluation-based criteria discussed above can start sling weaning and the hand-behind-the-back active-assisted exercise progressions, affording a little more functional independence and engendering our supportive holistic recovery approach. However, we do not start active exercise progressions and movement control until evaluated again at the six-week stage to help protect the subscapularis tendon repair (Mazaquin et al., 2018; Wattanaprakornkul et al., 2011). For the patients with an SP or ST approach who do not meet our criteria at this stage, we apply the strategies previously discussed for the LTO approach.

"Active recovery" movement control exercises

These progressions should be symptom free, and if they are not, patients are re-evaluated during physiotherapy sessions until we deem progression appropriate. Patients are encouraged to maintain the exercise frequency that has already been established, and then develop the movement control work as symptoms allow in a "little-and-often" routine. These exercises aim to achieve improved motor control where repetition and frequency is the goal, rather than a strength training/overload principle of exercise prescription. Such progressions help empower patients by reintegrating daily life activities, assisting to develop their resilience and self-efficacy, and facilitating adherence to rehabilitation (Picha & Howell, 2018).

Active flexion and external rotation from supine are comfortable starting transitions. As symptoms allow, these can be progressed to sitting or standing active flexion and external rotation along with extension and internal rotation physiological range of movement exercises (Edwards et al., 2017; Thigpen et al., 2016).

Patients with shoulder OA often have altered movement patterns (Alta et al., 2014; de Toledo et al., 2012) due to the pain, stiffness, and loss of function caused by the disease process. These patterns represent compensatory movement strategies that following anatomic TSR should be re-educated during rehabilitation; we consider a normal movement pattern a prerequisite to achieving normal function. Therefore, as patients are prescribed the active range of movement exercises above, they are taught with an emphasis on movement dissociation, particularly glenohumeral joint from scapulothoracic joint to improve their kinesthetic and proprioceptive awareness, which have been shown to be altered in TSR patients (Alta et al., 2014; de Toledo et al., 2012). Mirrors and/or video feedback are useful methods to employ to help patients understand the movement faults we want to address. Patients are also encouraged to incorporate movement dissociation into their other active-assisted exercises and simple functional tasks to enhance the cortical carry-over and motor relearning process. Importantly, the patient must have adequate passive/active-assisted movement before they can use this range actively.

Late postoperative phase: "Functional reintegration"

The next stage of rehabilitation aims to build upon the active-assisted and active-movement work already under way with the introduction of loading exercises to progress the strength, stamina, and efficiency of the shoulder complex to enhance functional reintegration.

TSR with an LTO (6 weeks post-surgery)

At 6 weeks, patients with an LTO are progressed according to our evaluation-based criteria. If there are no concerns with tissue quality or surgical considerations, and patients have experienced minimal pain with rehabilitation to date, clinical progression tests are applied. If patients are pain free with therapist-resisted supine internal rotation from neutral rotation, and can perform the "forward punch" test loaded in supine (Figure 4), loaded rehabilitation exercises are started. The clinical progression tests do not require any specific equipment. The internal rotation test utilises physiotherapist resistance to gentle isometric internal rotation in neutral to judge the quality of contraction and symptom reproduction (Figure 5). For the "forward punch" test, we start with a small weight, typically 0.5 kg, and if the patient is symptom free on testing, we use this as the starting load for exercise progressions. For any patient that fails our functional tests (i.e. pain with resisted internal rotation and/or with the loaded forward punch) we check their exercise programme for any factors that may be affecting their progression. Patients are not progressed until re-evaluation at subsequent physiotherapy sessions, whereby the clinical progression tests are repeated.

We apply this evaluation-based approach because whilst the LTO has been shown to have an excellent healing rate, literature suggests it is not immune from complications (Choate et al., 2018; Denard & Ladermann, 2016). A recent review identified a small number of tuberosity failures in relatively young (mean age 52 years) male patients with a muscular build, where the LTO failure occurred within 2 to 3 months following surgery, resulting from little or minor trauma (Shi et al., 2015). Thus,

Figure 4

Loaded Short-Lever Flexion (0-90°) "Forward Punch", Performed in Supine

Note. Left panel: Starting position. Right panel: End position.

Figure 5

Therapist-Resisted Isometric Internal Rotation from Neutral, Performed in Supine

it is vital to support a judicious and progressive rehabilitation approach, rather than one determined by a time-based assumption. Any concerns with patients continuing to fail our evaluation-based tests at this stage should prompt discussion with the surgical team.

TSR with an SP or ST (12-weeks post-surgery)

For patients who have undergone anatomic TSR using an SP or ST approach, a more cautionary route is taken with progression into functional reintegration. We want to allow time for sufficient healing before starting strengthening work, as suture cut through is the mode of failure that accounts for 97% of ST and SP repairs following anatomic TSR (Schrock et al, 2016). There is reasonable consensus from the rotator cuff repair literature that this should be considered from 12 weeks post-repair when there is sufficient bone tendon integration to started loaded rehabilitation (Ahmad et al., 2015; Thigpen et al., 2016). Even though the subscapularis may not have been diseased, it has nevertheless undergone surgical division and repair, so it would seem reasonable to take such a view. Patients are progressed if they pass the evaluation-based criteria tests. If they fail these tests, we follow the rationale discussed above for the LTO.

Loaded "functional reintegration" exercise progressions

Rotator cuff conditioning is prescribed in a graduated manner using exercises that have shown low subscapularis activity towards those where activity is higher (Jung et al., 2016; Thigpen et al., 2016), thereby fostering an incremental and controlled challenge for the healing tissues. We use hand weights or resistance bands with low load and high repetition exercises to promote stamina and endurance to replicate the patient's functional work physiology (Fisher et al., 2017). These are commonly employed due to their convenience and ease of application with a supportive goal-setting approach, which helps with exercise adherence, an important facet of a successful rehabilitation outcome (Picha & Howell, 2018).

Loaded external rotation, either supine or standing, have shown low subscapularis activity whilst strongly recruiting the external rotators (Edwards et al., 2017; Thigpen et al., 2016), as also shown with forward flexion-type exercise progressions (Wattanaprakornkul et al., 2011). When tolerated well, these practical and functional exercises can be progressed to incorporate internal rotation and extension-type exercises that have shown increasing subscapularis activity (Edwards et al., 2017; Wattanaprakornkul et al., 2011).

