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Original article

Agreement is very low between a clinical prediction rule and physiotherapist assessment for classifying the risk of poor recovery of individuals with acute whiplash injury

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ABSTRACT

Background: A prognostic clinical prediction rule (whiplash CPR) has been validated for use in individuals with acute whiplash associated disorders (WAD). The clinical utility of this tool is unknown.
Objectives: To investigate: 1) the level of agreement between physiotherapist- and whiplash CPR-determined prognostic risk classification of people with acute WAD; 2) which clinical findings are used by physiotherapists to classify prognostic risk; and 3) whether physiotherapists plan to differ the number of treatment sessions provided based on prognostic risk classification.
Design: Pragmatic, observational.
Method: 38 adults with acute WAD were classified as low, medium, or high risk of poor recovery by their treating physiotherapist (n = 24) at the conclusion of the initial consultation. A weighted Cohen's kappa examined the agreement between physiotherapist estimated risk classification and the whiplash CPR. Physiotherapists' reasons for classification were provided and summarised descriptively. Kruskal-Wallis and post-hoc Dunn's tests compared projected number of treatment sessions between risk subgroups.
Results: Physiotherapist agreement with the whiplash CPR occurred in 29% of cases (n = 11/38), which was less than what is expected by chance (K = −0.03; 95%CI -0.17 to 0.12). Physiotherapists most frequently considered range of movement (n = 23/38, 61%), a premorbid pain condition (n = 14/38, 37%), response to initial physiotherapy treatment (n = 12/38, 32%), and pain intensity (n = 12/38, 32%) when classifying prognostic risk. The projected number of treatment sessions was not different between risk groups using classifications provided by the physiotherapists ($\chi^2(2) = 2.69$, p = 0.26).
Conclusions: Physiotherapists should consider incorporating the whiplash CPR into current assessment processes to enhance accuracy in prognostic decision-making.

1. Introduction

Substantial heterogeneity in the population, complexity in the condition, and modest effect sizes from treatment trials (Lamb et al., 2013; Jull et al., 2013), means that clinicians may be faced with uncertainty when making decisions regarding the best course of management for individuals with acute whiplash associated disorders (WAD). The ability to gauge the likely prognosis of patients with acute WAD is important given that up to 50% of those injured will not fully recover, but will develop persistent pain and disability (Carroll et al., 2009; Sterling et al., 2006). Appropriate treatment in the early post injury period will likely be critical to facilitate recovery given most recovery (if it occurs) takes place in the first 2–3 months following injury (Sterling et al., 2010).

To our knowledge, physiotherapists' ability to identify risk of poor recovery has not been well investigated in people with acute WAD. Predictions of return to work status have been demonstrated to be improved by the addition of physiotherapist judgements to a predictive model that included demographic, psychological and pain variables (Scott and Sullivan, 2010). However, this study included patients with sub-acute to chronic WAD undergoing a rehabilitation intervention and did not provide indication of the accuracy of predictions about later recovery made in the acute injury stage. Evidence of physiotherapists' accuracy in identifying the prognosis of people with other spinal pain

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conditions has been inconsistent (Hancock et al., 2009; Dagfinrud et al., 2013; Abbott and Kingan, 2014; Cook et al., 2015). Cook and colleagues investigated physiotherapist estimation of three patient outcomes two weeks after initial contact, in people with any duration neck and back pain and found significant associations between clinician-predicted and actual disability and patient-reported recovery outcomes, but not resolution of pain (Cook et al., 2015). Alternatively, Dagfinrud and colleagues investigated physiotherapist prediction of eight week disability outcome in a neck pain population and concluded that clinician predictions did not add value to the prognostic model (Dagfinrud et al., 2013).

