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Factors influencing return-to-work following upper extremity surgery

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Abstract

The upper extremities are necessary to independently perform everyday activities, engage with the environment and others and, importantly, work. Unfortunately, upper extremity (UE) conditions, resulting in pain and impairments, are common. Although returning to work is usually straightforward, for some it can be difficult and prolonged, impacting significantly on the worker, key stakeholders and society.

This thesis utilized mixed methodology to explore factors influencing RTW following surgery for traumatic and non-traumatic UE conditions. Specifically, the overall aims were to: 1) identify gaps in the literature; 2) generate a list of factors influencing RTW; 3) explore stakeholders perspectives of barriers and the strategies to facilitate RTW; 4) determine the assessment tools used by health care providers (HCPs) to evaluate RTW barriers; 5) clarify a definition for delayed RTW; and 6) explore injured workers' lived experiences to understand the context surrounding the factors and processes that may influence RTW.

A scoping review identified gaps in the literature (**Aim 1**), generating the remaining thesis aims. A systematic review of prognostic studies for RTW following a common UE surgery, carpal tunnel release, was then conducted (**Aim 2**). This review revealed an inconsistent and low level of evidence for any studied prognostic factor for RTW or work disability.

A three-round Delphi study determined expert opinion on the barriers and facilitators for RTW following surgery for non-traumatic UE conditions (**Aim 2**). Thirty-one experts completed all rounds. Strong consensus was achieved for these barriers: mood disorder; symptoms at more than one site; heavy UE work exertions; lack of flexible RTW arrangements; lack of supervisor support; and high pain catastrophising. Strong consensus was achieved for these facilitators: high motivation to RTW; high RTW and recovery self-efficacy; availability of modified duties; flexible RTW arrangements; positive coping skills; limited heavy UE work exertions; no catastrophic thinking; no fear avoidance to RTW, pain or activity; return to meaningful work duties; supportive RTW policies; supportive supervisor; and high job satisfaction.

A cross-sectional study of 1011 RTW stakeholders (HCPs, employers, insurers and lawyers) was conducted. This study contained four sub-studies. In the first sub-study, a list

of factors that stakeholders perceived influence RTW was generated (**Aim 2**). Highest agreement was found for: RTW self-efficacy; post-operative psychological status; supportive employer or supervisor; employer's willingness to accommodate job modifications; worker's recovery expectations; mood disorder diagnosis; post-operative pain level; and whether the job can be modified. Disagreements between stakeholder groups existed for a third of the factors. Further analysis of the 787 HCPs was conducted in sub-study two (**Aim 2**). This revealed that HCPs rated difficulty coping with the pain as the main RTW barrier. Few differences between the disciplines existed.

In sub-study three, 621 of the stakeholders reviewed a hypothetical complex case to identify RTW barriers and strategies (**Aim 3**). Stakeholders identified similar RTW barriers but different strategies. More psychological and social barriers, than biological or demographic barriers, were identified. Employers and insurers identified similar strategies. However, the HCPs nominated more biological strategies.

In sub-study four, the HCPs nominated 59 types of assessment tools/methods that they use to identify RTW barriers for workers with UE conditions in clinical practice (**Aim 4**). The most favoured method was clinical interviewing. Other commonly used tools were strength measurement, and the Orebro Musculoskeletal Screening Questionnaire.

A definition for 'delayed RTW' was clarified by consulting 42 international experts (**Aim 5**). Experts were divided between definitions. Furthermore, two thirds of experts believed universal time-based cut-offs should not be used to delineate transition from an early to delayed RTW.

To understand workers' RTW experiences, a qualitative study was undertaken. Interviews with 34 workers generated two sub-studies (**Aim 6**). The first sub-study revealed that workers' experiences of encounters with insurers, employers and HCPs were embedded within the structural context of the workers' compensation system. These encounters were influenced by: stakeholders' responses to conflicting organizational mandates; stakeholders' responses to a system designed to 'fit' the average worker; and, the workers' limited decision-making regarding treatments and RTW options.

The second sub-study described the theme of 'loss' experienced by the workers and how loss influences the RTW process. The primary loss occurred when workers sustained the UE injury. Secondary, often snowballing, losses precipitated (e.g., related to work, relationships, self). Losses were intensified by workers' compensation systems problems influencing how workers responded to their losses. Issues related to loss of control and trust were intensified by systems problems which impacted on work-related outcomes.

This thesis' findings contribute to understanding the factors influencing RTW for workers with UE conditions, from the workers', employers', HCPs', insurers', lawyers' and international experts' perspectives. Recommendations for a longitudinal study of prognostic factors for RTW (and long-term work disability) for workers with UE conditions are documented. Future research should also aim to understand the influence of workers' compensation systems, and the complexities of stakeholder interactions to improve work disability outcomes.

Declaration by author

This thesis is composed of my original work, and contains no material previously published or written by another person except where due reference has been made in the text. I have clearly stated the contribution by others to jointly-authored works that I have included in my thesis.

I have clearly stated the contribution of others to my thesis as a whole, including statistical assistance, survey design, data analysis, significant technical procedures, professional editorial advice, and any other original research work used or reported in my thesis. The content of my thesis is the result of work I have carried out since the commencement of my research higher degree candidature and does not include a substantial part of work that has been submitted to qualify for the award of any other degree or diploma in any university or other tertiary institution. I have clearly stated which parts of my thesis, if any, have been submitted to qualify for another award.

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Publications during candidature

Peer Reviewed Papers

Included in this thesis

1. **Peters SE**, Johnston V, Hines S, Coppieters M. Prognostic factors for return-to-work following carpal tunnel release: Systematic Review. Accepted – The Joanna Briggs Institute Library of Systematic Reviews.
2. **Peters SE**, Ross M, Johnston V. Improving work-related outcomes following upper extremity injury: Current concepts, methodological challenges and considerations for future research. Accepted Journal of Open Orthopaedics.

Related but not included in this thesis -

1. **Peters SE**, Page MJ, Coppieters MW, Ross M, Johnston V. Rehabilitation following carpal tunnel release [Updated Review]. Cochrane Database of Systematic Reviews. 2016;2:CD004158. DOI:10.1002/14651858.CD004158.pub3.
2. **Peters SE,** Coppieters M, Johnston V. Interpreting systematic reviews: Looking beyond the all too familiar conclusion. Journal of Hand Therapy. 2014;27(1):1-3.
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Oral Presentations

1. **Peters SE.** *Thesis Review Milestone Presentation. Factors influencing return-to-work following upper extremity surgery.* School of Health and Rehabilitation Sciences, The University of Queensland; 21 March 2016.

2. Troung AP, **Peters SE**, Johnston V. *Examining the perspective of stakeholders regarding the barriers and strategies to return-to- work: A qualitative study of survey responses*. In: Australian Physiotherapy Association Conference, Gold Coast, Queensland. October 2015. Page 151. http://www.physiotherapy.asn.au/DocumentsFolder/CONFERENCE2015/APA%202015%20Abstracts%20Final.pdf.
3. **Peters SE,** Johnston V, Ross M, Coppieters M. *Stakeholders' perception of barriers to return-to-work for surgery for non-traumatic upper limb musculoskeletal conditions.* Queensland Hand Surgery Society, Noosa, Queensland. November 2014.
4. **Peters SE.** *Interpreting systematic review: looking beyond the all too familiar conclusion?* Queensland Hand Surgery Society, Noosa, Queensland. November 2014.
5. **Peters SE,** Johnston V, Ross M, Coppieters M. *Stakeholders' perception of barriers to return-to-work for surgery for non-traumatic upper limb musculoskeletal conditions. Australian Hand Therapy Association, Gold Coast Australia.* October 2014.
6. **Peters SE.** *Return to work following surgery for upper extremity musculoskeletal conditions: Results from a stakeholder survey.* Work Disability Prevention Strategic Training Program. Seminar presentation. June 2014.
7. **Peters SE.** *How do I know if my patient will return-to-work? Stages in the development of a screening tool.* Queensland Hand Surgery Society, Gold Coast, Queensland. November 2012.
8. **Peters SE,** Johnston V, Hines S, Ross M, Coppieters M. *Systematic review on prognostic factors for return-to-work following carpal tunnel release*. Australian Hand Therapy Association Conference, Adelaide, South Australia. October 2012.
9. **Peters SE,** Page M, Johnston V, Ross M, Coppieters M**.** *Rehabilitation after carpal tunnel release.* Australian Hand Therapy Association Conference, Adelaide, South Australia. October 2012.
10. **Peters SE,** Johnston V, Coppieters M. *Candidature Milestone Presentation: Preventing work disability following surgery for musculoskeletal disorders of the upper extremity.* Research Innovations Meeting. School of Health and Rehabilitation Science, The University of Queensland. September. August 2012.
11. **Peters SE,** Plumbe L. *Systematic Reviews: Pearls and Pitfalls.* Research Innovations Meeting. School of Health and Rehabilitation Science, The University of Queensland. October 2011

Poster Presentations

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Other contributions to the profession during candidature - Publications

1. Glasgow C, **Peters SE**. Extension orthosis and the stiff PIP joint following hand trauma: A review of current clinical practice in the Australian context. Hand Therapy (Journal of the British Association of Hand Therapists - SAGE). Published online before print: 21 April 2016. doi:10/1177/1758998316644275.
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11. Glasgow C, Tooth L, Fleming J, **Peters SE**. Splinting for the stiff hand following trauma: Predictors of contracture resolution. Journal of Hand Therapy. 2011;24(3):195-206.

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Contributor	**Statement of contribution**
Susan Peters (Candidate)	Conducted literature review (100%) Synthesised findings (70%) Wrote and edited the paper (80%)
Mark Ross	Wrote and edited paper (10%)
Venerina Johnston	Synthesised findings (30%) Wrote and edited the paper (10%)

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Susan Peters (Candidate)	Designed review protocol (70%) Reviewer for eligibility (50%) Data extraction (50%) Wrote and edited the paper (60%)
Venerina Johnston	Designed review protocol (10%) Wrote and edited the paper (10%)
Sonia Hines	Designed review protocol (10%) Study eligibility – third reviewer (10%) Data extraction – third reviewer (20%) Wrote and edited the paper (10%)
Mark Ross	Designed review protocol (5%) Wrote and edited the paper (10%)
Michel Coppieters	Designed review protocol (5%) Wrote and edited the paper (10%)
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Jill Boughen (paid research assistant)	Study eligibility – second reviewer (40%)

Contributions by others to the thesis

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Keywords

Prognosis, work disability, upper limb, wrist, hand, shoulder, elbow, carpal tunnel syndrome, trauma, stakeholders

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FoR code: 1117	Public Health and Health Services (50%)
FoR code: 1103	Rehabilitation and Therapy (30%)
FoR code: 1103	Orthopaedic Surgery (20%)

Table of Contents

List of Tables

List of Figures

List of Appendices

List of Abbreviations used in the Thesis

ADLs	Activities of Daily Living
ANOVA	Analysis of Variance
BMI	Body Mass Index
CI(s)	Confidence Interval(s)
CTS	Carpal Tunnel Syndrome
CTR	Carpal Tunnel Release
DASH	Disability of the Arm, Shoulder and Hand questionnaire
ECTR	Endoscopic carpal tunnel release
EP	Exercise Physiologist
FCE(s)	Functional Capacity Evaluation(s)
GDP	Gross Domestic Product
GP(s)	General Practitioner(s)
HCP(s)	Health Care Provider(s) or Health Care Professional(s)
HSE	Health and Safety Executive
ICF-DH	International Classification of Functioning, Disability and Handicap
JBI	Joanna Briggs Institute
JBI-MASTARI	Joanna Briggs Institute Meta-analysis of Statistical Assessment and Review Instrument
MO	Month
NCS	Nerve Conduction Study
OCTR	Open carpal tunnel release
OMPQ	Orebro Musculoskeletal Pain Questionnaire
OP(s)	Occupational Physician(s)
OT(s)	Occupational Therapist(s)
PRICE	Pain Recovery Inventory of Concerns and Expectations
PRW(H)E	Patient Rated Wrist (and Hand) Evaluation
PSYCH	Psychologist or Rehabilitation Counsellor
PT(s)	Physiotherapist(s)
QuickDASH	Disability of the Arm, Shoulder and Hand questionnaire (short version)
RCT(s)	Randomised controlled trial(s)
RTW	Return-to-Work
SD(s)	Standard Deviation(s)

SDP	Suitable Duties Plan
SPADI	Shoulder Pain and Disability Index
SURG	Surgeon
UE	Upper Extremity (may be used interchangeably with upper limb)
UEFI	Upper Extremity Functional Index
UL	Upper Limb (may be used interchangeably with upper extremity)
USA	United States of America
WC	Workers’ Compensation
X^2	Chi Squared

SECTION A: Introduction

CHAPTER 1: Thesis Introduction

1.1 Background

Hands, and the upper extremities, are necessary to independently perform activities of daily living, communicate, engage with the environment and, importantly, work. Unfortunately, upper extremity (UE) conditions, resulting in ongoing pain and impairments, are common globally.(1) They can result in difficulty performing important life roles, including employment. Although returning to work following an UE injury is usually straightforward, for some workers it can be difficult and prolonged, which can have significant impacts on the individual, key stakeholders (such as, family members, employers, co-workers, health care providers (HCPs) and insurance agencies) and society.