Once patients are progressing with their rotator cuff conditioning, exercises that target the deltoid and scapular complex can be included, such as scapular plane flexion to 90° then 120°, and standing rowing-type exercises (Castelein et al., 2016; Thigpen et al., 2016). The aim of these exercise progressions should always be driven by the patient's functional demands, which vary, making a bespoke approach preferable to a rigid framework. It is also important to ensure the resistance exercises incorporate education of normal movement patterns as well as the motor control work that was started in the active recovery phase.

Functional rehabilitation expectations

Rehabilitation continues until the patent's aims and goals have been achieved, as discussed in the pre-operative clinic and during rehabilitation. Whilst it can be difficult to predict the functional outcome for any given patient, there is a growing body of quantitative research that can help us provide patients with some practical guidance (Table 1) and help set realistic expectations, fostering a collaborative and holistic rehabilitation approach following TSR for OA. Furthermore, recent work has shown patients' functional improvements at 6 months are

Table 1

Functional Outcomes Following Total Shoulder Replacement

Author (year)	Post-operative measurements				
	Pain	Flexion (°)	External rotation in adduction (°)	Internal rotation (°)	Notes
Young et al. (2011)	11.1 [a]	125	30		10-year follow-up
Razmjou et al. (2014)		131	47		2-year follow-up
Dernard and Lädermann (2016)	0.7 [b]	142	62	L3	Immediate ROM group at 1-year follow-up
	1.0 [b]	146	57	L1	Delayed ROM group at 1-year follow-up

Note. ROM = range of movement.

[a] Pain score where 0 = intolerable pain and 15 = no pain. [b] Visual Analogue Scale where 0 = no pain.

maintained through 15 years postoperatively, meaning patients can be confident in the longevity of their functional recovery and independence (Raiss et al., 2014).

Some patients will also be keen to return to their leisure activities following TSR, and rehabilitation should be tailored to meet these demands. A recent meta-analysis has found that 92.6% of patients undergoing anatomic TSR return to sport (Liu et al., 2018). The most common sporting activities reported were swimming, golf, fitness sports (defined as lightweight training and/or gym attendance of more than 2 hours per week) and tennis. It should be noted, however, that the ramifications of sport participation on implant survivorship and/or complications are not fully understood at present. This is particularly important to reconcile when faced with a younger or more active patient, who may want to rehabilitate back to a number of sports or hobbies (Sowa et al., 2017).

CONCLUSION

Rehabilitation following anatomic TSR continues to advance with an evolving evidence base helping to inform our decision-making approach and patient care. There is a lack of evidence that shows one rehabilitation approach to be more efficacious than another. Therefore, rehabilitation protocols are often based on the available, current scientific understanding along with the experience of those clinicians that regularly manage such patient cohorts.

We hope that our approach, which utilises where possible the current scientific evidence, a collaborative multidisciplinary approach, and evaluation-based criteria, provides a guideline within which to optimally rehabilitate anatomic TSR patients. Future work should aim to inform this methodology with clinical outcomes to validate the rehabilitation approach and develop further thinking in this area. Physiotherapists should be open to the exciting developments that can be utilised to improve care, such as medical ultrasound, where real-time imaging could be used to help assess the healing tissues and drive rehabilitation decision-making processes. The growing understanding of qualitative factors, such as the psychosocial, also offer potential to develop strategies and methods to improve patient experience and outcomes.

KEY POINTS

1. A collaborative evidenced and evaluation-based approach coupled with a thorough understanding of the surgical technique and factors that can lead to a poor clinical result are vital for optimising patient outcomes following anatomic TSR.
2. This clinical commentary presents a new evaluation-based rehabilitation approach to optimise the patient outcome following anatomic TSR.

DISCLOSURES

No funding was received for this research. There are no conflicts of interest which may be perceived to interfere with or bias this study.

PERMISSIONS

Permission was obtained for the reproduction of the photographs included in this article.

ADDRESS FOR CORRESPONDENCE

James Blacknall, Advanced practice shoulder and elbow physiotherapist, Trauma and Orthopaedics Department, Sherwood Forest Hospitals NHS Foundation Trust, Mansfield Road, Sutton-in-Ashfield, Nottinghamshire, NG17 4JL, United Kingdom.

Email: j.blacknall@nhs.net

REFERENCES

Ahmad, S., Haber, M., & Bokor, D. J. (2015). The influence of intraoperative factors and postoperative rehabilitation compliance on the integrity of the rotator cuff after arthroscopic repair. *Journal of Shoulder and Elbow Surgery*, *24*(2), 229–235. https://doi.org/10.1016/j.jse.2014.06.050

Alta, T. D., de Toledo, J. M., Veeger, H. E. J, Janssen, T. W., & Willems, W. J. (2014). The active and passive kinematic difference between primary reverse and total shoulder protheses. *Journal of Shoulder and Elbow Surgery*, *23*(9), 1395–1402. https://doi.org/10.1016/j.jse.2014.01.040

Armstrong, A. D., Southam, J. D., Horne, A. H., Hollenbeak, C. S., Flemming, D. J., & Kothari, M. J. (2016). Subscapularis function after total shoulder arthroplasty: Electromyography, ultrasound, and clinical correlation. *Journal of Shoulder and Elbow Surgery*, *25*(10), 1674–1680. https://doi.org/10.1016/j.jse.2016.02.018

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84*(2)*,* 191–215. https://doi.org/10.1037/0033-295X.84.2.191

Blacknall, J., & Neumann, L. (2011). Rehabilitation following reverse total shoulder replacement. *Shoulder & Elbow, 3*(4)*,* 232–240. https://doi.org/10.1111/j.1758-5740.2011.00138.x

Bohsali, K. I., Bois, A. J., & Wirth, M. A. (2017). Complications of shoulder arthroplasty. *Journal of Bone and Joint Surgery (American)*, *99*(3), 256–269. https://doi.org/10.2106/JBJS.16.00935

Browne, A. O., Hoffmeyer, P., Tanaka, S., An, K. N., & Morrey, B. F. (1990). Glenohumeral elevation studied in three dimensions. *Journal of Bone and Joint Surgery (British)*, *72*(5), 843–845.