Research indicates that clinicians frequently rely on past experience, pattern recognition and intuition to guide early decision-making (McGinn et al., 2000), which can be misleading and may result in inconsistency (Liao and Mark, 2003) and bias (Kleinmuntz, 1990). Physiotherapists have a positive attitude towards using evidence based practice (Iles and Davidson, 2006) and consider clinical prediction rules (CPR) as part of best practice (Knox et al., 2015). However there seems to be very low clinical adoption rates of CPRs relating to musculoskeletal pain (Knox et al., 2015; Haskins et al., 2014). A clinical prediction rule (whiplash CPR), to improve the precision of clinicians' prognostic judgements for individuals with acute WAD, was derived and has successfully undergone a retrospective, external validation (Ritchie et al., 2013, 2015). Low, medium, and high risk prognostic groups are determined using cut-off scores for an individual's, Neck Disability Index score (Vernon and Mior, 1991), age and hyperarousal symptoms (Foa et al., 1997) (Fig. 1.). Although the final step in the development of a CPR, impact analysis, is currently being investigated (Rebbeck et al., 2016), the validated CPR may be considered for use with an acute WAD population (Kelly et al., 2017a). Determining the agreement between physiotherapists' estimation and the whiplash CPR's risk groupings is important in informing the utility of the CPR (Brehaut et al., 2006). For example, the whiplash CPR's perceived usefulness and subsequent adoption may be enhanced if agreement is found to be poor, as this would indicate the potential benefit of using the CPR in order to subgroup patients for treatment based on predicted recovery. Conversely, if agreement is good the effort required to implement such a tool may outweigh any potential benefit of use in the clinical setting (McGinn et al., 2000). The primary aim of this study was to determine the level of agreement between physiotherapist estimated and whiplash CPR determined prognostic risk classification of people with acute WAD. Secondary aims were to investigate the clinical findings most commonly used by physiotherapists to classify prognostic risk, and gain insight into whether or not physiotherapists plan to provide a different number of treatment sessions based on patient prognostic risk grouping.

2. Materials and methods

2.1. Design

A pragmatic cross-sectional study involving quantitative and qualitative surveys was used to determine the agreement between the whiplash CPR and physiotherapists' prognostic risk classification of patients who presented to physiotherapy for routine management of acute WAD.

2.2. Participants

Participants comprised two convenience samples: physiotherapists, and patients with acute WAD. Physiotherapist participants were Australian-based private practice clinicians who indicated that they manage individuals with WAD. Professional contacts of the research team, as well as Australian Physiotherapy Association members who practiced within 100 kilometers of a state capital city and had elected to appear on the associated publicly available professional locator service, were invited to participate via email. Specialist physiotherapists who