1.2 The research problem context

In Australia, one in 100 workers have one week or more off work to recover from a work-related injury.(2) In 2012-2013, 90% of these workers were diagnosed with a musculoskeletal disorder or injury.(2) Of these, more were related to the upper extremities (23%), than any other bodily location, including low back pain (22%).(2)

Work-related injuries are also costly. In Australia, it is estimated that they totaled $61.8 billion which equates to 4.1% of the Australian Gross Domestic Product (GDP).(3) The cost of these claims is attributed to the increasing time to return-to-work (RTW) following the injury. In 2012-2013, the median RTW absence in Australia increased to nearly six weeks.(2) Further, it is estimated that the most economic burden is borne by workers (74%), community (21%) and employers (5%).(3) The financial impact related to UE injuries have also climbed significantly over the last decade,(3) and without attention will continue to increase. However, the costs related to work-related UE conditions and injuries are not only monetary. Delayed RTW and prolonged work disability have also been associated with poorer general health, mental health, quality-of-life and mortality of the worker.(4-6)

For the majority of workers returning back to work is straightforward, and achievable with a shared commitment from all stakeholders. However, it is estimated that approximately one quarter of all injured workers will take longer than expected.(7) The longer a worker remains off work, the more unlikely it is that the worker will RTW. The probability of returning to work after 45 days has been found to be as low as 50%.(6) Strong evidence supports that, as well as the influence of biomedical factors towards RTW, psychosocial and systems-related factors also contribute to delays in RTW and long-term work disability. Identifying and understanding what influences RTW and long-term work disability, and the context of these relationships, assists in improving a worker's health and quality-of-life and has wider (cost-) benefits for employers, insurance agencies and society. However, the factors and processes that influence these work-related outcomes for workers with either non-traumatic or traumatic UE conditions/injuries remain largely unknown.

1.3 Thesis aims

The overall goal of this program of research was to explore the factors influencing RTW (and prolonged work disability) following surgery for traumatic UE injuries or non-traumatic UE conditions. This data could be used to support future research and to guide RTW stakeholder's management of workers with these diagnoses. Specifically, the overall aims of this these were:

Aim 1: To identify gaps in the literature on RTW following UE surgery;

Aim 2: To generate a list of barriers and facilitators for RTW (and factors influencing work disability) following surgery for non-traumatic and traumatic UE conditions, that warrants future research and could be used to inform clinical practice;

Aim 3: To explore key stakeholders' (i.e., HCPs, employer, insurer, and legal representatives) perspectives of barriers and the strategies to facilitate RTW for a complex case of a worker with an UE injury;

Aim 4: To determine the assessment tools and methods currently used by Australian HCPs to evaluate barriers to RTW in clinical practice;

Aim 5: To clarify a definition for delayed RTW and determine whether a time-point to differentiate the transition from early to delayed RTW is appropriate; and,

Aim 6: To explore injured workers' lived experience to understand the structural context, barriers, facilitators and RTW processes that influence RTW and contribute to prolonged work disability.

1.4 Thesis methods

The work presented in this thesis utilized mixed methodology to explore RTW following surgery for traumatic injuries and non-traumatic UE conditions. Specifically, this thesis contains the findings generated from six studies: a scoping review of the literature; a systematic review of prognostic factors; a survey of RTW stakeholders; a Delphi study of international experts; and, a qualitative study with injured workers. This thesis used the biopsychosocial model and the 'Arena' model for work disability as a framework.(8, 9)

1.5 Taxonomy used in this thesis

The following terms are used throughout this thesis (**Table 1.1**).

Table 1.1: Taxonomy

Term	Definition/Explanation
Return-to-work	i) A process which encompasses a series of events, transitions and phases related to a worker retuning to work (e.g., graduated RTW or job accommodation).(10) ii) A measurable final outcome of work status (i.e., working versus not working).(10) iii) It may involve returning to the pre-injury employer or an alternate job, occupation or employer. It may involve return to lighter or alternate duties, or to full capacity.
First return-to-work	This occurs at the time when a worker returns to work in some capacity for the first time after the work-absence. A first RTW is an event, and does not indicate long-term success. In fact, evidence suggests that a first RTW is not an indicator for a sustained RTW.(11)
Sustained return-to-work	This occurs when a worker returns to work or continues working with a health condition for a (pre-designated) period of time.
Work disability	Disability associated with the absence from work, reduced productivity or functioning as a result of a health condition.(12) It can be measured as both prolonged work absence due to a health condition or injury or a delayed RTW.(13)
Return-to-work intervention	Changes in the workplace or equipment in the workplace, work design or organisation (including working relationships), working conditions, working environment and occupational case-management with RTW stakeholders which include (at least) the worker and an employer.(14)

1.6 Thesis structure and publications

The thesis was structured according to The University of Queensland Guidelines for Thesis by Publication (refer to www.uq.edu.au/grad-school?thesis-preparation). The thesis contains seven (7) articles that have been accepted, revised or submitted for publication in peer-reviewed journals (**Chapters 2- 8**). One publication is prepared for submission (**Chapter 9**). Two publications have been abbreviated to avoid duplication of information or data in the thesis; this has been done purely for logistical reasons and does not impact on the meaning of the study findings (**Chapters 2 and 3**). Studies that have not been submitted for publication are in the same format as the published papers for consistency throughout the thesis (**Chapters 10-11**). Each chapter begins with a short introduction to explain the relationship between the thesis aims and the program of studies.

To address each of the aforementioned aims, one or more research questions were posed. **Table 1.2** presents the relationship between the thesis aims, research questions, and methods used to answer these questions, thesis chapters and publications.

Table 1.2: Summary of project aims, research questions, study methods, thesis chapters and publications

Thesis Aims	Study Research Question/s	Research design to achieve the aim	Stakeholder group represented	Chapter & Publication
To identify gaps in the literature on RTW for UE conditions and injuries.	1. Do UE conditions and injuries cause significant costs and burden to stakeholders in the work setting? 2. What models could be applied to UE diagnoses to help understand the factors that influence RTW and contribute to long-term work disability? 3. What is the current evidence for factors influencing RTW for UE diagnoses? 4. What tools/assessments have been used to identify barriers to RTW and can they be applied to the UE? 5. What interventions have been found to improve work-related outcomes for UE diagnoses? 6. What gaps in the literature warrant further empirical study?	Scoping literature review	Researchers – evidence based literature	**Chapter 2:** Improving work-related outcomes following UE injury. Current concepts, methodological challenges and considerations for future research. *Accepted for publication*
To generate a list of barriers and facilitators for RTW (and factors for work disability) following surgery for non-traumatic conditions and traumatic UE injuries, that warrant future research and inform management of injured workers.	1. What is the current evidence for prognostic factors for work-related outcomes for workers who have had carpal tunnel release (a non-traumatic UE condition)?	Systematic review	Researchers – evidence based literature	**Chapter 3:** Prognostic factors for RTW following carpal tunnel release: A systematic review. *Review – First revision* *Protocol - Published*
	1. What factors do RTW stakeholders identify as being influential on a worker's ability to RTW following surgery for a non-traumatic UE condition? 2. What, if any, differences exist between the RTW stakeholder groups? 3. What demographic and job-related variables of the respondents influence the rating of a factor?	Cross-sectional study of stakeholders perspectives using a valid and reliable questionnaire	HCPs, Employers, Insurers, Lawyers	**Chapter 4:** Perspectives from employers, insurers, lawyers and healthcare providers on factors that influence workers' RTW following surgery for non-traumatic UE conditions. *Submitted for publication*
	1. What are HCPs perspectives on factors		HCPs by	**Chapter 5:** Healthcare providers'

	influencing RTW following surgery for non-traumatic conditions of the UE? 2. Do HCPs from different disciplines agree (or disagree) on the factors they perceive influence RTW?		discipline	perspectives on factors influencing RTW after surgery for non-traumatic conditions of the UE *Submitted for publication*
	1. What facilitators to RTW do experts identify as being influential following surgery for a non-traumatic condition of the UE? 2. What barriers to RTW do experts identify as being influential following surgery for a non-traumatic condition of the UE?	Delphi study of experts	International experts	**Chapter 6:** Expert consensus on facilitators and barriers to RTW following surgery for non-traumatic UE conditions. A Delphi study. *Prepared for publication*
To explore key stakeholders' (i.e., HCPs, employer, insurer, and legal representatives) perspectives of barriers and the strategies to facilitate RTW for a worker with a complex case to explore.	1. What barriers to RTW do stakeholders identify as being most influential when they are dealing with a worker with an UE condition and a complex case? 2. Considering the barriers identified, what strategies do stakeholders perceive would help to remedy the modifiable barriers and facilitate RTW? 3. Are there differences between the barriers and strategies identified between stakeholder groups?	Cross-sectional study of stakeholders perspectives using a case study	HCPs, Employers, Insurers, Lawyers	**Chapter 7:** Stakeholders identify similar barriers but different strategies to facilitate RTW: A vignette of a worker with an UE condition *First Revision*
To determine the assessment tools and methods currently used by Australian HCPs to evaluate barriers to RTW in clinical practice.	1. What assessment tools or methods do HCPs use to identify barriers to RTW for injured workers with UE conditions/injuries in their clinical practice?	Cross-sectional study of stakeholders perspectives using a questionnaire	HCPs	**Chapter 8:** Assessment tools used by HCPs to evaluate barriers to RTW *Submitted for publication*
To clarify a definition for delayed RTW and determine whether a time-point to differentiate transition from early to delayed RTW is appropriate;	1. How do experts define delayed RTW? 2. Can a time-based cut-off be used to determine transition to a delayed RTW for workers following surgery for non-traumatic UE conditions?	Expert opinion – derived from Round 1 of the Delphi Study	International experts	**Chapter 9:** Experts' perspective on a definition for delayed RTW following surgery for non-traumatic upper extremity disorders: Recommendations and implications *Submitted for publication*
To explore injured workers' lived experiences to understand the structural	1. From the standpoint of the workers with a severe UE trauma, how do interactions with RTW	Qualitative interview study using a phenomenological	Injured workers	**Chapter 10:** "Walk a mile in my shoes": Worker's experiences of stakeholder interactions during the

context surrounding the barriers, facilitators and processes that may influence RTW and contribute to work disability.	stakeholders influence: a) Their RTW experience and RTW process; and, b) How do these encounters act as barriers (or facilitators) to RTW?	approach	RTW process following a severe UE injury
	1. Is the concept of loss relevant to recovery and work resumption for workers with severe UE trauma? 2. What are the dimensions of loss that affect workers following severe UE trauma? 3. How can the dimensions of loss act as barriers to RTW and culminate in long-term work disability?		**Chapter 11:** Workers experiences of loss following severe UE injuries.

Key: HCP(s): Health Care Provider(s)**;** RTW: Return-to-work**;** UE: Upper Extremity

SECTION B: Literature Review

CHAPTER 2: Improving work-related outcomes following upper extremity injury: Current concepts, methodological challenges and considerations for future research.