Bullock, G. S., Garrigues, G. E., Ledbetter, L., & Kennedy, J. (2019). A systematic review of proposed rehabilitation guidelines following anatomic and reverse shoulder arthroplasty. *Journal of Orthopaedic & Sports Physical Therapy*, *49*(5), 337–346. https://doi.org/10.2519/jospt.2019.8616

Castelein, B., Cagnie, B., Parlevliet, T., & Cools, A. (2016). Superficial and deep scapulothoracic muscle electromyographic activity during elevation exercises in the scapular plane. *Journal of Orthopaedic & Sports Physical Therapy*, *46*(3), 184–193. https://doi.org/10.2519/jospt.2016.5927

Chester, R., Jerosch-Herold, C., Lewis, J. & Shepstone, L. (2018). Psychological factors are associated with the outcome of physiotherapy for people with shoulder pain: A multicentre longitudinal cohort study. *British Journal of Sports Medicine*, *52*(4), 269–275. https://doi.org/10.1136/bjsports-2016-096084

Cho, C. H., Song, K. S., Hwang, I., Coats-Thomas, M. S., & Warner J. J. P. (2017). Changes in psychological status and health-related quality of life following total shoulder arthroplasty. *Journal of Bone and Joint Surgery (American)*, *99*(12), 1030–1035. https://doi.org/10.2106/JBJS.16.00954

Choate, S. W., Kwapisz, A., Momaya, A. M., Hawkins, R. J., & Tokish, J. M. (2018). Outcome for subscapularis management techniques in shoulder arthroplasty: a systematic review. *Journal of Shoulder and Elbow Surgery*, *27*(2), 363–370. https://doi.org/10.1016/j.jse.2017.08.003

Denard, P., & Lädermann, A. (2016). Immediate versus delayed passive range of motion following total shoulder arthroplasty. *Journal of Shoulder and Elbow Surgery*, *25*(12), 1918–1924. https://doi.org/10.1016/j.jse.2016.07.032

de Toledo, J. M., Loss, J. F., Janssen, T. W., van der Scheer, J. W., Alta, T. D., Willems, W. J., & Veeger, H. E. J. (2012). Kinematic evaluation of patients with total and reverse shoulder arthroplasty during rehabilitation exercises with different loads. *Clinical Biomechanics*, *27*(8), 793–800. https://doi.org/10.1016/j.clinbiomech.2012.04.009

Edwards, P. K., Ebert, J. R., Littlewood, C., Ackland, T., & Wang, A. (2017). A systematic review of electromyography studies in normal shoulders to inform postoperative rehabilitation following rotator cuff repair. *Journal of Orthopaedic & Sports Physical Therapy*, *47*(12), 931–944. https://doi.org/10.2519/jospt.2017.7271

Farng, E., Zingmond, D., Krenek, L., SooHoo, N. F. (2011). Factors predicting complication rates after primary shoulder arthroplasty. *Journal of Shoulder and Elbow Surgery*, *20*(4), 557–563. https://doi.org/10.1016/j.jse.2010.11.005

Fisher, J., Steele, J., & Smith, D. (2017). High- and low-load resistance training: Interpretation and practical application of current research findings. *Sports Medicine*, *47*(3), 393–400. https://doi.org/10.1007/s40279-016-0602-1

Gil, J. A., Goodman, A. D., & Mulcahey, M. K. (2018). Psychological factors affecting outcomes after elective shoulder surgery. *Journal of the American Academy of Orthopaedic Surgeons*, *26*(5), e98–e104. https://doi.org/10.5435/JAAOS-D-16-00827

Gurney, A. B., Mermier, C., LaPlante, M., Majumdar, A., O'Neill, K., Shewman, T., & Gurney, J. S. (2016). Shoulder electromyography measurements during activities of daily living and routine rehabilitation exercises. *Journal of Orthopaedic & Sports Physical Therapy*, *46*(5), 375–383. https://doi.org/10.2519/jospt.2016.6090

Henn, F. R., Ghomrawi, H., Rutledge, J. R., Mazumdar, M., Mancuso, C. A., & Marx, R. G. (2011). Preoperative patient expectations of total shoulder arthroplasty. *Journal of Bone and Joint Surgery (American)*, *93*(22), 2110–2115.

Jung, M. C., Kim, S. J., Rhee, J. J., & Lee, D. H. (2016). Electromyographic activities of the subscapularis, supraspinatus and infraspinatus muscles during passive shoulder and active elbow exercises. *Knee Surgery, Sports Traumatology, Arthroscopy*, *24*, 2238–2243. https://doi.org/10.1007/s00167-015-3586-8

Liu, J. N., Steinhaus, M. E., Garcia, G. H., Chang, B., Fields, K., Dines, D. M., Warren, R. F., & Gulotta, L. V. (2018). Return to sport after shoulder arthroplasty: A systematic review and meta-analysis. *Knee Surgery, Sports Traumatology, Arthroscopy*, *26*, 100–112. https://doi.org/10.1007/s00167-017-4547-1

Malhas, A., Rashid, A., Copas, D., Bale, S., & Trail, I. (2016). Glenoid bone loss in primary and revision shoulder arthroplasty. *Shoulder & Elbow*, *8*(4), 229–240. https://doi.org/10.1177/1758573216648601

Matsen, F. A., Rockwood, C. A., Wirth, M. A., Lippitt, S. B., & Parsons, M. (2004). Glenohumeral arthritis and its management. In C. A. Rockwood, F. A. Matsen, M. A. Wirth & S. B. Lippitt (Eds.), *The Shoulder* (3rd ed., pp. 879–1007). Saunders.

Mazuquin, B. F., Wright, A. C., Russell, S., Monga, P., Selfe, J., & Richards, J. (2018). Effectiveness of early compared with conservative rehabilitation for patients having rotator cuff repair surgery: An overview of systematic reviews. *British Journal of Sports Medicine*, *52*(2), 111–121. https://doi.org/10.1136/bjsports-2016-095963

Mueller, M., & Hoy, G. (2014). Soft tissue balancing in total shoulder replacement. *Current Reviews in Musculoskeletal Medicine*, *7*, 16–21. https://doi.org/10.1007/s12178-013-9195-6

Picha, K. J., & Howell, D. M. (2018). A model to increase rehabilitation adherence to home exercise programmes in patients with varying levels of self-efficacy. *Musculoskeletal Care*, *16*(1), 233–237. https://doi.org/10.1002/msc.1194

Raiss, P., Bruckner, T., Rickert, M., & Walch, G. (2014). Longitudinal observational study of total shoulder replacements with cement: Fifteen to twenty-year follow-up. *Journal of Bone and Joint Surgery (American)*, *96*(30, 198–205. https://doi.org/10.2106/jbjs.m.00079

Razmjou, H., Stratford, P., Kennedy, D., & Holtby, R. (2014). Pattern of recovery following total shoulder arthroplasty and humeral head replacement. *BMC Musculoskeletal Disorders*, *15*, 306. https://doi.org/10.1186/1471-2474-15-306