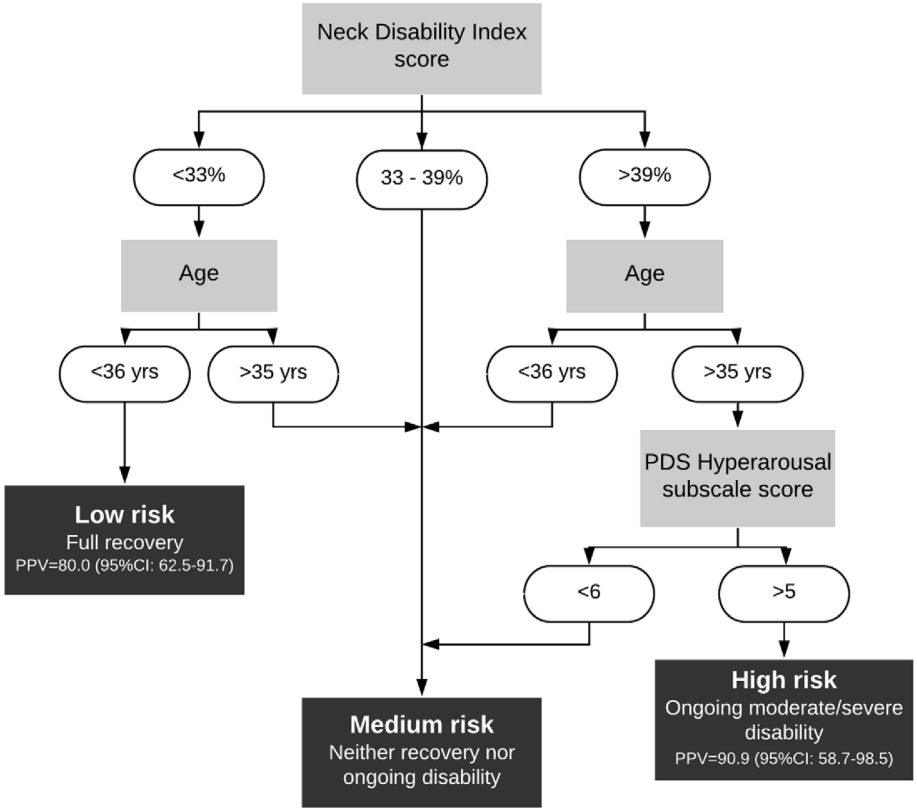

Fig. 1. The whiplash clinical prediction rule to identify low, medium, and high risk of poor recovery in whiplash-injured individuals. Adapted from Ritchie et al. (2013).

were a fellow of the Australian College of Physiotherapists, had published in the area of WAD, or had taken part in a clinical trial conducted by the research team were excluded as they may have had prior knowledge of the whiplash CPR.

Patient participants were adults (≥18 years) with acute WAD who presented to a participating physiotherapist for treatment. Patients were invited to participate by their physiotherapist, and were eligible for inclusion if they had a whiplash injury of less than six weeks duration as a result of a motor vehicle crash and a Quebec Task Force Classification of WAD I, II or III. Exclusion criteria comprised WAD IV (fracture or dislocation), concurrent concussion or head injury as a result of the accident, concurrent neck pain unrelated to the accident, and history of cervical spine surgery. Both physiotherapist and patient participants provided written informed consent prior to inclusion. Ethical approval was granted by Griffith University Human Research Ethics Committee (2016/553).

2.3. Procedures

Prior to enrolling patient participants, all physiotherapists completed a survey of personal demographic characteristics. When a patient presented to their clinical practice with a whiplash injury, the physiotherapist screened the patient against eligibility criteria and sought patient consent to participate in the study. Following patient consent, the physiotherapist assessed and treated the patient participant as per their usual initial clinical consultation. At the conclusion of this session, the patient completed a paper survey that included the whiplash CPR components embedded around questions regarding demographic and clinical characteristics. The physiotherapist returned this survey to the researchers and hence was not blind to the results. The components of the whiplash CPR were embedded amongst the other survey questions to reduce the likelihood of physiotherapists recognising, scoring, and using the whiplash CPR in their prognostic risk classifications.

Physiotherapists completed a different survey that included three questions. First, physiotherapists classified the patient into a prognostic risk group by responding to the question: *Based on your clinical assessment, what outcome do you expect the patient will have in* 6 months *time?* Standardised explanations that corresponded to each of the whiplash CPR's risk classifications (denoted below in brackets) were provided as answer options:

1. Patient signs suggest that full recovery is likely (low risk)
2. Patient signs are mixed – it's not yet clear whether they will fully recover or have ongoing pain and disability (medium risk)
3. Patient signs suggest that ongoing pain and disability are likely (high risk)

Second, physiotherapists provided reasons for this choice of prognostic risk group by recording up to five factors that they considered when making the aforementioned decision. A final question, *How many times do you anticipate treating this patient before discharge?,* was posed to quantify potential differences in the planned number of treatment sessions between each of the prognostic risk groups, and hence provide some indication of whether or not physiotherapists intend to treat individuals differently based on predicted outcome. All completed surveys were then forwarded to the investigators who compiled CPR component scores to determine whiplash CPR grouping. Physiotherapists were kept naïve to the aims of the study, but were debriefed at its conclusion. The debriefing included asking physiotherapists who had contributed patient prognostic risk classification data whether they had used the whiplash CPR as part of their decision-making.

2.4. Sample size

A sample size of 35 physiotherapist ratings was required to achieve 90% power (alpha 0.05) to detect a true Kappa value of 0.41 in a test of H0: Kappa ≤ κ0 vs. H1: Kappa > κ0 with 3 categories involving frequencies equal to those reported in the whiplash CPR validation study (Ritchie et al., 2015). A Kappa value of 0.41 (moderate agreement) was selected in preference to zero (agreement equal to chance) on the basis that values less than 0.41 may be considered clinically unacceptable (Sim and Wright, 2005).