2.1 Chapter Introduction

This chapter is comprised of an overview of the recent work disability and occupational health literature for workers with upper extremity (UE) conditions to identify gaps in the literature (**Aim 1**). The review explored the following research questions:

1. Do UE conditions and injuries cause significant costs and burden to stakeholders in the work setting?
2. What models could be applied to UE diagnoses to help understand the factors that influence RTW and contribute to long-term work disability?
3. What is the current evidence for factors influencing return-to-work (RTW) for UE diagnoses?
4. What tools/assessments have been used to identify barriers to RTW and can they be applied to the UE?
5. What interventions have been found to improve work-related outcomes for UE diagnoses?
6. What gaps in the literature warrant further empirical study?

This review highlights the dearth of research on work-outcomes for workers with UE non-traumatic conditions and traumatic injuries. The gaps in the literature informed **Aims 2-6** of this thesis.

2.2 Publication

This chapter is a modified version of the following publication:

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The chapter was modified from the original publication to: include updated literature; remove information that was not used to inform this thesis; reduce duplication of data reported elsewhere in the thesis; and for readability.

2.3 Abstract

Returning to work following an UE injury is an important outcome that is impacted on by various clinical, psychological and social factors. This review found that limited research in the field of RTW and work disability for workers with UE conditions exists, let alone following surgery. Most research on interventions designed to facilitate RTW and prevent long-term work disability have been conducted on other health conditions, such as back pain. Lack of evidence leads health care providers (HCPs) to utilise research from other musculoskeletal conditions, which needs to be interpreted with caution.

The purpose of this scoping review was to provide a summary of the research related to facilitating RTW and preventing unnecessary work disability for workers following surgery for UE disorders and injury, to identify the gaps in the literature and to make recommendations for future research and clinical practice. This review concluded that well-designed high quality studies of workers with UE conditions/injuries are critically needed to establish: 1) the relationships between prognostic factors and work-related outcomes; 2) to validate and/or establish appropriate screening tools to ascertain risk profiles for those workers are at risk of a worse work-related outcome; 3) the experiences of RTW stakeholders (including workers with UE conditions) to establish the context, processes and interaction of factors that may act as barriers to RTW; and, 4) to develop and test interventions aimed to improve work-related outcomes.

2.4 Introduction

Hands and the UE are necessary to independently perform activities of daily living, communicate (e.g., engagement with technology) and interact with other people and the environment. Injuries and conditions affecting the UE can result in impairments that may lead to difficulty in returning to, or possibly a change in, life roles, such as employment. Reduced capacity to work, or loss of employment, can have enormous personal, financial and social impacts on a person. These can include the health, wellbeing and financial situation for the worker and their families, productivity and associated economic costs to employers and insurance companies, high utilisation of health care resources, as well as societal impacts.

The purpose of this scoping review was to examine the current literature on RTW and long-term work disability following surgery for both non-traumatic UE disorders and traumatic UE injury, to identify the gaps in the literature and to make recommendations for future research and clinical practice. The sections of this review will include: 1) Background information on non-traumatic disorders and traumatic injury of the UE and the importance of work; 2) Models to conceptualise RTW and prevention of work disability following UE injury; 3) Prognosis for RTW and long-term work disability following surgery for UE conditions; 4) Assessment of work-related outcomes and screening for risk of a poor work-related outcome; 5) Interventions to improve work-related outcomes for workers with UE conditions; and, 6) Methodological considerations for future research in the field. In areas where there has been limited research, results garnered from the general work disability literature will be discussed. The review of the literature will be followed by recommendations for future research focused on the gaps identified, and implications for clinical practice.

2.5 Background information on disorders and traumatic injury of the UE and the importance of work

This section of the literature review will provide an overview of the prevalence and costs of non-traumatic disorders and traumatic UE injuries, as well as the surgical interventions required to manage these conditions. The importance of work, as a key research outcome and clinical considerations, will also be discussed.

Non-traumatic musculoskeletal disorders of the upper extremity

Non-traumatic musculoskeletal disorders of the UE are a leading cause of work disability, resulting in immense costs, work-loss and burden on health-care resources.(1, 3) Systematic review evidence cites the lifetime prevalence of non-traumatic UE conditions to be as high as 53% in the general population.(15) Clinically diagnosed UE disorders are most prevalent in the general population for carpal tunnel syndrome (CTS) (3.8%), rotator cuff tendinopathy (3.8%), lateral epicondylalgia (1.1%), biceps tendinopathy (0.5%) and medial epicondylalgia (0.3%).(16) Despite advances in our knowledge of aetiology, improved interventions and advances in technology, disability and associated costs are increasing.(3, 15, 17)

Non-traumatic UE conditions may cause various symptoms including pain, numbness, tingling, stiffness, swelling, weakness, reduced dexterity, and differences in skin colour and temperature.(18, 19) These usually occur along a continuum of relatively clear and defined symptoms and pathophysiology (e.g., trigger finger, deQuervains tenosynovitis or CTS), but can also give rise to disorders that are non-specific in origin (e.g., myalgias or non-specific pain disorders).(20) Research has indicated that the aetiology and course of these conditions is multi-factorial, consisting of individual (e.g., medical history), work-related (e.g., biomechanical exposures, organizational factors) and non-work related factors (e.g., psychosocial factors),(18, 21-24) with some of these having an apparent dose-response relationship.(19) The most commonly reported risk factors are repetitive movements, force, vibration exposure, as well as psychosocial and workplace exposures, such as, high job demands, low decision latitude, low social support and few rest breaks during the working day.(25) Risk factors also vary by diagnoses.(13) These disorders can persist and become chronic, or may even recur at a later stage.(26)

Surgery is often recommended for workers with UE disorders that have: either severe clearly defined symptoms; failed conservative management; and/or, persistent disability.(27) In recent years, surgical techniques have evolved with the advent of minimal incision and endoscopic methods.(27-29) These techniques, such as the endoscopic carpal tunnel release (CTR), are becoming more common, as they are thought to be less traumatic on the soft tissues, allowing wounds to heal quicker and enabling early return to function and work.(30) However, reduced functional capacity may extend beyond what is expected, resulting in ongoing work disability, high utilisation of health care services, and associated costs.(31, 32) In a study by Hashemi,(33) 7% of workers remained off work one year after surgery for work-related UE disorders. Moreover, although surgery may be effective in ameliorating the symptoms of UE injuries, it has also been reported as a prognostic factor for poor RTW outcomes in musculoskeletal diagnoses,(34) including non-traumatic UE conditions.(35)

Traumatic upper extremity injury

Trauma to the UE is common and accounts for up to 40% of all work-related admissions to Australian Emergency Departments,(36) and up to 20% of all Emergency Department admissions internationally.(37) Injuries most commonly include hand and distal radius fractures, tendon lacerations and crush injuries particularly to the distal fingertips.(36, 37)

They rank highest as the most expensive traumatic injury type with the majority of expenditure associated with productivity loss, rather than health care costs.(37)

Severe traumatic upper extremity injuries

A subset of these traumatic injuries is severe in nature. These types of injuries include severe lacerations, de-gloving, mutilating, crush or burn injuries. These injuries are frequently caused by machinery or heavy objects falling or rolling onto the hand or forearm, or motor vehicle accidents. Although far less common than those that are non-traumatic in nature, these injuries can result in more devastating physical damage to the skin, bones, blood vessels, nerves and tendons in the arm. Surgery is required to repair the damaged structures and the post-operative recovery is usually long, often taking six months or more before the injuries are considered stable.(38)

Severe injuries to the UE can result in persistent pain, sensory loss, reduced mobility, weakness, and endurance of the limb. The injury, as well as the long recovery process, can result in psychological and emotional sequelae,(39-41) and ultimately can affect a person's quality of life.(42) Additionally, the aesthetic appearance of the hand caused by a traumatic injury may create additional challenges both emotionally and psychologically.(43)

Previous research has found that the duration of sick leave is proportional to the severity of the UE injury, with longer durations of sick leave required for those with more severe injuries.(38, 44-47) A recent study, found 33% of workers with severe to major hand injuries remained off work at one year following the injury.(44)

Importance of studying work-related outcomes for workers with UE conditions

Work has been recognized for centuries as one of the most important roles that individuals perform.(48) It provides an important source of financial independence, social status, self-accomplishment, and self-realisation.(49) Work disability related to the incapacity to fully perform one's work roles due to illness or injury has been the focus of prevention efforts in recent years.(4, 49) Early rehabilitation and early RTW have been found to result in not only better work-related outcomes, but also higher quality of life and improved health outcomes for injured workers.(35) Moreover, human rights legislation in many countries prohibits discrimination in employment on the basis of a health condition or disability.(50)

Work outcomes have numerous operational definitions including time off work; sick leave; presenteeism; absenteeism; reduced productivity; and/or working with functional limitations.(10, 51, 52) For the purpose of this review, RTW is defined as a process which encompasses a series of events, transitions and phases related to a worker retuning to work (e.g., graduated RTW or job accommodation; or the measurable final outcome of work status (i.e., working versus not working).(10) RTW may involve returning to the pre-injury employer or an alternate job, occupation or employer. It may also involve returning to lighter or alternate duties, or full work capacity. First RTW occurs at the time when a worker returns to work in some capacity for the first time after the work-absence. A first RTW is an event, and does not indicate long-term success. In fact, evidence suggests that a first RTW is not an indicator for a sustained RTW.(11) Young et al suggests four key phases in the RTW process: i) work absence/total incapacity; ii) work-reentry; iii) work retention (sustained RTW) and iv) occupational advancement,(52) of which the end of each phase is an important indicator of success along the recovery trajectory. Barriers along this RTW process can occur at any phase, and thus, can influence both short-term and long-term work-related outcomes. Work disability, alludes to the longer-term nature of the outcome and, is defined as time off work, reduced productivity or functioning as a result of an health condition.(12) It can be measured as both prolonged work absence due to a health condition or injury or a delayed RTW.(13)

In 2003, the World Health Organisation released a report advocating that researchers and clinicians should focus on modifiable factors that improve (work-) disability outcomes.(1) Since then, research has focused on identifying both modifiable (e.g., physical demands of work, coping skills) and non-modifiable variables (e.g., age, gender, educational level) to understand which factors might influence (or be prognostic of) RTW and long-term work disability; and to develop interventions that improve work outcomes, across a myriad of health conditions.(4,53)

2.6 Models to conceptualise RTW and prevention of work disability following UE injury

Disability prevention has been studied from various disciplinary and epistemological perspectives, resulting in differing conceptual models and definitions.(12, 52) Conceptual models refer to a defined set of variables or relationships that are examined to explain their relationships with respect to a particular phenomenon,(54) in this case ‘RTW’ and ‘work disability’. The emerging paradigm within the medical, allied health, and occupational health literature is the early identification of injured workers at risk of developing chronic pain, persistent functional limitations, delayed RTW and becoming work disabled.(4, 23, 53, 55) Historically, prediction of a worker’s RTW potential was based on clinical judgement,(53) objective bio-medical evaluations (e.g., electrodiagnostic testing),(56) and functional capacity evaluations.(57) However, current practice has transitioned away from a purely clinical model, to one considering the injured worker holistically within biomedical, psychosocial and broader systems-based frameworks.(12)