Schrock, J. B., Kraeutler, M. J., Houck, D. A., Provenzano, G. G., McCarty, E. C., & Bravman, J. T. (2016). Lesser tuberosity osteotomy and subscapularis tenotomy repair techniques during total shoulder arthroplasty: A meta-analysis of cadaveric studies. *Clinical Biomechanics*, *40*, 33–36. https://doi.org/10.1016/j.clinbiomech.2016.10.013

Shi, L. L., Jiang, J. J., Ek, E. T., & Higgins, L. D. (2015). Failure of the lesser tuberosity osteotomy after total shoulder arthroplasty. *Journal of Shoulder and Elbow Surgery*, *24*(2), 203–209. https://doi.org/10.1016/j.jse.2014.05.006

Singh, J. A., Sperling, J. W., & Cofield, R. H. (2011) Revision surgery following total shoulder arthroplasty: Analysis of 2588 shoulders over three decades (1976 to 2008). *Journal of Bone and Joint Surgery (British), 93*(11), 1513–1517. https://doi.org/10.1302/0301-620X.93B11.26938

Sowa, B., Bochenek, M., Bülhoff, M., Zeifang, F., Loew, M., Bruckner, T., & Raiss, P. (2017). The medium- and long-term outcome of total shoulder arthroplasty for primary glenohumeral osteoarthritis in middle-aged patients. *Bone and Joint Journal*, *99-B*(7), 939–943. https://doi.org/10.1302/0301-620X.99B7.BJJ-2016-1365.R1

Stephens, S. P., Spencer, E. E., & Wirth, M. A. (2017). Radiographic results of augmented all-polyethylene glenoids in the presence of posterior glenoid bone loss during total shoulder arthroplasty. *Journal of Shoulder and Elbow Surgery*, *26*(5), 798–803. https://doi.org/10.1016/j.jse.2016.09.053

Styron, J. F., Higuera, C. A., Strnad, G & Iannotti, J. P. (2015). Greater patient confidence yields greater functional outcomes after primary total shoulder arthroplasty. *Journal of Shoulder and Elbow Surgery*, *24*(8), 1263–1267. https://doi.org/10.1016/j.jse.2015.04.018

Thigpen, C. A., Shaffer, M. A., Gaunt, B. W., Leggin, B. G., Williams, G. R., & Wilcox, R. B. (2016). The American Society of Shoulder and Elbow Therapists' consensus statement on rehabilitation following arthroscopic rotator cuff repair. *Journal of Shoulder and Elbow Surgery*, *25*(4), 521–535. https://doi.org/10.1016/j.jse.2015.12.018

Tokish, J. M., Kissenberth, M. J., Tolan, S. J., Salim, T. I., Tadlock, J., Kellam, T., Long, C. D., Crawford, A., Lonergan, K. T., Hawkins, R. J., & Shanley, E. (2017). Resilience correlates with outcomes after total shoulder arthroplasty. *Journal of Shoulder and Elbow Surgery*, *26*(5), 752–756. https://doi.org/10.1016/j.jse.2016.12.070

Wattanaprakornkul, D., Cathers, I., Halaki, M., Ginn, K. A. (2011). The rotator cuff muscles have a direction specific recruitment pattern during shoulder flexion and extension exercises. *Journal of Science and Medicine in Sport*, *14*(5), 376–382. https://doi.org/10.1016/j.jsams.2011.01.001

Werner, B. C., Wong, A. C., Chang, B., Craig, E. V., Dines, D. M., Warren, R. F & Gulotta, L. V. (2017). Depression and patient-reported outcomes following total shoulder arthroplasty. *Journal of Bone and Joint Surgery (American)*, *99*(8), 688–695. https://doi.org/10.2106/JBJS.16.00541

Wolff, A. L., & Rosenzweig, L. (2017). Anatomical and biomechanical framework for shoulder arthroplasty rehabilitation. *Journal of Hand Therapy*, *30*(2), 167–174. https://doi.org/10.1016/j.jht.2017.05.009

Young, A., Walch, G., Boileau, P., Favard, L., Gohlke, F., Lowe, M., & Mole, D. (2011). A multicentre study of the long-term results of using a flat-back polyethylene glenoid component in shoulder replacement for primary osteoarthritis. *Journal of Bone and Joint Surgery (British)*, *93*(2), 210–216. https://doi.org/10.1302/0301-620X.93B2.25086

Appendix A

TOTAL SHOULDER REPLACEMENT REHABILITATION PROTOCOL

Pre-operative clinic evaluation

Patient educated regarding rehabilitation plan and any functional needs evaluated

Early phase (inpatient care onwards): "Protected mobility"

Goals

- Pain controlled
- Competent with rehabilitation programme and care of upper limb
- Independent for discharge (with or without care/support as required)

Precautions

- Check operation note/surgical team communication to clarify plan and surgery details
- Check x-rays cleared as necessary
- Sling requirement for protection and support (3–4 weeks depending on surgical approach)
- No loading of upper limb

Days 1–21

- Patient educated regarding upper limb functional use (sleep, resting positions and simple activities of daily living)
- Patient educated regarding sling management (can be removed for exercises and simple activities of daily living, as educated above)
- Patient taught routine AAROM exercises (avoiding impingement positions): Shoulder rolls, pendulum, pulley from sitting, supine flexion, supine external rotation, standing extension
- Outpatient physiotherapy arrangements made on discharge from hospital and care continued

Intermediate phase: "Active recovery"

Goals

- Complete criterion-based evaluation for progression. Consider time from surgery, patient tissue quality, surgical considerations, patient progress with rehabilitation to date and complete clinical tests (supine active internal/external rotation, and supine active forward punch)

Precautions

- Avoid loading the upper limb to protect healing soft tissues

LTO approach at 3 weeks post-surgery

- Start weaning off sling
- Start AAROM hand-behind-back movements
- Start active motor control ROM exercises

SP/ST approach at 4 weeks post-surgery

- Start weaning off sling
- Start AAROM hand- behind-back movements

SP/ST approach at 6 weeks post-surgery

- Start active motor control ROM exercises

Late postoperative phase: “Functional reintegration”

Goals

- Complete criterion-based evaluation for progression: Consider time from surgery, patient tissue quality, surgical considerations, patient progress with rehabilitation to date, and complete clinical tests (supine resisted internal rotation and supine loaded-forward punch)