2.5. Analysis

All statistical analyses were conducted using IBM SPSS Statistics (version 22). Absolute agreement of prognostic risk classification between physiotherapists and the whiplash CPR was calculated as a percentage ((number matched/total ratings) x 100). Agreement beyond chance was evaluated using a weighted Cohen's Kappa test where < 0.00 demonstrates agreement that is less than chance, 0.01 to 0.20 slight agreement, 0.21 to 0.40 fair agreement, 0.41 to 0.60 moderate agreement, 0.61 to 0.80 substantial agreement and > 0.80 near perfect agreement (Viera and Garrett, 2005). Physiotherapists' statements regarding reasons for classification were summarised descriptively and reported using frequencies. Finally, Kruskal-Wallis (Kruskal and Wallis, 1952) and post-hoc Dunn's (Dunn, 1961) tests were applied to compare the planned number of treatment sessions between risk subgroups as classified by the physiotherapists and the whiplash CPR.

3. Results

3.1. Participant characteristics

A total of 263 physiotherapists were invited to participate, of which 89 were included in the study. Reasons for non-participation by physiotherapists included; failure to respond to the invitation (n = 126), not treating individuals with WAD (n = 27), not providing consent (n = 19), and being a fellow of the Australian College of Physiotherapists (n = 2). Of the 89 included physiotherapist participants, 24 contributed a total of 38 patient prognostic risk groupings between July 2016 and November 2017. Demographic and clinical characteristics of physiotherapists who did, and did not, provide patient data are presented in Table 1. One physiotherapist had previous knowledge of the whiplash CPR, but was not familiar with how to use it so their data was included in analyses. All other physiotherapists who contributed patient prognostic risk data were naïve to the whiplash CPR. Table 2 provides patient participant characteristics.

3.2. Agreement between the whiplash CPR and physiotherapist prognostic risk classifications

According to the whiplash CPR, 24% (n = 9) of patients were classified at low risk of poor recovery, 47% (n = 18) at medium risk, and 29% (n = 11) at high risk (Fig. 2). Physiotherapists classified 68% (n = 26/38) of patients as being at low risk of poor recovery, 29% (n = 11/38) as medium risk, and 3% (n = 1/38) as high risk (Fig. 2). The absolute agreement between physiotherapists and the whiplash CPR was 29% (n = 11/38). The corresponding Cohen's weighted kappa value of −0.03 (95% CI -0.17 to 0.12) indicates agreement less than chance (Viera and Garrett, 2005).

3.3. Physiotherapists' reasons for prognostic risk classification

The factors physiotherapists considered when selecting patients' prognostic risk groups are summarised in Table 3. The indicators most frequently reported included range of movement (n = 23/38, 61%), a premorbid pain condition (n = 14/38, 37%), response to initial physiotherapy treatment (n = 12/38, 32%), and pain intensity (n = 12/38, 32%). Complete descriptions of prognostic indicators from physiotherapists are provided in the supplementary material.

Table 1
Characteristics of physiotherapist participants.

	Physiotherapists that contributed patient prognostic risk classifications (n = 24)	Physiotherapists that did not contribute patient prognostic risk classifications (n = 65)
Mean age (SD)	33.4 (8.87)	35.7 (9.24)^
Male gender (%)	15 (62.5)	40 (61.5)
Highest physiotherapy qualification		
Pre-professional training (%)	16 (66.7)	41 (63.1)
Clinical specialisation postgraduate (%)	8 (33.3)	22 (33.8)
Postgraduate by research (%)	0 (0)	2 (3.08)
Practice location		
Australian Capital Territory (%)	2 (8.33)	4 (6.15)
New South Wales (%)	1 (4.17)	6 (9.23)
Queensland (%)	2 (8.33)	4 (6.15)
Tasmania (%)	1 (4.17)	0 (0)
Victoria (%)	3 (12.5)	26 (40.0)
Western Australia (%)	15 (62.5)	25 (38.5)
Mean clinical practice years (SD)	9.28 (8.15)	11.6 (9.38)
Mean number of patients with WAD seen per year (SD)	9.25 (7.22)	7.36 (6.20)^
Mean number of prognostic classifications provided to study (SD)	1.58 (0.72)	0 (0)

SD = standard deviation, WAD = whiplash associated disorder, ^missing values (n = 64).