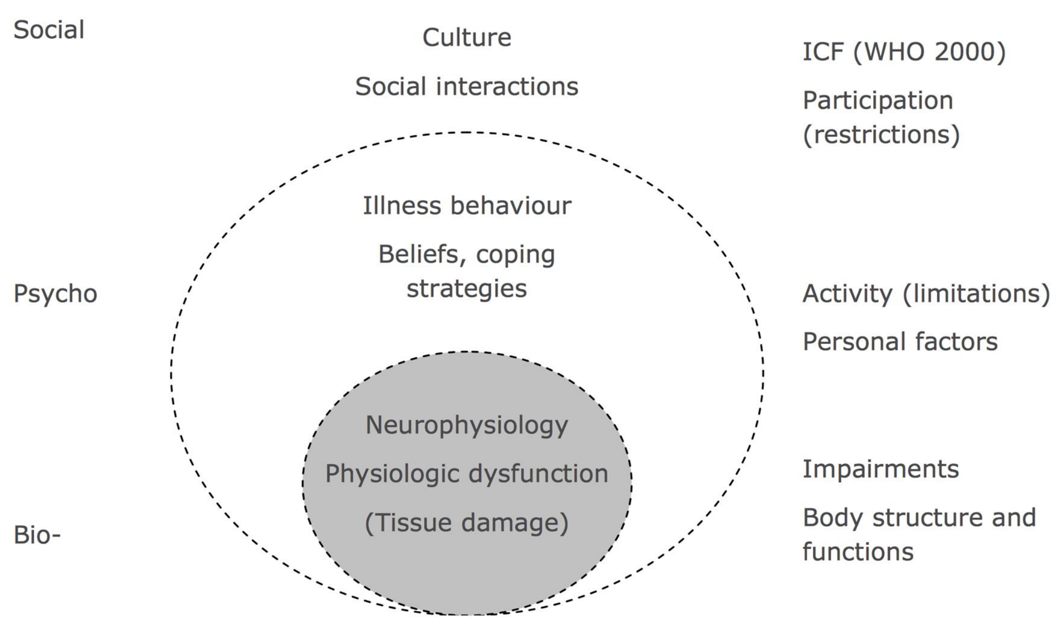
Much evidence exists to support adoption of a broader approach to managing work-related injuries, which takes into account the multifarious interaction between the biological, psychological and social domains.(4, 9, 53, 58, 59) Thus, the conceptualisation of work disability has moved away from a purely static, biomedical/causation-based framework toward models that acknowledge the multi-dimensionality and dynamic nature of work disability. This means that RTW outcomes can be influenced by many different psychosocial and systems-related factors. Hence, a coordinated effort with a common goal between all stakeholders (e.g., HCPs, employers, insurance agencies, co-workers, and family members) that may be involved in the RTW process is required.(60) However, it is also important to note that a gold standard for conceptualising and operationalizing work disability does not yet exist.(12) Therefore, it may be possible that a number of contemporary models may apply contemporaneously, rather than being mutually exclusive, due to their differing epistemological perspectives. Hence, they might all provide a unique contribution when considering the health condition, setting and purpose of the conceptualization.(12)

While many different models for understanding work disability and RTW have been developed, this section of the review will describe the two main conceptual and operational models that were utilised as a framework for the studies in this thesis. These models are the biopsychosocial model and the Sherbrooke ‘Arena’ model.

Moving towards a biopsychosocial approach for managing work-related upper extremity conditions

The biopsychosocial model is the most accepted model for conceptualising both health-related problems and to understand the interaction of the multiple factors influencing work disability.(61) Biopsychosocial refers to the concept that biological, psychological, and social factors combine to play a significant role in human functioning and need to be treated or managed as interlinked systems.(8) It accepts that there is an interaction between the individual and systems levels, focusing also on self-efficacy, coping, motivations, perceptions, beliefs and expectations of recovery and disability.(62) The biopsychosocial approach has been adopted by the World Health Organisation in the development of an international framework for health care – “International Classification for Functioning, Disability and Health (ICF-DH)”.(63) This framework characterizes the dynamic nature of illness and musculoskeletal disorders conditions (**Fig. 2.1**).

Figure 2.1: Relationship between the biopsychosocial model and the ICF(64)



The biopsychosocial model is one of the few models that has been applied to work-related UE conditions. In a report commissioned by the Health and Safety Executive (HSE) in the United Kingdom a best evidence synthesis made the following recommendations:(62)

- Principles of rehabilitation should be instigated early and there should be a focus on biopsychosocial obstacles to participation;
- All stakeholders need to openly communicate and work together towards a common goal;
- Cognitive behavioural approaches are effective and cost-effective in both acute and chronic conditions;

- Multimodal integrated interventions that address both biomedical and psychosocial aspects at the same time should be implemented when managing work-related musculoskeletal disorders of UE;
- Treatment should include self-management, staying active and early RTW; and,
- Integrative approaches by all stakeholders is fundamental in achieving an early and successful RTW.

Interestingly, despite the wide support of this model, the existing literature has found that although HCPs agree with implementing a biopsychosocial approach, they are still not implementing the model into practice.(65, 66) Reasons for this include: increased time taken to complete evaluations; lack of remuneration to complete evaluations for interventions outside of the scope of their practice; and lack of training, knowledge and competency.(65, 66)

Table 2.1 illustrates some of the key differences between the biomedical and biopsychosocial approaches in relation to managing UE conditions.

Table 2.1: Implementation of a biomedical or a biopsychosocial approach to managing upper extremity conditions

	Biomedical Model	Biopsychosocial Model
Presentation	Focus is on physical causes of disease. HCP asks questions about onset and cause, pain history and other symptoms. Empirical signs and symptoms of pain and clinical dysfunction are considered most important.	Focus is on physical causes of disease, but also psychosocial risk factors for development and poor prognosis. HCP aims to determine both physical and psychosocial determinants to a poor or good outcome. HCP considers outcomes that may be influenced by other factors not specifically related to the pathology. HCP may explore psychosocial concepts through interviewing or specific screening tools.
Diagnosis	HCP examines the worker using clinical parameters and results of other imaging or laboratory tests.	Based on a combination of clinical examination, imaging and laboratory tests and evaluation of psychosocial factors using interviews or valid and reliable screening tools.
Treatment	Treatment plan is based on reversing or treating the pathology, minimizing pain and improving objective clinical outcomes such as mobility, strength, and endurance.	HCP discusses available interventions considering both the biological considerations to reduce pain and improve clinical outcomes, but also focuses on overcoming psychosocial barriers to achieving mutual goals.

Key: HCP= Health care professional　　Adapted from HSE 2008(62)

Further, Heerken et al applied the ICF model specifically to the issue of work disability,(67) including the UE. This model augments the original ICF model by including work-related factors leading to lower physical function and subsequent health problems. Work conditions are represented including physical work hazards (e.g., repetition, lifting or use of vibrating tools at work and ergonomic design) as well as mental job requirements. It advocates a balanced work-life as an emphasis on maintaining and/or improving a worker's quality of life. One of the benefits of this model is that it helps HCPs to look outside of the traditional clinical and biomedical spheres towards external factors that may impact on recovery and RTW.(68)

Work disability models

Although the biopsychosocial approach has been theoretically adopted in practice, some researchers have proposed that the model for conceptualising and operationalizing RTW may need to be even broader.(9, 12) There is support for a further paradigm shift away from a biomedical model towards a biopsychosocial model that transfers responsibility for outcomes to a multi-stakeholders decision-making system which is influenced by complex professional/disciplinary, legal, system and cultural (societal) interactions.(9) Thus, a work disability prevention model needs to focus on not only the internal factors (i.e., biological, psychological and social related factors specifically related to the worker) but also needs to consider the broader systems (e.g., health care, workplace, insurer systems) that may influence outcomes.(9, 69, 70)

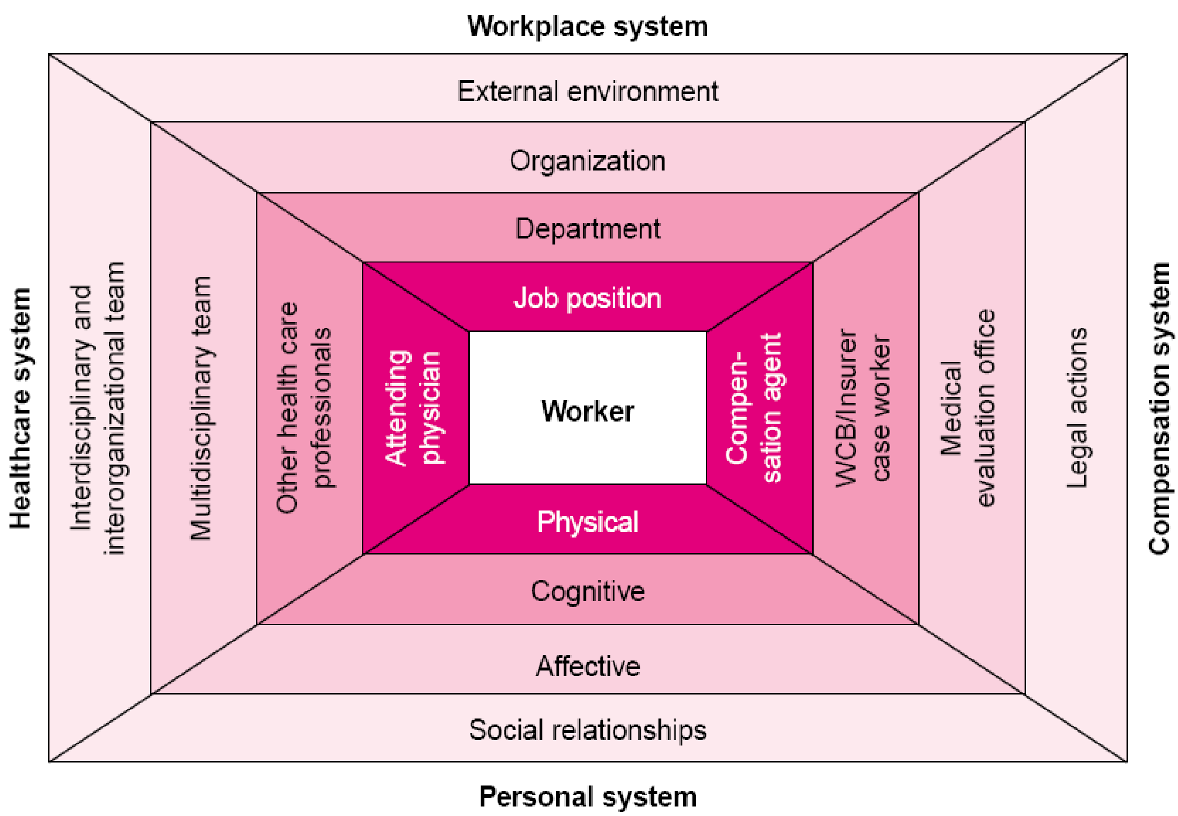
Much discussion has surrounded the most appropriate models to describe the complex nature of RTW and long-term work disability and the person-environment interaction.(4, 12, 68) As there is little consensus on which model should be used as a gold standard, a number of contemporary models have been implemented across various health-related conditions.[1](12, 68) Many of these models have both benefits and barriers to implementation depending on their clinical or research utility. However, their overarching aims remain consistent –to guide work disability management and prevention. Although these models have been developed and applied to many general musculoskeletal and health related conditions, there is a dearth of models that have been translated to workers specifically with UE conditions. One that has plausible application based on the main tenets and scope of practice, for UE conditions, is the Sherbrooke 'Arena' model (**Fig 2.2**).(9)

[1] Refer to: Schulz et al (2007). Models of Return-to-work for Musculoskeletal Disorders. J Occup Rehabil. 17: 327-352

The Sherbrooke 'Arena' Model

The Arena model is founded on the premise that work disability prevention needs to be considered within a systems and societal context and, in particular, relevant disability and work injury management legislation (**Fig. 2.2**).(9) Although originally developed as a case-management model for low back pain, it has been applied to practice for various health conditions where prevention of long-term work disability is needed.(71, 72) This model offers a broad operationalization of the multiple influencing factors from the worker, the workplace, healthcare and insurance systems, and society.

Figure 2.2: Sherbrooke Arena Model



Courtesy of Loisel et al 2001(9)

The Arena model has also been applied to various settings; however, it was developed in the Canadian workers' compensation setting. So, it considers the insurer as an important stakeholder and may be easily generalised to other workers' compensation settings, such as Australia. This model also considers the important influence of stakeholders instrumental in the RTW process. In the Australian setting the stakeholders may consist of workers, employers, insurance agencies (e.g. workers' compensation insurers), and HCPs, which are represented by the four sides of the arena. Within the stakeholder systems, various organizational levels are included to represent the multi-level, multi-factorial nature of work disability. Decision-making for RTW is influenced by the actions, behaviours, interactions and motivations of each stakeholder system.(60) Therefore, stakeholder engagement is considered to be integral to facilitating RTW and preventing work disability.