Precautions

- Avoid large functional loads through upper limb

LTO approach 6 weeks post-surgery and SP/ST approach from 12 weeks post-surgery

- Continue AAROM and AROM motor control exercises from early and intermediate phases
- Start rotator cuff exercise work up
  - Supine/standing external rotation with resistance
  - Supine/standing forward punch with resistance
  - Supine/standing internal rotation with resistance
  - Standing extension with resistance
- Start periscapular and deltoid work up
  - Lateral raise in scaption 0-90° →120°
  - Rowing-type exercises with resistance
  - Anterior deltoid progressions supine to upright sitting

LTO and SP/ST up to 24 weeks post-surgery

- Goals
  - Good AAROM, AROM, and strength and stability
  - Rehabilitation progressions toward patient’s functional demands and hobbies
- Exercise work up to match patient functional demands
  - Problem solve or make adjustments for sports/leisure aspirations collaboratively as necessary
  - Discuss life-long functional adaptations and upper limb demand

Note. AROM = active range of movement; AAROM = active-assisted range of movement; LTO = lesser tuberosity osteotomy; ROM = range of movement; SP = subscapularis peel; ST = subscapularis tenotomy.

The Bridge Between Theory and Practice for Supporting Patient Self-Management: A Clinical Perspective for Physiotherapists

Amanda Wilkinson *PhD*
Research Fellow, Centre for Health, Activity, and Rehabilitation Research, School of Physiotherapy, University of Otago, Dunedin, New Zealand

Hilda Mulligan *PhD*
Associate Professor, Centre for Health, Activity, and Rehabilitation Research, School of Physiotherapy, University of Otago, Dunedin, New Zealand

Jessie Snowdon *BPhty, PGCertHealSc (Clinical Rehabilitation)*
Multiple Sclerosis and Parkinson's Canterbury Inc., Christchurch, New Zealand

Klaus Pfeifer *PhD*
Chair for Exercise and Health, Institute of Sport Science and Sport, Friedrich-Alexander University (FAU), Erlangen-Nürnberg, Germany

ABSTRACT

Self-management behaviours, if constructively used, can assist people with long-term conditions to manage their health and well-being more effectively. The role of clinicians is to provide support for patient self-management because we know that incorporating constructive behaviours into daily life can be challenging for patients. The aim of this paper is to provide an opportunity for clinicians to understand how the content and delivery of interventions could support patient self-management. In this paper, we therefore highlight a number of theoretical frameworks that may assist clinicians to explicitly identify components of their interactions with patients. As an illustrative example, we use a self-management programme for fatigue, developed with people with multiple sclerosis (MS) in New Zealand. We believe that with a better understanding of behaviour change processes, clinicians have an opportunity to see the full range of behaviour change techniques (BCTs) available to them and how these could be used, to think more carefully about the BCTs they embed in their practice and, therefore, to critically reflect on how they could better support patient self-management.

Wilkinson, A., Mulligan, H., Snowdon, J., & Pfeifer, K. (2020). Bridging theory and practice for supporting patient self-management. *New Zealand Journal of Physiotherapy, 48*(2), 92-97. https://doi.org/10.15619/NZJP/48.2.05

Key Words: Behaviour Change, Long-Term Conditions, Self-Management Support

INTRODUCTION

As clinicians we often notice patterns of behaviours in ourselves that are potentially detrimental to our own health. We also know, however, that self-management behaviours, if constructively used, can assist us to manage our health and well-being effectively. This is also true for people with long-term conditions. Yet we know only too well that incorporating constructive behaviours for self-management into daily life is challenging (Harvey et al., 2015; Jerant et al., 2005; Kralik et al., 2004; Wilkinson et al., 2014). Our role as clinicians is to provide support to patients toward self-management. Thus, an important aim for clinicians is to understand how to best support patients to develop and include self-management behaviours into their daily lives. In a guest editorial of the New Zealand Journal of Physiotherapy, Mulligan (2019) argued that efficacy of physiotherapy interventions could be improved through incorporating patients' preferences and contexts into physiotherapy interventions.

Abraham, Michie and colleagues present a growing body of research about theory, and understanding of behaviour and behaviour change, specifically as these relate to health interventions. This has included development of the Behaviour Change Wheel, which incorporates the Capability, Opportunity and Motivation for Behaviour (COM-B), a framework for characterising and designing behaviour change interventions (Michie, van Stralen, & West, 2011). The COM-B system proposes that for a person to achieve behaviour change, the individual requires capability for the behaviour, opportunity for the behaviour change, and motivation to change the behaviour in order to achieve success in changing their behaviour (Michie, van Stralen, & West, 2011). Michie and colleagues' work has also included the Theoretical Domains Framework, an integrative theoretical framework developed for behaviour change research (Cane et al, 2012). Furthermore, they have developed a formal system to characterise components of interventions, and have explained how to link these with the context for delivery of each component within an intervention (Michie et al., 2013; Michie, van Stralen & West, 2011). The intent of this body of work has been to facilitate understanding of the behaviour change processes that underpin effective behavioural interventions. Thus, development of the Behaviour Change Wheel and Theoretical Domains Framework can assist clinicians to explicitly understand the theory/theories underpinning self-management interventions. There are a number of examples in the literature that illustrate the use of frameworks for identifying behaviour change strategies used in various health interventions. These include programmes for smoking cessation (Michie, Churchill, & West, 2011), care for patients with sepsis in a hospitalised setting (Steinmo et al., 2015), physical exercise for health in the motivation and volition (MoVo) model (Fuchs et al., 2011), and the health action process approach (Schwarzer, 2008).

We use an illustrative example – a self-management programme for fatigue developed with people with multiple sclerosis (MS) in New Zealand (Mulligan et al., 2015; Mulligan et al., 2017) – to highlight use of these theories. Through gaining an understanding of how theoretical frameworks might inform and underpin interventions and interactions with patients, we hope this paper will prompt clinicians to critically reflect on the range of behaviour change techniques (BCTs) they routinely use in their practice, and how other techniques could be usefully selected, introduced, and applied to better support patient self-management.

METHODS

The Template for Intervention Description and Replication (TIDieR) framework was developed to improve the reporting of interventions (Hoffman et al., 2014). This framework allows identification of the programme elements (the "what"), the rationale for the programme elements (the "why"), the mode of delivery (the "how"), the programme facilitator (the "who"), and when and how much or how often a programme element occurs (the "when"/"how much"). To examine how the self-management programme for fatigue in MS supported patient self-management, we collected data from three sources: document analysis, observation and participation, and interviews and discussion.