Table 2
Characteristics of patient participants.

	Mean (SD) or frequency (%) n = 38
Age (years)	42.7 (14.4)
Female gender	32 (84.2)
Days since motor vehicle crash	12.5 (9.65)
Neck pain intensity (10 cm visual analogue scale)	
Past 24 h	4.68 (21.3)
Past 7 days	5.15 (22.8)*
Neck Disability Index score (%)	35.3 (16.7)
Self-perceived expectation of recovery (0–10)	8.96 (1.40)^
Depression Anxiety Stress Scales – 21 item score	
Total score	14.1 (13.9)
Depression subscale score	3.49 (4.96)
Anxiety subscale score	4.45 (4.68)
Stress subscale score	6.18 (5.10)
Work status at time of physiotherapy consult	
Usual hours	18 (51.4)^
Reduced hours	6 (17.1)^
Not working due to whiplash associated disorder	5 (14.3)^
Not applicable (unemployed or retired)	6 (17.1)^
Compensation claim	
Compulsory Third Party insurance	20 (52.6)
Workers Compensation	3 (7.89)
Other compensation scheme	2 (5.26)
None	13 (34.2)

SD = standard deviation, *missing value (n = 37), ^missing values (n = 35).

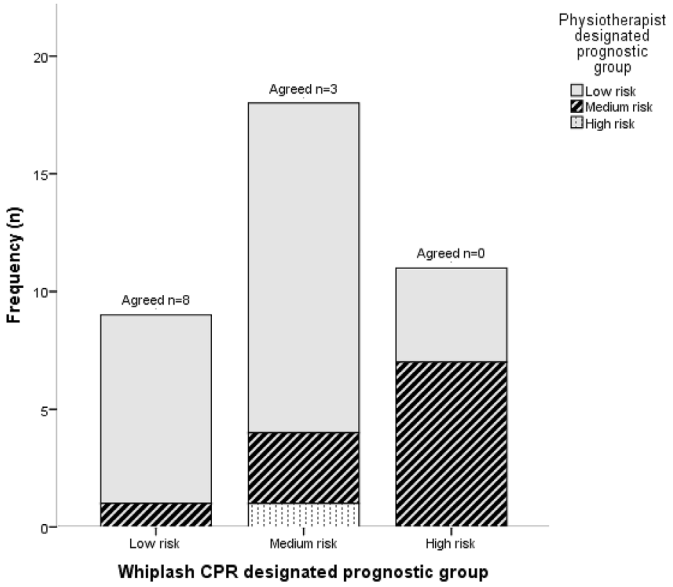

Fig. 2. Patient prognostic risk groupings as classified by the whiplash CPR in comparison to groupings classified by physiotherapists. CPR = clinical prediction rule, n = number.

3.4. Projected treatment numbers by prognostic risk classification

The estimated number of treatment sessions by prognostic risk grouping are provided in Table 4. There was no difference in the number of anticipated treatment sessions with the physiotherapist calculated risk grouping ($\chi^2(2) = 2.69$, $p = 0.26$). A significant difference was found between the projected number of sessions when groups were classified by the whiplash CPR ($\chi^2(2) = 7.14$, $p = 0.028$). Patients classified as high risk by the CPR were projected to receive significantly more sessions than those classified as low risk ($z = -13.5$, $p = 0.023$), but there were no differences between low and medium ($z = -7.5$, $p = 0.29$), or medium and high ($z = -5.75$, $p = 0.52$) risk groups.

4. Discussion

The results of this study indicate that agreement between physiotherapists' estimation of patient prognostic risk classification and that provided by the whiplash CPR is very low and less than what would be expected by chance alone. Physiotherapists used varied factors to classify these judgements of risk. The most commonly nominated were: range of movement compared to normative values; the presence or absence of a premorbid pain condition; a patient's immediate response to initial physiotherapy treatment; and patient reported pain intensity. The number of treatment sessions estimated by the physiotherapists were significantly larger in the high risk group compared to the low risk group, when using the whiplash CPR's classification, but not different amongst risk groups using classifications provided by the physiotherapists.