2.7 Prognosis for RTW and long-term work disability following surgery for UE disorders and injury

Prognosis is the ‘probable course and outcome of a health condition over time’ (p.552, 73) The results of prognostic studies have many benefits including: 1) improving our understanding of a health condition and its trajectory; 2) improving the design and analysis of clinical trials by enabling a greater understanding of the factors influencing the outcome; 3) assisting in comparing outcomes between treatment groups in a non-randomised study, by allowing adjustment for case-mix; 4) defining “at risk” groups based on prognosis; 5) predicting the outcome for a condition more accurately; and 6) guiding clinical decision making including treatment selection and pre-operative education.(74) Thus, early identification of prognostic factors influencing RTW and long-term work disability enables researchers to develop appropriate screening tools and interventions to facilitate successful work outcomes.(53, 58) HCPs, such as surgeons and therapists, can also use the information to educate patients and to recommend interventions to target the modifiable risk factors to enhance (work-) disability outcomes.

Epidemiological research has consistently shown that a multitude of factors are important for determining risk of a delayed or poor RTW outcome.(24, 75) Systematic reviews have consistently concluded that there is strong evidence associating psychosocial determinants with delayed RTW and long-term disability;(76, 77); for both acute(78, 79) and chronic musculoskeletal disorders.(80, 81) Moreover, research has also found that biological and medical factors independently are not predictive of RTW status(82) and psychosocial factors have a significant prognostic role on outcomes.(83) A cross-sectional study of workers with UE disorders and a workers’ compensation claim, found that a combination of ergonomic and psychosocial factors (including feelings of being overwhelmed by pain, low confidence in problem solving, high ergonomic risk, and other non-pain-related symptoms), contributed twice as much toward a poorer functional outcome, than pain alone.(84)

This section of the review will summarise the current evidence for prognosis for RTW and long-term work disability in relation to UE conditions and surgery.

Evidence for prognostic factors for return to work and long-term work disability following upper extremity injury

Despite the large number of studies published on prognostic factors, there are few that have investigated their association with RTW outcomes following surgery for UE injury.(85) Prognostic research for RTW has concentrated on work disability in workers with back pain,(79, 86, 87) or other diagnoses, such as mental health,(88) and cancer.(89) Evidence indicates that there are many potential prognostic variables including individual, socio-demographic, biomedical, ergonomic, psychological, organisational and societal factors.(24, 75) Although this research provides greater insight into the multifactorial nature of work disability, prognostic factors may differ for different diagnoses.(90) Therefore, translation of results across health conditions must be approached with caution. Furthermore, various factors have been shown to be prognostic at different phases of the disability process.(35) Furthermore, most workers with a work-related UE condition RTW at least once, but a first return does not necessarily mark the end of work disability. Among workers absent at least once, 26% of those with an UE condition report a second injury-related absence.(11) This is much higher than their back pain counterparts (18%).(11) Therefore, it is important to consider that different factors may be prognostic for RTW outcomes at various time-points.

Two cohort studies have examined prognostic variables for RTW across various hand conditions and surgeries. Opsteegh and colleagues conducted a well-designed prospective cohort study to examine prognostic factors for RTW following any type of hand surgery in a sample of 91 workers.(43) They found a number of prognostic variables for a delayed RTW including pain (the strongest predictor), post-traumatic stress disorder symptoms, and the accident occurring at work. In an earlier study, Pransky et al found no relationship between treatment type (i.e., surgical treatment versus conservative management) and work-related outcome in a population of 112 workers with work-related UE conditions.(97) They found patients self-reported functional limitations were not predictive of work status. Overall, those who were employed at baseline tended to remain employed after their injury, and vice versa, i.e., those that were unemployed before entering the study remained unemployed.

Few studies have explored factors predicting a work-related outcome following specific treatments for non-traumatic and traumatic conditions. There is evidence to suggest that the presence of a workers' compensation claim tends to be prognostic for a poorer RTW in a number of UE conditions including surgery for rotator cuff,(91) surgery for lateral epicondylalgia,(92, 93) and radial tunnel release.(94) A prospective cohort study conducted by MacDermid et al concluded that the pattern of work-loss following distal radius fracture management was highly variable and cannot be accurately predicted based on clinical variables alone.(95) This study found that self-reported disability and occupational demands were the strongest predictors. Further, Bruyns and others found that level of education, type of job and adherence to hand therapy were predictors for RTW following treatment for median and ulnar nerve injuries.(96)

In a systematic review by Shi et al, prognostic factors for RTW following traumatic hand injury were synthesised.(77) Eight studies were eligible for review, which examined 11 prognostic factors. Few studied psychosocial variables, with the main focus on demographic and biological variables. At six-months, 40% of workers had not returned to work in any capacity. Variables predictive of work disability included higher levels of physical impairments and lower pre-injury income. Age, sex and level of education had no effect on RTW. While it may seem intuitive that workers with more severe injuries need longer to recover, they found a paucity of research investigating the challenges these workers face in being able to both RTW and maintain employment.

A number of studies have investigated prognostic factors for work-related outcomes following CTR. These will be discussed in the systematic review included as **Chapter 3** of this thesis.

There are a number of systematic reviews of RTW prognosis conducted in other diagnoses,(78, 79, 86, 88, 98, 99) which have reported differing findings to the aforementioned UE studies. This is partly due to factors, which have been found to be prognostic for some health conditions, not being included in UE prognosis studies. Therefore, what is still unknown is whether prognostic variables from other diagnoses are similarly prognostic for workers with UE conditions? This cannot be assumed and, therefore, further research in this field is urgently needed.

Factors influencing return-to-work: What can we learn from the qualitative literature studying workers with UE injury?

Quantitative studies are the strongest methods to examine the strength of prognostic variables on an outcome. However, there are instances in which some variables, or the interaction of variables, may be best explored with qualitative methods. The complexity of RTW and work disability, and the myriad of influential factors across systems lend itself to qualitative enquiry.(70) Because of this, these methods have been utilised in the work disability field across a number of health conditions and injuries. Studies have explored the perspectives of various stakeholders and have found that RTW is influenced by many factors, both internal and external to the worker. These include interactions occurring between the worker, the workplace, and the health care and insurance systems.(70, 100, 101)

There are a small number of qualitative studies that have explored the concept of RTW after UE injury. Amman et al, in a narrative study, interviewed two hand-injured adults.(102) They found that both participants experienced some form of disruption in their occupation and underwent a dynamic process of adapting to their injury over time. In a phenomenological study by McDonald and Pettigrew, ten participants were interviewed. They identified that adjusting to role change and identity, in particular for those who work in manual occupations, were key to recovery.(103) Although participants viewed RTW as an important step in their recovery, they also felt that acceptance and discrimination within the workplace influenced their work ability. In a mixed methods study conducted in Brazil, seven participants were interviewed to explore the complexity of factors that might influence work status at three years following hospital discharge.(104) These results were then triangulated with the findings from a cross-sectional quantitative study of 35 participants, of which 20% had not returned to work. Return of grip strength, desire to RTW, pain, fear of re-injury, fear of being fired and employer support were stated to be important factors influencing long-term work absence.

Summary of prognosis for RTW and long-term work disability

Prognostic models and frameworks for clinical use are developed from well-designed, multi-factorial, prospective studies.(89, 105) However, there is an overwhelming paucity of well designed studies examining RTW prognosis for workers with either traumatic and non-traumatic UE disorders (and the concomitant surgeries to manage these conditions).

2.8 Assessment of work-related outcomes and screening for risk of a poor work-related outcome

The majority of workers with an UE injury recover and RTW within expected timeframes. However, for those who do not, stakeholders, such as HCPs, are often required to identify barriers to RTW and recommend more intensive and structured interventions both clinically and in the workplace. As the body of evidence grows to support the adoption of a broader biopsychosocial approach to managing UE conditions, there is a need for biopsychosocial assessment tools to both screen for risk factors and to identify those workers at risk of a poorer prognosis for recovery or RTW.(106) Screening tools enable stakeholders to tailor interventions to the specific needs of the injured worker based on their findings. Such an approach has been found to be more effective in allocating health care resources and costs to workers most at risk of a poorer (work) disability outcome.(58, 72, 107, 108) Assessment instruments (either objective, clinician-directed or patient reported outcome measures) can be used to evaluate for barriers to RTW and to monitor process, which is an important marker for recovery.

Shaw and colleagues categorized the various assessment tools used in work-related practice with respect to their delivery/format into six types: 1) patient questionnaires; 2) semi-structured clinical interviews; 3) worksite evaluations; 4) clinician's overall impressions and clinical opinion;5) objective measurements and 6) administrative data.(55) These methods can be used in conjunction with each other or as stand-alone instruments to evaluate individual, organisational or system related factors. However, before implementing any tool in either clinical or research utility, it is important to consider the appropriateness, reliability, validity, responsiveness, feasibility and interpretation of the tool.

Generic upper extremity outcome instruments and application to work-related outcomes

A number of UE specific outcomes measures exist that evaluate, or have been found to predict, levels of function, impairment or disability; albeit, not as specific measures of work capacity; or as screening instruments for RTW prognosis. Instruments that have undergone substantial psychometric testing and are suitable for use as an outcome measure in populations of working age adults, and include questions related to work ability include: Disability of the Arm, Shoulder and Hand (DASH) questionnaire;(109) QuickDASH;(110) Upper Limb Functional Index;(111) Patient Rated Wrist/Hand/Elbow Evaluation;(112) and the American Shoulder and Elbow Surgeons Score.(113) The DASH and QuickDASH have a sub-section, which can be used to provide baseline data on work ability (or disability) and progress. Besides the DASH questionnaires, most outcome measures contain only a single item on ability to participate in work and therefore do not provide a comprehensive measurement of work disability.(111-113) Also, this is not a comprehensive list of the many assessments used to monitor progress or assess for impairments for individuals with UE conditions. Nonetheless, few have a focus on facilitating work-specific outcomes.

Instruments designed to determine capacity to RTW

Tools assessing work ability include objective evaluations such as functional capacity evaluations (FCEs) and formal assessments of work performance.(57, 114) An FCE is used to determine whether a worker is capable to safely RTW in a limited or full capacity. It is primarily an evaluation of physical ability, which can then be matched to job demands, either specific to the workers current job or to establish general fitness and capacity for work in another role or occupation. An FCE can also be used as a means to determine progress during rehabilitation. Gross et al found the predictive validity of a full FCE was poor for Canadian workers, including those with UE conditions.(57, 115, 116) On the contrary, in a study of workers following distal radius fracture in Hong Kong, FCEs were found to be predictive for: a recommendation to not work; job change; or, return to a previous job with modifications.(117) One of the possible reasons that FCEs may not be predictive of a work outcome in some settings, may be because they don't consider psychosocial or system-related factors, such as the insurance context. In fact, semi-structured interviewing of injured workers, which can encompass psychosocial questions, has been found to be equally as effective as formal functional capacity evaluations in predicting and facilitating work-related outcomes.(118)

An instrument designed to determine Readiness to RTW

A worker's readiness to RTW is based not only on physical demands but also social and interpersonal factors. Therefore, it is an important consideration that may influence the success of a work-related outcome. If a worker does not feel they are ready to return to work, this may prompt discussion about the factors they believe are contributing to this. The ‘Readiness for RTW’ questionnaire was developed for this purpose. It has a temporal dimension fitting the phases of chronicity and recovery following an injury to assist in directing stage-specific interventions.(119) It has also been used as an outcome measure to determine whether the worker’s readiness to RTW has improved over time. This questionnaire has been validated on a sample of workers, of which 34% had an UE injury (66% had low back pain), however no sub-analyses of the different diagnoses were conducted.(119)

The Workstyle Measure

The Workstyle Measure, although not intended as a screening tool for prognosis for RTW, was developed to identify how a worker responds behaviourally, cognitively and physiologically to work and increased work demands.(120) Although one of the few tools developed on workers with UE disorders, it has not been validated on a post-surgical population and considers primarily individual worker factors and responses.

Screening instruments used to predict a delayed return to work or long-term work disability

In 2000, Feuerstein identified the importance of a multifactorial screening approach for determining prognosis for RTW in workers with UE conditions.(35) When considering tools designed to determine risk for RTW, there are three categories of instruments. These include: 1) instruments designed to determine risk factors (or barriers) to either RTW or long-term work disability; 2) instruments designed to identify those that are at risk of a poor work-related outcome (i.e., either a first RTW or long-term work disability); or 3) instruments that are designed to identify both risk profiles and those that are most at risk of a poor outcome.