Document analysis

We read two manuals associated with the programme (the facilitators' manual and participants' workbook), and published research about the programme (Mulligan, Wilkinson, Barclay, et al., 2016; Mulligan et al., 2015; Mulligan, Wilkinson, & Snowdon, 2016; Mulligan et al., 2017). From these sources, we extracted and tabulated data about the programme content and its method of delivery.

Observation and participation

Three of the authors (HM, AW & KP) participated in a training course with nine other healthcare professional facilitators who wished to deliver the programme. We took field notes about our observations, the type and nature of questions asked by new facilitators, and how these were discussed and answered. We, thus, reflected on the training content of the programme and how delivery of the programme was modelled by the trainer.

Interviews and discussion

One author (AW) undertook three semi-structured interviews with JS, who was the trainer of new facilitators for the programme. Topics discussed and then documented were: a) the general and specific goals of the programme, b) the weekly goals of the programme, c) the topics included in the programme, d) allowances for individual and group reflections undertaken by programme attendees, and e) self-management strategies practiced, encouraged, and discussed during the programme.

RESULTS

To create an outline of the elements within the self-management programme, we drew from the three data sources and categorised these onto the TIDieR framework. Through this process, we identified that the fatigue self-management programme consisted of the following elements: a) licensing of healthcare professionals; b) training of healthcare professionals to facilitate delivery of the programme; c) a facilitator training manual; d) registration of attendees to the programme; e) a workbook for the programme; and f) standardised questionnaires of fatigue and self-efficacy, and a programme evaluation questionnaire. Table 1 details the elements of the self-management programme.

Table 1

Fatigue Self-Management Programme Elements Based on the TIDieR Framework (Hoffman et al., 2014)

Programme elements (what)	Rationale (why)	Mode of delivery (how)	Facilitated by (who)	When/how much
Licensing of HCPs	To collect contact and demographic details To ensure HCP has experience with patients with MS and is supported by local MS Society To reinforce licensing requirements – ongoing training and reflection	Documents	MS Society of the region	Pre-training – 2 yearly
Training of HCP for delivery of programme	To familiarise facilitators with programme content To explain principles of self-care, role model facilitation of the programme, and educate about working with groups	Face to face	HCP training – physiotherapist/ trainer	HCP – intensive two-day group course

Programme elements (what)	Rationale (why)	Mode of delivery (how)	Facilitated by (who)	When/how much
HCP facilitator training manual	To provide consistent information for education/training To provide written education/documentation for future reference	Documents	Physiotherapist / trainer and HCP group	Used while on course and during delivery of the programme
Registration of attendees and attendance at the programme	To collect contact details for communicating with attendees To collect demographic details for reporting/ statistical purposes	Documents	HCPs collect and send to MS Society	Pre-programme
	To empower individuals to develop self-determination and self-confidence for intrinsic motivation of daily management of fatigue	Face to face	Participant programme – registered HCPs trained to facilitate programme	Participants – 2 hrs weekly for six weeks
Workbook (plus weekly diary forms)	To provide consistent information for group sessions To stimulate group discussion To provide written education/documentation for future reference To facilitate written reflection around current behaviour and potential action to achieve behaviour change	Documents	Participant, group, and HCP	Used while at programme and at home
Questionnaires	To provide feedback for attendees regarding levels of self-reported fatigue and self-efficacy pre-/post-programme attendance To provide data for audit and fidelity purposes	Documents	Participant, HCP	Pre- and post-programme
	To enable attendee and HCP feedback on programme delivery and content	Documents	HCP, physiotherapist / trainer	Post course and programme

Note. HCP = healthcare professional; MS = multiple sclerosis.

Drawing on our three data sources, we then identified and categorised the BCTs in the programme (Michie et al., 2013). As outlined by Michie and colleagues, we grouped the categories and associated BCTs to identify how the BCTs were operationalised within the programme (Michie et al., 2013), and then linked these to the "intervention functions" according to the Behaviour Change Wheel (Michie, van Stralen, & West, 2011). The Behaviour Change Wheel (Michie, van Stralen, & West 2011) and its intervention functions allows for identification of the link between a BCT and how it is delivered or packaged. Lastly, we identified the mechanisms of action of the programme content (i.e. the descriptions of key intervention components) by mapping the BCTs and their corresponding "intervention functions" to the COM-B system (Michie, van Stralen, & West, 2011) and to the Theoretical Domains Framework (Michie et al., 2005) described by Cane et al. (2012).

In Table 2, we present components of the first week of the self-management programme, how we believe these were operationalised in the programme, and their corresponding intervention content and mechanisms of action. The table shows each identified BCT linked to one or more "intervention functions". It also shows where the "intervention functions" link to the underlying mechanisms of action in the COM-B system and in the Theoretical Domains Framework.

DISCUSSION

By undertaking this process, we have been able to identify and make explicit how the self-management programme theoretically supports behaviour change via a complex network of strategies. We found that many of the BCTs in the programme content link to more than one of the "intervention functions", and that "intervention functions" then link to more than one of the "mechanisms of action" in the COM-B system.

Table 2

Introduction to Fatigue Self-Management Programme – Summarising Programme Components and how they are Operationalised in the Programme, Intervention Content and Mechanisms of Action for Week 1 of the Programme