To our knowledge, agreement between clinician-rated prognosis and that of a predictive tool has been investigated in only two other studies. Hill and colleagues (Hill et al., 2010) reported fair agreement between nine clinicians (general practitioners, physiotherapists and pain management specialists) and the STarT Back Screening Tool in individuals with low back pain (absolute agreement = 47%, $\kappa = 0.22$).

Table 3
Factors used by physiotherapists when choosing patient prognostic risk classification.

Category	Prognostic indicator	Example description from physiotherapists	Frequency (%)
Symptoms	Pain		
	Intensity	"Extremely high levels of self-reported pain"	12 (32)
	Multiple sites/spread of	"Bilateral symptoms and headaches"	10 (26)
	Other	"Low irritability"	2 (5.3)
	Disability		
	NDI score	"Low score [Neck Disability Index] (16%)"	6 (16)
	ADLs	"Currently very functional"	8 (21)
	Work	"Returned to full work duties"	6 (16)
	Other	"Additional symptoms (vertigo, nausea)"	2 (5.3)
Physical impairments	Cold hyperalgesia	"No cold hypersensitivity"	1 (2.6)
	Range of movement	"Minimal active ROM restriction in neck"	23 (61)
	Neurological deficits	"Nil neurological signs or symptoms"	9 (24)
	Other	"Increased sensitivity to touch"	2 (5.3)
Psychological factors	Expectation of recovery	"Positive about likelihood of recovery"	7 (18)
	Posttraumatic stress symptoms		
	IES score	"Low [Impact of Events Scale] score"	2 (5.3)
	Other	"Low emotional response to traumatic event"	7 (18)
	Anxiety	"Low anxiety levels"	1 (2.6)
	Kinesiophobia	"Low [Tampa Scale of Kinesiophobia]"	3 (7.9)
	OMPSQ score	"Low modified Orebro score (18/100)"	4 (11)
	Attitude or motivation for recovery	"Patient's attitude towards recovery – excellent"	9 (24)
	Understanding of condition	"Fair understanding of condition"	2 (5.3)
	Other/non specified	"Nil yellow flags"	7 (18)
Past medical history	Premorbid condition		
	Pain	"Past history of neck pain prior to whiplash"	14 (37)
	Psychological	"Major depressive disorder"	5 (13)
	Other	"Medical illnesses which could affect neck pain"	4 (11)
	Premorbid medication	"Isn't taking regular medication"	1 (2.6)
	Fitness or activity levels	"Patient is fit and active"	7 (18)
Health care utilisation	Time to seek care	"Sought treatment one day after MVC"	3 (7.9)
Recovery	Recovery pre-care	"Pain and movement improved by 50% in 5 days"	4 (11)
	Response to treatment		
	Signs and symptoms	"Responsive to first treatment"	12 (32)
	Other	"High rapport"	4 (11)
Socio-demographics	Age	"Less than 50 [years] of age"	6 (16)
	Other	"Post-menopausal"	4 (11)
Crash related factors	Collision force	"Low force accident"	2 (5.3)
Compensation factors	Legal representation	"Not interested about engaging a solicitor"	1 (2.6)

NDI = Neck Disability Index, ADLs = activities of daily living, ROM = range of movement, IES = Impact of Events Scale, OMPSQ = Orebro Musculoskeletal Pain Screening Questionnaire, MVC = motor vehicle crash.

Table 4
Anticipated number of treatment sessions provided by physiotherapists and categorised by prognostic risk classification.

	Low risk	Medium risk	High risk
Median number of treatments by physiotherapist classification (IQR)	7.5 (5)	10 (9.5)	8 (0)
Median number of treatments by whiplash CPR classification (IQR)	6 (1.5)*	9 (4)	10 (14)*

CPR = clinical prediction rule, IQR = interquartile range, *significant difference ($p < 0.05$).