A number of clinician- or worker-based screening tools have been developed that include biopsychosocial determinants for RTW, for which psychometric testing has and is still being conducted. Although, none of these have been specifically developed or validated on the UE population. Psychometric testing has most often been conducted on other musculoskeletal disorders (e.g., back pain, neck injuries) or a sample of general musculoskeletal disorders, of which UE conditions were a minority.(58, 121-124) A description of screening instruments designed or validated on various musculoskeletal conditions will be discussed below.

A systematic review conducted by Gray and colleagues reported that amongst work-related screening tools with a psychosocial component for back injured workers, only the Obstacles to Return-to–Work Questionnaire had adequate psychometric properties for assessing psychosocial factors, but lacked clinical feasibility due to its length.(106) This questionnaire was developed on workers with chronic musculoskeletal pain (58% had neck and shoulder injuries) who had been off work for a prolonged period.(121) The original instrument contains 55 items and nine subscales including: depression, pain intensity; difficulties at work; physical workload and harmfulness; social support at work; worry due to sick leave; work satisfaction; family situation and support; and perceived prognosis for RTW. Marhold et al found that this questionnaire was able to identify key barriers to RTW confirming its predictive ability.(121) Further evaluation is still required to ascertain the utility of this scale in workers with various UE conditions distal to the shoulder or following surgery for non-traumatic conditions, e.g., CTR or rotator cuff surgery, or those who suffer acute or traumatic UE injuries.

Numerous other tools exist that have been developed primarily in workers with back pain such as, the Flags System,(125) Orebro Musculoskeletal Pain Questionnaire,(122, 126), Subgroup for Targeted Treatment Back Screening Tool (StarT Back Screening Tool),(107) RTW Self-Efficacy Scale,(123) The Pain Recovery Inventory of Concerns and Expectations (PRICE) screening tool,(58) Absentee Screening Questionnaire,(124); or generically across a number of work-related conditions, such as, the Balansmeter,(127) Work Disability Diagnosis Interview,(128) and Worker Role Interview.(129, 130). These have been found to be valid, reliable and mostly responsive to identifying those workers either at risk of a poor RTW prognosis or for identifying potential RTW barriers that are amenable to intervention.

While there is little empirical evidence for screening tools used in workers with UE conditions, anecdotally, some of these tools have been implemented clinically for workers with UE conditions. This is based on the assumption that there may be a set of risk factors common across all musculoskeletal disorders. One of these assessment tools is the flags system.

Over recent years, the “flags” system has become one of the most accepted and well-used tools to identify those workers at risk of delayed RTW and long-term work disability by focusing on modifiable risk factors (**Table 2.2**).(125, 132, 134, 135) Due to its broad application, this system has been advocated in various workers' compensation settings and across various musculoskeletal conditions including UE diagnoses.(131) The flags system was initially presented by Kendall for workers with acute low back pain, with red flag risk factors representing serious pathology requiring medical attention and yellow flags for psychosocial risk factors.(125) More recently, orange flags (i.e., significant mental health problems requiring mental health treatment), blue flags (i.e., workplace factors) and black flags (i.e., systems or contextual factors) have been added to the flags system.(132) However, although well accepted and widely implemented, the flag identification system still relies to some degree on a clinician's judgment, which may be influenced by their experience and prior training.(53, 133)

Table 2.2: Summary of flags system for identifying barriers to return-to-work

Flag	Description	Examples
Red	Signs of serious pathology	Symptoms requiring medical attention
Orange	Psychiatric symptoms/diagnoses	Significant mental health concerns warranting urgent treatment
Yellow	Beliefs, appraisals and judgments	Negative beliefs and expectations; preoccupation with health; uncertainty about the future
	Emotional Responses	Worry; distress; anger
	Pain behaviour (including pain and coping strategies)	Pain catastrophising; fear of movement; extreme symptom reporting; passive coping strategies
Blue	Perceptions about the relationship between work and health	Fear of re-injury; high physical job demand (perceived or actual); low expectations of returning to work; low job satisfaction; low social support or social dysfunction in the workplace; lack of job accommodations or modified work available; lack of communication between the employee and employer.
Black	System or contextual obstacles	Misunderstandings and disagreements between stakeholders; financial and compensation issues; system-related delays in the recovery or RTW process.

Current approaches to identify risk factors are moving towards developing specific instruments to screen workers who are 'at-risk' and then triage the 'at-risk' workers to certain intervention groups based on their risk-profiles.(58, 107) Research, in addition to certain workers' compensation policies, supports HCPs screening workers early in the trajectory of the musculoskeletal condition to recommend interventions.(136, 137) An example of an existing tool is The Pain Recovery Inventory of Concerns and Expectations (PRICE).(58) The PRICE is a psychosocial instrument that identifies blue and yellow flags that have been found to be prognostic for RTW and recovery following acute low back pain. The worker-based screening instrument was developed to determine clusters of workers with particular profiles of risk factors that could then be matched to early interventions. Although not yet applied specifically to UE injuries, it is plausible that similar principles could be effective. Such an approach could feasibly reduce costs (i.e., health care, productivity and claims costs) as well as improve work outcomes. However research needs to be conducted to explore the validity of applying existing tools in workers with UE conditions, or whether UE specific tools need to be established.

Summary of instruments used to evaluate and screen workers with UE injuries

Being able to RTW, in some capacity, is an important aspect of recovery that is often not the focus of UE-specific patient reported outcome measures. Furthermore, tools used to screen 'at-risk' workers for a delayed RTW or work disability, are lacking and not specific to UE conditions. While there may be tools available, caution needs to be taken when applying a screening tool or outcome measure to a condition that it has not been validated for.

The optimal screening tool would be one that was developed specifically for workers with UE conditions, or an existing tool that has been validated for the various UE diagnoses frequently suffered by workers. Ultimately, the tool would also identify those factors that are modifiable and, therefore, amenable to intervention. Thus, it would have the ability to facilitate clinical decision-making, and intervention planning by directing resources to workers most at risk. Research into this field is warranted and crucial to facilitating successful RTW interventions for workers with UE conditions.

2.9 Interventions to improve work-related outcomes following UE injury

Interventions can be either clinical in nature to resolve symptoms (and thereby, facilitate RTW or work retention), or can be RTW-specific interventions designed to either prevent injury in the work-place or to specifically facilitate RTW. While there is strong evidence to support many of the biomedical interventions to effectively manage various musculoskeletal conditions, there is also a plethora of literature that focuses on the small percentage of workers that go on to develop a chronic condition or become work disabled. These workers ultimately account for the majority of costs.(11, 138) These workers require interventions to specifically focus on promoting their RTW.

For workers with UE conditions, the studies examining interventions supporting RTW are few.(139-142) Studies that exist focus on biomedical interventions in clinical practice rather than vocational or RTW interventions.(143) While clinical interventions may resolve symptoms and reduce impairments, there is evidence indicating that resolution of symptoms does not always translate to RTW.(140) A number of reviews of the existing literature found few studies with no or limited effect of either clinical or RTW interventions on work-related outcomes.(59, 144) Interventions included job modifications, hand therapy, physical therapy, occupational therapy, ergonomic interventions, anti-inflammatory medications and injections, workplace interventions and case-management.(145)

In recent years, two reviews specifically related to workers with UE conditions have been conducted. Burton et al conducted a best evidence synthesis review on the management of work-relevant UE disorders.(59) Their review found neither clinical nor ergonomic interventions have been found to improve work-related outcomes. However, the evidence in their review did indicate that early RTW or work retention to prevent long-term work disability was an important goal for the stakeholders involved and could be facilitated by graduated RTW programs. Another key finding was that successful management of RTW required all key stakeholders to work collaboratively on the same team as the worker (rather than against the worker). In another review, 28 studies of various designs were examined with respect to workplace interventions for managing UE conditions.(144) They found limited evidence for a number of tertiary interventions including computer keyboard modification in workers with CTS and tenosynovitis and a multidisciplinary approach for managing workers with non-specific arm pain who have been sick listed for at least four weeks.

A recent Cochrane systematic review conducted by the authors found that high quality randomized trials or interventions for improving outcomes after CTR were scarce.(146, 147) Moreover, the use of RTW as an outcome was lacking and was usually included only as a secondary outcome measure. The included studies focused on preventing iatrogenic complications from the surgery, and hence were primarily clinical treatments (e.g., to help with scarring or mobility). These clinical treatments had relatively no effect on improving RTW rates.

Considering the high reported costs and variable RTW rates following UE conditions, future research in this field is needed. The basic assumption for RTW interventions is that those at risk of developing long-term work disability can be identified, so that resources can be directed to those most in need.(53) Research from the general work disability field has found promise in ‘staged’ or ‘stepped-care’ approaches which enable interventions to be allocated following a screening evaluation or functional assessment.(58, 107) These approaches allow interventions to be allocated using finite resources in the most appropriate and efficient way to meet the worker’s and stakeholder’s needs.(72) As mentioned above, screening tools have been developed which can identify risk profiles based on their results, e.g., psychological or workplace issues, and potentially direct at-risk workers towards appropriate interventions.(58, 107) However, research is still needed to establish the effectiveness of interventions based on screening to triage workers into at-risk profiles.

The lack of studies using populations of workers with UE conditions may partly be due to: the heterogeneous nature of the interventions and the lack of ‘control’ achievable in a workplace setting or when delivering multi-modal interventions; and the difficulty describing the inherent complexities of many of the vocational or multi-modal interventions, e.g., with respect to the components and delivery of the interventions. These studies are usually resource intensive and costly. There may also be issues with generalizability to jurisdictions with different workers’ compensation legislation. No two compensation settings are entirely the same, and there are also differing governing legislations. To date, no intervention (with either one or multiple components) has been found to be effective across all occupational settings,(148) and hence generalising across conditions and settings also needs to be carefully interpreted. Regardless, studies examining the efficacy of both clinical and RTW interventions are needed. Waddell and colleagues found that RTW interventions reduced long-term work disability and improved workers’ socio-economic status and quality of life for workers with musculoskeletal conditions,(138) but this has yet to be found in workers with UE conditions.

Summary on interventions facilitating return-to-work

Interventions need to focus on the multiple factors that have been found to influence RTW outcomes, and should encompass not only biomedical treatments, but also psychological and social (i.e., workplace) interventions. A 'stepped' or 'stage care' approach may also be appropriate, safe and effective for workers with UE conditions, however this is yet to be studied. Studies of clinical interventions also need to consider work-related outcomes as an outcome. Moreover, what is also unknown is to whom RTW interventions should be directed, and the timeframe in which it is best delivered.

2.10 Methodological considerations for research design

Well-designed high quality studies are more likely to deliver recommendations for translation to clinical practice and to change policy at institutional and system levels. In light of the absence of studies examining RTW in workers with UE conditions, research is critically needed. Selecting the most appropriate research design to best answer the research question, and in consideration of cost, logistical and practical issues (such as, available sample size) is a researchers dilemma. However, despite the type of study design there are a number of methodological issues that have been identified in the work disability literature that can be applied when designing studies using workers with UE conditions. These include providing appropriate descriptions of independent variables, dependent variables, and interventions, and consideration of the setting context.

Importance of defining work-related outcomes

Various complex and multi-dimensional definitions for work outcomes have been identified.(51) A recent review by Pranksy et al found that while work-related outcomes may be measured, they are often not clearly articulated, making interpretation of findings difficult.(51) In addition to variation in definitions, the method in which the data related to the outcome is reported or collected can create confusion. Self-reported outcome measures can be less reliable in the long-term. Recommendations have been made that questionnaires and studies should not rely on self-reported sickness absence data of greater than two months due to the unreliability of recall.(51) On the other hand, administrative data has the supposed advantages of objectivity, completeness and accuracy of data collection. However, it is also not without its disadvantages. Difficulties can arise in determining the cause of sickness absence, issues with claim determination and acceptance, disability succeeding the cessation of the claim and database coverage, disability coverage recorded in other administrative systems, presenteeism, and job accommodations instituted to enable RTW. Also, access to company or insurer data is often protected by confidentiality agreements and hence is not always easy to access.