Programme component and how operationalised in programme	Programme content		Mechanisms of action	
	Grouping and associated BCTs	Intervention functions	COM-B	Theoretical Domains Framework
Week 1 Introduction				
Role of the facilitator – to set the scene, build group trust and rapport, establish ground rules for attending the programme	Provide a positive, friendly and professional relationship and environment	Environmental restructuring Incentivisation	Psychological capability Reflective motivation Physical opportunity	Behavioural regulation Optimism Intentions Environmental context and resources
Introduce and discuss concepts of self-management	13 Identity 13.1 Identification of self as role model	Environmental restructuring Modelling Persuasion Enablement	Psychological capability Reflective motivation Social opportunity	Knowledge Skills Memory, attention and decision processes Behavioural regulation Social role and identity Beliefs about capabilities Social influences
Examine and acknowledge the experience and expertise of the group as a whole	15 Self-belief 15.1 Verbal persuasion about capability 15.3 Focus on past success			
Complete a standardised self-efficacy scale	2.7 Feedback on outcome(s) of behaviour			
Education about fatigue Acknowledge, discuss and examine fatigue, its causes and effects via group reflection on fatigue, and own personal behaviour and impact of fatigue on personal life	5 Natural consequences 5.1 Information about health consequences 9 Comparison of outcomes 9.1 Credible source 9.2 Pros and cons 9.3 Comparative imagining of future outcomes	Environmental restructuring Education Modelling Persuasion Enablement	Psychological capability Reflective motivation Social opportunity	Knowledge Skills Memory, attention and decision processes Behavioural regulation Social role and identity Beliefs about capabilities Social influences
Complete a standardised fatigue scale	2.7 Feedback on outcome(s) of behaviour			
Goal setting and communicating about fatigue	13 Identity 13.1 Identification of self as role model 13.2 Framing/reframing 13.3 Incompatible beliefs			
Group discussion of stories/anecdotes in workbook that identify others' experiences about managing fatigue in daily life and work, and communicating about fatigue with significant others (e.g. family/friends, work colleagues)	5 Natural consequences 5.1 Information about health consequences 5.2 Salience of consequences 5.3 Information about social and environmental consequences 6 Comparison of behaviour 6.1 Demonstration of the behaviour 6.2 Social comparison 6.3 Information about other's approval	Environmental restructuring Modelling Training Persuasion Enablement	Social opportunity Psychological capability Reflective motivation Physical capability	Social influences Knowledge Skills Memory, attention and decision processes Behavioural regulation Social role and identity Beliefs about capabilities Optimism

Programme component and how operationalised in programme	Programme content		Mechanisms of action	
	Grouping and associated BCTs	Intervention functions	COM-B	Theoretical Domains Framework
Decide and record personal goals for completion of a fatigue diary and communication about fatigue with significant others (e.g. family/friends, work colleagues) Sharing goals with group	1 Goals and planning 1.1 Goal setting (behaviour) 1.2 Problem solving 1.3 Goal setting (outcome) 1.4 Action planning 1.5 Review of behavioural goal(s) 1.6 Discrepancy between current behaviour and goal 1.8 Behavioural contract 1.9 Commitment	Environmental restructuring Incentivisation Enablement	Automatic motivation Reflective motivation Social opportunity Psychological capability	Emotion Behavioural regulation Social role and identity Beliefs about capabilities Optimism Beliefs about consequences Intentions Goals

Note. Numbered BCTs in the column "Grouping and associated behaviour change techniques" correspond to the numbered BCTs provided by Michie et al. (2013) in their electronic supplementary material. BCTs = Behaviour change techniques; COM-B = Capability, Opportunity and Motivation for Behaviour framework.

Likewise, the "mechanisms of action" in the COM-B system link to more than one of the behaviour determinants of the Theoretical Domains Framework. Although we have undertaken the process for the full programme, for the purposes of this paper, we discuss below only the "intervention functions" of "education" together with "environmental restructuring", "persuasion", "modelling" and "enablement" inherent within the first week of the fatigue self-management programme.

The literature is clear that provision of education to patients with the aim of knowledge transfer is insufficient to facilitate sustained behaviour change (Corace & Garber, 2014; Kelly & Barker, 2016; Ng et al., 2012; Thompson et al., 2006). Through undertaking a systematic process to identify programme components, BCTs, and their mechanisms of action as we have described here, we show that the programme uses a variety of "intervention functions" (not only education) to support development of self-management. While the "intervention function" of "education" enabled attendees to examine fatigue from a wider perspective than they may have done previously, use of "environmental restructuring", actioned by bringing a group of attendees with a similar focus together, would facilitate attendees to learn from others in the programme by drawing on their experiences and expertise. This approach aligns with existing research supporting use of multiple BCTs within a programme as being more effective in the long-term than a single technique, such as education only (Fuchs et al., 2011; Michie, Churchill, & West, 2011; Schwarzer, 2008). The fatigue self-management programme used as an example in this paper also included "intervention functions of "persuasion", "modelling" and "enablement", achieved via attendees being invited and facilitated (i.e. through having time, space, and concentrated effort) to compare and reflect on their own past negative and/or positive experiences of fatigue self-management, to reflect on the experiences of other attendees in the programme, and to reflect on affirmative stories by people with MS illustrated in the workbook. Overall, through these three functions, we show how programme attendees could develop an individual and preferred plan of action for self-management.

The TIDieR framework facilitates identification of the programme elements, which are described above. We suggest that clinicians could unpack, critique, and reflect on their practice, for example by videoing an intervention with a patient, and then examining the footage to see what they have incorporated and delivered. They could identify the specific BCTs they have used by comparing these with the list provided by Michie et al. (2013), much like we have done here. By comparing the specific BCTs they have used with the COM-B system, clinicians would gain a clearer understanding of the modus operandi of their practice.

While programmes and clinical interactions contain many potential BCTs, identifying which of these or which combinations have most effect is, nevertheless, a challenge for researchers. Indeed a scoping review with 135 individual studies aimed to identify BCTs for reducing excessive alcohol consumption (Michie et al., 2012). The authors drew only weak conclusions about effectiveness of any specific or combination of BCTs because of the plethora of study methods and combinations of BCTs used within the individual studies. Furthermore, there is still work being undertaken to understand the links between BCTs and how they work.

CONCLUSION

Through this clinical perspective we explore frameworks and tools like the TIDieR, the Theoretical Domains Framework and the COM-B system, which can be used to reflect on the range of BCTs available. For clinicians to support patient self-management, clinical practice should provide opportunities for development of a patient's capability for self-management. Therefore, we need to be cognisant and appreciative of how BCTs can be introduced during a clinical interaction but also aware that there is still much that is unknown in the science and application of behaviour change.

KEY POINTS

Use of behaviour change frameworks provides an opportunity for clinicians to:

1. See the range of BCTs available to them and how these could be used in practice.
2. Think carefully about the BCTs they embed in their practice.
3. Critically reflect on their own practice toward supporting patient self-management.

DISCLOSURES

The development of this manuscript received support from the School of Physiotherapy Research Fund, University of Otago, for which we are grateful. There are no other conflicts of interest which may be perceived to interfere with or bias this study.

PERMISSIONS

None.

ADDRESS FOR CORRESPONDENCE

Amanda Wilkinson, Centre for Health, Activity, and Rehabilitation Research, School of Physiotherapy, University of Otago, Dunedin, New Zealand.