Brunner and colleagues (Brunner et al., 2018) described similar results (absolute agreement = 41%) when comparing physiotherapists (n = 20) against the same screening tool. These greater levels of agreement compared to our study, may be explained by methodological differences. Clinicians in the study by Hill and colleagues provided prognostic risk groupings after reviewing a video-recorded comprehensive patient examination that was performed by a clinical expert. This assessment may have elicited additional information to what would ordinarily be gleaned, and was likely exempt from the time-pressures of routine physiotherapy practice, a factor accommodated in the present study. While Brunner and colleagues used a pragmatic study design that was more similar to what we employed, physiotherapist participants were informed of the study aims and provided with a copy of the STarT Back Screening Tool prior to commencement, which may have aided familiarisation.

Most agreement in the current study occurred in the low risk group (73%, n = 8/11), which may be explained by the high frequency that physiotherapists nominated patients to this classification (68%, n = 26/38). This possible over estimation of the number of individuals likely to recover, combined with underestimation of those at high risk of poor recovery (3%, n = 1/38), indicates that physiotherapists may be overly optimistic about patient outcomes. This optimism is at odds with what is currently known about WAD recovery. Consistent international data indicate that irrespective of treatment provided, approximately 50% of injured individuals will experience persistent pain and disability, and up to 30% will have moderate to severe symptoms (Carroll et al., 2009; Sterling et al., 2006). While optimism may be important, in that providing reassurance of a good prognosis may enhance patient outcomes (Pincus et al., 2013), the lack of agreement between physiotherapist judgement and current evidence about prognosis indicates that physiotherapists may not be accurate in predicting patient outcomes. Inclusion of the whiplash CPR as part of physiotherapy assessment may therefore aid prognostic decision-making and subsequent patient communication.

There were no differences in estimated treatment numbers between physiotherapist-classified prognostic risk groups, indicating that physiotherapists may not use prognostic information to inform treatment decisions as has been suggested in previous literature (Liao and Mark, 2003). However, physiotherapists did anticipate providing more sessions to 'high risk' patients when they were classified by the whiplash CPR. The need to provide more intensive treatment to patients at high risk of poor recovery is in line with clinical practice guidelines (State

Insurance Regulatory Authority, 2014). Further assessment and possible onward referral of these individuals is recommended (State Insurance Regulatory Authority, 2014), which would lead to the provision of a greater number of treatment sessions. It is interesting that these differences in proposed treatment numbers occurred despite physiotherapists having not identified any of these patients as being at high risk of poor recovery. It may be that physiotherapists' inherently recognised that these individuals could require more intensive treatment to facilitate recovery, but did not associate this with the potential for poor recovery. Alternatively, other factors such as constraints associated with insurance or medical claims, may have influenced physiotherapists' estimation of treatment session numbers. The reasons for selecting a specific number of treatments were not evaluated in the present study, and hence further investigation using qualitative interviews may help clarify these differences.

The median projected number of treatment sessions was higher than anticipated for those in both the physiotherapist and whiplash CPR-classified low risk groups. While results of the whiplash CPR do not direct the number of treatment sessions, patients in the low risk group are very likely to experience complete and rapid recovery (Sterling et al., 2010; Ritchie et al., 2015), and hence are unlikely to receive further benefit from intensive input. The results of a recent clinical trial indicated that the provision of six physiotherapy sessions provided no additional benefit to long term patient outcomes and was less cost effective, when compared to a single physiotherapy advice session (Lamb et al., 2013). Further, a review of epidemiological studies indicated that over-treatment early after a whiplash injury may be detrimental, potentially resulting in delayed recovery and iatrogenic disability (Côté and Soklaridis, 2011). Education on the potential risks of over-treatment is needed so that physiotherapists consider reducing on-going treatment to patients who have a good prognosis.