Importance of clear definitions of independent variables and interventions

An important reason for conducting research is to evaluate treatments or understand the trajectory of a disease path (for example, in Shi et al)(77). The results of these studies can be interpreted by HCPs or policy makers to make a judgement whether they should be implemented clinically as standard practice; or alternatively, by researchers, to replicate methods. However, inadequate reporting of methods used to define or measure variables, or describe the components, dose, setting or timing of an intervention is unfortunately commonplace.(149) A number of systematic reviews conducted in the UE field have identified this as one of the greatest shortfalls with respect to research methodology.(30, 77)

In addition, studies on prognosis continue to focus on non-modifiable database-driven factors using a biomedical framework. It is recommended that studies should prioritise inclusion of prognostic variables that meet five selection criteria: factors amenable to change; factors that are relevant to the end users; factors that can be generalised across different diagnoses, disability phases and settings; factors that have been found to have a "degree or promise" in exploratory studies of experts or stakeholders; and the capacity to improve current measurement instruments.(24) A number of recommendations have been made to improve the reporting of participant selection and setting, independent variables, outcomes and interventions (**Table 2.3**).

Table 2.3: Quality checklist for defining variables and interventions in research studies (149-152)

Independent variables (Prognostic factors)
1. Are the variables well defined and able to be replicated?
2. Were the variables measured using reliable and valid measures?
Interventions
· Are the interventions (biologically and theoretically) plausible?
· Are the interventions studied multimodal or uni-modal? Is it clear what treatments were included in the multimodal interventions?
· Is it clear who delivered the intervention?
· Is the procedure (including the sequencing of the technique) of the intervention sufficiently clear to allow replication?
· Are the physical or informational materials adequately described (and available)?
· Is the dose/length (interval, frequency, duration, or timing) of individual sessions of the intervention clear?
· Is the description of the intervention able to be replicated based on the description provided in the publication?
Participant Selection & Setting
· How were participants selected?
· Is the setting for the study and where the interventions delivered clear?
· Are implications related to the study setting detailed e.g., description of the workers' compensation setting?
· Is it clear who the sample is being studied (i.e., clear diagnostic and eligibility criteria)?
· Has our understanding of pathophysiology changed since the studies were conducted?
Dependent Variables (Outcomes)
· Are the outcomes adequately described in detail so that the can be replicated by others?
· Are the outcome measures appropriately measured using reliable and valid measurement tools?
· Are the time-points for outcome measurement appropriate and clearly defined?

2.11 Knowledge gaps in the literature

There is a lack of well-designed prospective longitudinal studies investigating prognosis for work-related outcomes for various UE conditions, and even more so following surgery for UE conditions. Future research needs to focus on prognostic factors amenable to intervention, especially within the psychosocial, organisational and compensation system-related domains. Consequently, the results of these studies could facilitate the development or validation of appropriate screening tools specifically for workers with UE conditions (and following the concomitant surgeries to manage the condition).

Studies examining prognosis for RTW for workers with UE conditions need to take a comprehensive approach and explore variables within a biopsychosocial and work disability framework. The complex and multi-dimensional nature of RTW and other work-related outcomes must be considered. Studies should attempt to understand the similarities and differences across jurisdictions to allow for generalizability of study findings. Due to the vast number of prognostic variables that could be studied,(24, 75) researchers need to use broader and more inclusive methods to develop the most important variables to be included in longitudinal studies. These could include: stakeholder surveys, Delphi studies and utilisation of systematic reviews of prognostic factors for RTW and work disability.

The complex interaction of variables and those that are difficult to study quantitatively should be studied by qualitative enquiry. Researchers and clinicians could benefit from an in-depth understanding of the context in relation to the process, and barriers and facilitators for RTW process for workers with UE conditions. This understanding would help facilitate the transition to work, trouble shoot potential barriers and prepare the individual, their family and the workplace for the returning worker. Moreover, it could help guide assessment, and both clinical and RTW interventions.

There is a paucity of research focusing on the interventions that facilitate RTW and/or prevent work disability after an UE injury. Moreover, as the need for interventions is directed by appropriate assessment and the use of screening tools, research is needed to identify prognostic factors to enable such assessment.

2.12 Conclusions

To date, limited research in the field of RTW and work disability for workers following both non-traumatic and traumatic UE conditions exists, and in particular, post-surgical conditions. Insufficient evidence may lead stakeholders to utilise research from other musculoskeletal conditions, such as low back pain, which should be interpreted with caution. Well-designed high quality studies are critically needed in this field for workers with UE conditions to establish: 1) the relationships between prognostic factors and work-related outcomes; 2) to validate and/or establish appropriate screening tools to ascertain risk profiles for those workers are at risk of a worse work-related outcome; 3) the RTW experiences of stakeholders (including workers with UE conditions) to establish factors and processes that may as barriers to RTW using qualitative enquiry; and, 4) to develop RTW interventions based on this research.

SECTION C: Factors influencing return-to-work following surgery for non-traumatic upper extremity conditions

CHAPTER 3: Prognostic factors for return-to-work following carpal tunnel release: A systematic review

3.1 Chapter Introduction

A preliminary scoping review of the literature found a limited number of studies on prognostic factors for return-to-work (RTW) following upper extremity (UE) condition or injury (**Chapter 2**). Shi et al recently completed a systematic review on prognostic factors following UE trauma.(77) The main findings from the review by Shi et al,(77) are detailed in **Chapter 2**. In this chapter, we focused on non-traumatic conditions of the UE. Of those non-traumatic conditions, the primary focus of interest in the vast majority of studies was workers who had carpal tunnel syndrome (CTS) and had undergone surgery (i.e., carpal tunnel release or CTR). Hence this review only included workers who had a CTR.

This aim of this review was to generate a list of prognostic variables for work-related outcomes from the empirical literature (**Aim 2**), of workers who have had CTR surgeries.

3.2 Publications

Two publications were generated for this review, a systematic review protocol and the full review. They have both been accepted for publication.

The systematic review publication has been modified for inclusion in this chapter. Modifications have not changed the overall content of the review, but were made to reduce duplication of reported data; and for readability in the format of this thesis.

1. ***Peters SE**, Johnston V, Hines S, Ross M, Coppieters MW. Prognostic factors for return-to-work following carpal tunnel release: A systematic review. The Joanna Briggs Institute Library of Systematic Reviews. Accepted 23 April 2016.*

The published protocol has not been included in this chapter but can be viewed through the following web-link:

2. ***Peters SE**, Johnston V, Hines S, Ross M, Coppieters M. Prognostic factors for return to work following carpal tunnel release: A Systematic Review [Protocol]. The Joanna Briggs Institute Library of Systematic Reviews. 2011. http://connect.jbiconnectplus.org/ViewSourceFile.aspx?0=5931.*

3.3 Executive Summary

Background: CTS is a common problem, which is effectively managed by surgery. Screening for prognostic factors is important to identify those workers who are at greater risk of a poor work outcome to direct tailored interventions to facilitate RTW.

Objective: To synthesise the best available evidence on the association of pre-surgery prognostic factors with work-related outcomes in people who have undergone CTR.

Inclusion criteria

Types of participants: Participants included those who were employed at the time of surgery, had carpal tunnel surgery and planned to RTW.

Types of outcomes: The primary outcome was RTW.

Types of studies: Quantitative studies investigating at least one prognostic factor for a work-related outcome in studies of workers who had CTR were considered.

Search strategy: Eleven electronic databases were searched from their respective inception date up to July 2015. A total of 3893 publications were reviewed.

Methodological quality: The quality of the included studies was assessed by two reviewers using a modified version of an appraisal tool (Joanna Briggs Institute Meta-analysis of Statistical Assessment and Review Instrument (JBI-MAStARI)). The following criteria were evaluated: study population representativeness; clearly defined prognostic factors and outcomes; potential confounding variables; and appropriate statistical analysis.

Data extraction: Data extraction was performed using a modified version of the standardised extraction tool from JBI-MAStARI.

Data synthesis: Statistical pooling was not possible. Findings are presented in tables and narrative format.

Results: Eleven studies (13 publications) investigating 93 prognostic factors for delayed RTW or prolonged work disability outcomes, and 27 prognostic factors for work role functioning in 4187 participants, were identified.

Prognostic factors associated with workers' increased likelihood of an earlier RTW in a moderate to high quality study included: worker expected or desired fewer days off work; occupation; lower pain anxiety; and if CTS had not altered their work role.
Prognostic factors for a poorer work-related outcome also included: older age; lower household incomes; greater UE functional limitations; greater than two musculoskeletal pain sites; lower recovery expectations; worse mental health status; job accommodation availability; high job strain; high job demands with high job control; poor co-worker relationships; poor baseline work role functioning; less supportive workplace policies; pre-operative work absence due to CTS or work disability of any cause; workers' compensation status; attorney involvement; and post-diagnosis surgical wait time.

Conclusions: For workers who have had a CTR, there are a number of factors which may be modifiable to improve RTW outcomes.

Implications for practice: The factors associated with a worker being less likely to RTW should be considered in both clinical and RTW interventions. In particular, attention to the modifiable factors may improve work-related outcomes. The factors associated with a worker being more likely to RTW, could also be used to identify those workers who are more likely to have a better outcome.

Implications for research: Further research to identify the direction and strength of the association between prognostic factors and work-related outcomes is needed.

Keywords: Prognostic factor; carpal tunnel; upper extremity; return-to-work; work disability; risk factor

3.4 Introduction

Background

Work has been recognised for centuries as one of the most important roles that individuals perform. Work-related musculoskeletal disorders, such as CTS, are a leading cause of work disability, resulting in significant costs to workers, employers, insurers and society.(49, 153-155) The accepted paradigm within the medical and occupational health literature is the early identification of injured workers at greater risk of a delayed RTW resulting in prolonged absence from work, or sub-optimal functioning whilst at work.(9)

Carpal Tunnel Syndrome

CTS is the most common peripheral compression neuropathy in the UE.(156) The incidence rate of CTS has been found to be 2.3 cases per 100 persons.(157) It has a prevalence of 3.8% in the general population when diagnosed clinically and 2.7% when diagnosed neurophysiologically.(158) Prevalence in females is 9.2% and 6% in males,(159) with a peak between 40 to 60 years of age.(160)

CTS is caused by compression of the median nerve at the wrist.(161) Physiologically, there is increased pressure within the carpal tunnel that is formed by the carpal bones and the transverse carpal ligament. This increased pressure causes decreased function of the median nerve. Symptoms include pain, paraesthesia or numbness in the distal distribution of the thumb, index, middle and radial half of the ring finger.(162) In advanced stages, wasting of the thenar muscles, hand weakness and reduced dexterity can be observed.(159)

Surgery for Carpal Tunnel Syndrome

Surgery to release the carpal tunnel is called Carpal Tunnel Release (CTR). A CTR is indicated for individuals with persistent symptoms that have not responded to conservative management, have more severe symptoms (such as frequent numbness or thenar muscle wasting) or with electrophysiologically severe disease.(161, 163) Surgery has a reported success rate of approximately 90%.(164)

There are various types of surgical approaches used to release the carpal tunnel. Open CTR (OCTR) divides the carpal tunnel ligament using a palmar incision. In recent years, surgical techniques have evolved with the advent of minimal incision (mini-open) and endoscopic methods. These less invasive techniques have become more common due to reduced post-operative pain and iatrogenic symptoms.(165) Endoscopic CTR (ECTR) involves division of the transverse carpal ligament whilst leaving the overlying structures intact by using small portals to access the carpal tunnel. This is believed to reduce postoperative pain and scarring and hasten early return to function and work.(30) Two techniques are commonly used for ECTR: the single portal technique,(166) and the two portal technique.(28) A number of secondary procedures may also be performed concurrently. These include techniques such as epineurotomy, internal neurolysis, synovectomy and reconstruction of the transverse carpal ligament.(167)

Return-to-work following carpal tunnel release

Although the work-relatedness of CTS is controversial,(156, 168, 169) it has been documented to account for approximately 14% of UE disorders in industrial settings.(170) Moreover, the costs associated with a workers' absence can be high for not only the workers, but also for insurers and employers. Total time incapacitated following CTR is highly variable in the literature. Some studies report the average absence from work as low as 4.3 days,(171) and others as high as 3 months.(172, 173) In the United States in 2010, the median time away from work for a worker suffering from CTS was 25 days - three times higher than other occupational musculoskeletal condition, with a total societal cost exceeding $110 million.(174)

Studies examining interventions for facilitating RTW following CTR have been underrepresented in the literature.(147) However, a systematic review of randomised controlled trials found that work-related outcomes following either open and small incision CTR were highly variable.(30) These differences in RTW timeframes and outcomes are possibly influenced by a number of prognostic factors. Information on which prognostic factors influence RTW could be incorporated into interventions to improve their effectiveness.(154)

Prognosis for return-to-work following carpal tunnel release

Prognosis has been defined as "the probable course and outcome of a health condition over time" (p.552, 73) Knowledge of prognostic factors has been recognised as being important in the development of models used in intervention planning and clinical reasoning.(73, 175) A number of studies have investigated prognostic factors following CTR over the last two decades.(176-178) This suggests the variability in timeframes for RTW may not be purely medical in nature and may be impacted on by a number of both modifiable (e.g., type of work and psychological state) and non-modifiable factors (e.g., age or gender).