Email: mandy.wilkinson@otago.ac.nz

REFERENCES

Cane, J., O'Connor, D., & Michie, S. (2012). Validation of the theoretical domains framework for use in behaviour change and implementation research. *Implementation Science, 7*, 37. https://doi.org/10.1186/1748-5908-7-37

Corace, K., & Garber, G. (2014). When knowledge is not enough: Changing behaviour to change vaccination results. *Human Vaccines & Immunotherapeutics, 10*(9), 2623–2624. https://doi.org/10.4161/21645515.2014.970076

Fuchs, R., Goehner, W., & Seelig, H. (2011). Long-term effects of a psychological group intervention on physical exercise and health. The MoVo concept. *Journal of Physical Activity and Health, 8*(6), 794–803. https://doi.org/10.1123/jpah.8.6.794

Harvey, J., Dopson, S., McManus, R. J., & Powell, J. (2015). Factors influencing the adoption of self-management solutions: An interpretive synthesis of the literature on stakeholder experiences. *Implementation Science, 10*, 159. https://doi.org/10.1186/s13012-015-0350-x

Hoffman, T., Glasziou, P., Boutron, I., Milne, R., Perera, R., Moher, D., Altman, D. G., Barbour, V., Macdonald, H., Johnston, M., Lamb, S. E., Dixon-Woods, M., McCulloch, P., Wyatt, J. C., Chan A-W., & Michie, S. (2014). Better reporting of interventions: Template for intervention description and replication (TIDieR) checklist and guide. *BMJ, 348*, g1687. https://doi.org/10.1136/bmj.g1687

Jerant, A. F., von Freiderichs-Fitzwater, M. M., & Moore, M. (2005). Patients' perceived barriers to active self-management of chronic conditions. *Patient Education and Counseling, 57*(3), 300–307. https://doi.org/10.1016/j.pec.2004.08.004

Kelly, M. P., & Barker, M. (2016). Why is changing health-related behaviour so difficult? *Public Health, 136*, 109–116. https://doi.org/10.1016/j.puhe.2016.03.030

Kralik, D., Koch, T., Price, K., & Howard, N. (2004). Chronic illness self-management: Taking action to create order *Journal of Clinical Nursing, 13*(2), 259–267. https://doi.org/10.1046/j.1365-2702.2003.00826.x

Michie, S., Churchill, S., & West, R. (2011). Identifying evidence-based competencies required to deliver behavioural support for smoking cessation. *Annals of Behavioural Medicine, 41*(1), 59–70. https://doi.org/10.1007/s12160-010-9235-z

Michie, S., Johnston, M., Abraham, C., Lawton, R., Parker, D., & Walker, A., on behalf of the "Psychological Theory" Group. (2005). Making psychological theory useful for implementing evidence based practice: A consensus approach. *Quality Safety Health Care, 14*, 26–33. https://doi.org/10.1136/qshc.2004.011155

Michie, S., Richardson, M., Johnston, M., Abraham, C., Francis, J., Hardeman, W., Eccles, M. P, Cane, J., & Wood, C. E. (2013). The Behaviour Change Technique Taxonomy (v1) of 93 hierarchically clustered techniques: Building an international consensus for the reporting of behaviour change interventions. *Annals of Behavioural Medicine, 46*(1), 81–95. https://doi.org/10.1007/s12160-013-9486-6

Michie, S., van Stralen, M. M., & West, R. (2011). The behaviour change wheel: A new method for characterising and designing behaviour change interventions. *Implementation Science, 6*, 42. http://www.implementationscience.com/content/6/1/42

Michie, S., Whittington, C., Hamoudi, Z., Zarnani, F., Tober, G., & West, R. (2012). Identification of behaviour change techniques to reduce excessive alcohol consumption. *Addiction, 107*(8), 1431–1440. https://doi.org/10.1111/j.1360-0443.2012.03845.x

Mulligan, H. (2019). Behaviour change: Is human interaction the nub of the issue? *New Zealand Journal of Physiotherapy, 47*(2), 65. https://doi.org/10.15619/NZJP/47.2.01

Mulligan, H., Wilkinson, A., Barclay, A., Whiting, H., Heynike, C., & Snowdon, J. (2016). Evaluation of a fatigue self-management programme for people with multiple sclerosis. *International Journal of MS Care, 18*(3), 116–121. http://doi.org/10.7224/1537-2073.2015-019

Mulligan, H., Wilkinson, A., Lusty, A., Delorme, A., & Bong, S. (2015). Consumers and health professionals' perceptions of participatory action research in developing a health resource. *New Zealand Journal of Physiotherapy, 43*(3), 93–97.

Mulligan, H., Wilkinson, A., & Snowdon, J. (2016). Perceived impact of a self-management programme for fatigue in multiple sclerosis: A qualitative study. *International Journal of MS Care, 18*(1), 27–32. http://doi.org/10.7224/1537-2073.2014-110

Mulligan, H., Wilkinson, A., & Snowdon, J. (2017). A fatigue management programme for persons with multiple sclerosis: Development, theory and practical considerations. *Physical Therapy Reviews, 22*(1–2), 3–6. https://doi.org/10.1080/10833196.2017.1287393

Ng, J. Y., Ntoumanis, N., Thøgersen-Ntoumani, C., Deci, E. L., Ryan, R. M., Duda, J. L., & Williams, G. C. (2012). Self-determination theory applied to health contexts: A meta-analysis. *Perspectives on Psychological Science, 7*(4), 325–340. https://doi.org/10.1177/1745691612447309

Schwarzer, R. (2008). Modeling health behaviour change: How to predict and modify the adoption and maintenance of health behaviors. *Applied Psychology: An International Review, 57*(1), 1–29. https://doi.org/10.1111/j.1464-0597.2007.00325.x

Steinmo, S., Fuller, C., Stone, S. P., & Michie, S. (2015). Characterising an implementation intervention in terms of behaviour change techniques and theory: The 'sepsis six' clinical care bundle. *Implementation Science, 10*, 111. https://doi.org//10.1186/s13012-015-0300-7

Thompson, G. N., Estabrooks, C. A., & Degner, L. F. (2006). Clarifying the concepts in knowledge transfer: A literature review. *Journal of Advanced Nursing, 53*(6), 691–701. https://doi.org/10.1111/j.1365-2648.2006.03775.x

Wilkinson, A., Whitehead, L., & Ritchie, L. (2014). Factors influencing the ability to self-manage diabetes for adults living with type 1 or 2 diabetes. *International Journal of Nursing Studies, 51*(1), 111–122. https://doi.org/10.1016/j.ijnurstu.2013.01.006