The physiotherapists in our study infrequently nominated recognised prognostic indicators for acute WAD outcomes. Evidence consistently shows that initial pain intensity and disability are predictive of poor recovery (Walton et al., 2013; Sarrami et al., 2017), yet pain intensity was considered in only 32% of cases, disability was considered in 16% of cases, and the concurrent consideration of pain intensity and disability occurred in only 5.3% of cases. These findings are consistent with a previous study using clinical vignettes, where only 8% of Australian physiotherapists (n = 7/91) could correctly identify these prognostic indicators (Ng et al., 2014). Factors with less or inconsistent evidence, such as range of movement, a premorbid pain condition, and immediate patient response to initial physiotherapy treatment, were more frequently nominated by the physiotherapists. The results of both studies indicate that the research evidence has not been successfully translated into clinical practice. This issue may be specific to WAD, given other studies have demonstrated that physiotherapists are cognisant of prognostic indicators for individuals with non-specific neck (Hill et al., 2007), and low back (Bishop and Foster, 2005) pain. Other studies have shown that health care providers (mostly physiotherapists) appreciate the importance of identifying prognostic risk factors for WAD (Bandong et al., 2018) but it was not determined if they could nominate specific prognostic indicators. The reasons for this apparent lack of knowledge for WAD prediction is unclear but should be further investigated.

One of the strengths of this study was the pragmatic approach used. Testing physiotherapists who were blind to the tool in question, and operating in real clinical settings across multiple geographical locations, likely provided a more accurate assessment of agreement than what has been reported in the past (Hill et al., 2010; Brunner et al., 2018). However, some methodological limitations should be considered when interpreting the results of this study. First, the cross-sectional design employed cannot be used to ascertain physiotherapists' accuracy in predicting patient outcomes. While poor agreement with the whiplash CPR and infrequent use of established prognostic indicators provides some indication that physiotherapists may be inaccurate, a prospective cohort study is needed to investigate the predictive capacity of physiotherapists in this respect. Second, the extent to which the included sample is representative of Australian physiotherapists may be limited. Although the majority of registered physiotherapists are Australian Physiotherapy Association members (approximately 82%, n = 25 000/30 388) (Physiotherapy Board of Australia, 2018; Australian Physiotherapy Association, 2018), membership includes only those who have paid an annual subscription fee, and inclusion on the professional locator service occurs on an “opt-in” basis. Further, while limiting invitation to physiotherapists who practiced in high density population areas may have captured those most likely to treat individuals with acute WAD, the applicability of these results to physiotherapists in regional locations is not clear. Finally, although the exclusion of physiotherapists with potentially greater expertise in the management of WAD (i.e. specialist physiotherapists), was advantageous in reducing the potential for contamination of the agreement data, this may have led to an underestimation of both physiotherapist agreement with the whiplash CPR and frequency of using established prognostic indicators. However, the included physiotherapists are likely to be representative of clinicians who provide early management to this population, given it is advocated that, if needed, clinicians with expertise in managing WAD provide a peer-review role later in care (State Insurance Regulatory Authority, 2014).

5. Conclusions

The agreement between physiotherapist-estimated prognostic risk grouping and that provided by the whiplash CPR was very low, and less than that expected by chance. Physiotherapists appeared overly optimistic about the number of individuals that would fully recovery and did not identify any patients classified by the whiplash CPR as being at high risk of poor recovery. Given that the whiplash CPR has been validated, incorporation of the tool into current assessment processes may help physiotherapists make better-informed decisions on whether or not patients are at risk of poor recovery. Strategies that address current barriers to knowledge translation are needed to facilitate increased uptake of the whiplash CPR (Stander et al., 2018). Specifically, instruction on how and when to use the tool, the provision of flexible platforms for delivery, and guidance on how to communicate the CPR's results to patients may aid future clinical use (Kelly et al., 2017b). Reduced uncertainty in prognostic decision-making may improve the ability of physiotherapists to provide reassurance to patients who are at low risk of poor recovery. Further, physiotherapists' confidence in the effectiveness of providing fewer treatment sessions to these individuals may be enhanced.

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Conflicts of interest

None.

Data sharing statement

The complete record of physiotherapists' qualitative descriptions of clinical findings used to classify patient prognostic risk groupings is available as online supplementary material. Anonymised quantitative data can be provided to interested researchers by contacting the corresponding author.

Conflicts of interest

None declared.

Ethical approval

Ethical approval was granted by Griffith University Human Research Ethics Committee (2016/553).

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.msksp.2018.11.003.

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