Identification of modifiable factors is especially pertinent to clinicians and other key stakeholders involved in the RTW process. Knowledge of which risk factors influence work-related outcomes may improve RTW outcomes and the costs associated with work disability. This can improve clinical pathways, develop interventions and influence organizational policies and laws to support workers returning to work in the safest and most (cost-) effective way.

Previous systematic reviews examining prognostic factors for RTW have focused on traumatic hand injury;(77, 179) acute orthopaedic trauma;(78) back injury;(79, 81, 180) lower limb amputation;(181) rheumatoid arthritis;(182) burns;(183) mental health;(88) traumatic brain injury;(99, 184) and stroke.(185) However, no systematic review has yet examined prognostic factors for work-related outcomes following CTR.

Therefore, the objective of this study was to review the evidence on prognostic factors (that could be measured pre-operatively) for work-related outcomes following CTR, using a predefined protocol.(186) The conceptual framework used to complete the review was based on the multi-factorial understanding of work disability(9) that postulates that factors related to the injury, to the worker and their workplace, to psychosocial functioning and due to legal or economic factors may influence RTW and the amount of time lost from work due to injury.(133, 187)

Challenges associated with Systematic Reviews of Prognostic Factor Studies

The challenges associated with conducting a systematic review of prognostic factors have been well documented.(87, 188) The methodology for such reviews is still being refined(189, 190) and at the time of developing this review's protocol was not as well developed as procedures for reviews of randomized controlled trials. Subsequently, this systematic review was conducted using The Joanna Briggs Institute (JBI) methodology.(191)

3.5 Definitions of terms used in this review

In this review, the following definitions of terms are used. A work-related outcome refers to any outcome pertaining to returning to work, work disability or functioning at work.

Work disability and RTW terms are often used synonymously however their definitions vary.

> ***Work Disability*** *can be operationally defined as "time off work, reduced productivity or working with functional limitations as a result (outcome) of either traumatic or non-traumatic clinical conditions" (p. 329.)(12)*

Return-to-work (or RTW) has been used interchangeably in the literature as both the process of returning an injured worker back to their pre-injury work capacity, and as an outcome.

> ***Return-to-work*** *is defined as a multi-phase process, encompassing a series of events, transitions, and phases as well as interactions with other individuals and the environment.(10)*
>
> ***RTW outcomes*** *are defined as measurable characteristics of workers' RTW status or experience. RTW outcomes are multifactorial and can be quantified many different ways - hours, duties, workplace.(10) Hence, a poor RTW outcome could be defined as an outcome in which the worker does not RTW at all or to their pre-injury hours or occupation. It might also mean that if the worker does RTW, the worker does not return to their pre-injury job, hours or the ability to perform their job is reduced.*
>
> ***Work role functioning*** *is defined as a workers ability to function (successfully) on the job following, or with, a medical condition. It is a measure of work limitations/ability with respect to various work demands, which can include physical, social, psychological/cognitive demands, work scheduling and output demands*.(176, 192)

Table 3.1: Taxonomy for variables used in this systematic review

Term used in Systematic Review	Terms used in Studies
Time to RTW	Length of work absence Length of sickness absence Length of post-operative work absence Days of absenteeism Time loss days Duration of work incapacity Duration of sick leave Duration of work disability
Attorney involvement	Lawyer involvement Legal involvement Hired Attorney

3.6 Objectives

The objective of this systematic review was to critically synthesise the best available evidence on the effect of prognostic factors measured pre-operatively on work-related outcomes in workers who had undergone CTR surgery.

Review questions

1. What are the prognostic factors (measured pre-operatively) associated with a poorer work-related outcome following CTR?
2. What are the prognostic factors (measured pre-operatively) associated with a better work-related outcome following CTR?

3.7 Systematic review methods

Inclusion criteria

Types of participants

This review considered articles for inclusion according to the following criteria:

1. Studies of patients/participants that have undergone a primary CTR and were planning to RTW;
2. Patients/participants were employed at the time of the surgery;
3. Studies investigating at least one prognostic factor; and,
4. Study design was appropriate for examining prognosis and the paper reported results with statistical analysis using multivariate analysis.

There were no restrictions on age, gender, type of work (occupation), or type of CTR surgery i.e., open, minimally invasive, single or double portal ECTR.

Phenomena of interest / Types of prognostic factors

This review will consider prognostic factors that were measured **pre-operatively** in the following domains:

- Socio-demographic factors e.g., age, education, hand-dominance;
- Worker clinical/physical factors e.g., pre-operative physical status, smoker, diabetes, obesity, pre-operative pain reporting baseline symptom severity and duration of symptoms, surgical factors;
- Psychosocial factors e.g., depression, self-efficacy, recovery expectations; family/social support;
- Workplace factors e.g., exposure to heavy lifting or vibration, psychological work demands, supervisor support, and job control;
- System/economic/legal factors e.g., workers' compensation status, income, legislative processes.

Prognostic factors that were determined post-operatively such as post-operative function or pain, or secondary surgical procedures (e.g., revision CTR) or interventions were not included. Definitions used to categorize prognostic factors described in this review are detailed in **Table 3.2**.

Table 3.2: Definitions of prognostic variables used in this review

Prognostic variable	**Definition**
Recovery Expectations	Recovery expectations are what the individual 'expects will occur' in the future with respect to their health condition.(55) *For example: "Do you think that you would be able to use your hand normally 3 months after the operation?"(193)*
Self-efficacy	Self-efficacy is related to the person's perceptions (e.g., belief or confidence) regarding their ability execute behaviours to achieve a future outcome.(194) *For example: " I believe I will be able to perform my usual duties and RTW." or " I am confident that I can RTW."*
RTW expectations	RTW expectation is related to the workers expectations regarding their RTW. *For example: "Amount of time worker wants off work"*(177)
Job satisfaction	Whether the worker is satisfied with his job and aspects of their job as a whole. *For example: "If you look at your work, salary, career possibilities, management and colleagues as a whole, how satisfied are you?"(193)*
Job accommodation	Job accommodation means modifying a job, job site, or the way in which a job is performed so the person with a disability can have equal access to all aspects of work. Accommodations may include, but are not limited to: 1) Making existing facilities used by employees readily accessible to and usable by persons with disabilities; 2) Job restructuring, modifying work schedules, reassignment to a vacant position; 3) Acquiring or modifying equipment or devices, adjusting or modifying examinations, training materials, or policies, and providing qualified readers or interpreters.(195)
Pain catastrophising	Pain catastrophising has been classified as a tendency to misinterpret and exaggerate situations that may be threatening.(196)
Pain anxiety	Anxiety that has resulted due to pain or fear of pain.
Job Strain	Job strain is different to job stress. While job stress generally refers to the demands at work that we experience as stressful, job strain refers to the negative physical and psychological toll that job stress takes when our jobs involve high demands and we have little decision-making power. Karasek first described job strain as resulting "not from a single aspect of the work environment, but from the joint effects of the demands of a work situation and the range of decision-making freedom available to the worker facing those demands. Job strain occurs when job demands are high and job decision latitude is low" (p. 287).(197)
Decision Latitude	Decision latitude is related to how freely a person can make decisions and exercise control over her or his work.
Job burnout	Job burnout (or occupational burnout) is characterized by physical, emotional or mental exhaustion, lack of enthusiasm and motivation, feelings of ineffectiveness, and also may have the dimension of frustration or cynicism and as a result, reduced efficacy within the workplace.(198)

Types of outcome measures

This review considered studies that examined the association between prognostic factors and the following work-related outcome measures:

1. Time to RTW following CTR (either days, months or years);
2. Total duration of work disability;
3. RTW capacity outcomes, that is the time workers returned to work in a defined capacity:
   - return to normal duties,
   - return to reduced capacity duties,
   - return to alternate duties or host employment,
   - did not RTW;
4. Other work-related outcomes of interest such as work role functioning, work ability.

Definitions of RTW and work disability were detailed in an earlier section of this review. Indemnity costs or work-related costs were not included as outcome measures.

Types of studies

This review considered any experimental study design including randomised controlled trials, non-randomised trials, quasi-experimental studies, cohort studies, case-control studies, and case series that examined prognostic factors for work-related outcomes and used appropriate statistical analysis for drawing conclusions on prognosis. Prospective, retrospective and cross-sectional studies that reported multivariate analysis of a prognostic factor and matched the review's outcomes were included in the systematic review.

Search strategy

Prior to undertaking this systematic review on this topic, a preliminary search of the Cochrane Library, JBI Library of Systematic Reviews, MEDLINE, CINAHL and the Database of Abstracts of Review of Effects (DARE) was performed to establish that no previous systematic reviews have been published on this topic.

The search strategy aimed to identify both published and unpublished studies from January 1990 to July 2015. This timeframe was chosen due to the high popularity of endoscopic surgery for workers and patients in the 1990s. The search strategy had no language limitations.

A three-step search strategy was utilised to identify studies. An initial limited search of MEDLINE and CINAHL was undertaken, followed by analysis of the text words contained in the title and abstract and of the index terms used to describe each article (**Table 3.3**). A second search, using all identified keywords and index terms, was then performed across all included databases. The Medline OVID search strategy is outlined in **Appendix I**. Thirdly, the reference lists of all identified reports and articles were searched for additional studies.

The databases that were searched included:

- Medline
- CINAHL
- Embase
- OTseeker
- PEDro
- ProQuest
- PubMed
- Web of Science
- ScienceDirect (first 1000 most-relevant hits were examined)

The search of the grey literature (and for unpublished studies) included:

- Dissertation Abstracts in the ProQuest Dissertation Library
- GoogleScholar (first 1000 most-relevant hits were examined)

Table 3.3: Keywords used in combination to create the search strategies

'carpal tunnel syndrome' OR 'carpal tunnel' OR 'carp$ synd$' OR 'carp$ tunn$' OR 'tunn$ synd$' OR 'median nerve entrapment' OR 'median nerve compression'
'surgery' OR 'surg$' OR 'decompression' or 'epineurotomy'
'return to work' OR 'sick leave' OR 'sick$ absence' OR 'time off work' OR 'return to employment' OR 'work loss' OR 'work disability' OR 'work resumption' or 'absenteeism'
'cohort studies' OR 'prospective study' OR 'retrospective study' or 'predict$' or 'prognost$' OR 'determ$' or 'course' or 'follow-up studies'

Method of the review

The references identified from the searches were entered into a bibliographic software package, EndNote X7 (Thomas Reueters, USA). Two reviewers assessed titles and abstracts against the inclusion/exclusion criteria independently and those that met the inclusion criteria were retrieved. The “Verification of Study Eligibility Form” was used (**Appendix II**). If the title and abstract of a study was inconclusive, the full text was retrieved for further review. Studies that have been published in duplicate with identical data were included only once. Two reviewers made decisions regarding study eligibility, and a third reviewer resolved any disagreements.

Assessment of methodological quality

Prior to inclusion in the review, papers selected for retrieval were assessed by two independent reviewers for methodological quality prior to inclusion. We used the JBI critical appraisal tool for cohort/case series studies, with an additional question,(191) specific for prognostic factors, so that all the sources of bias in prognostic studies could be adequately addressed.(190) Please refer to **Appendix III** for the Critical Appraisal Tool utilised in this systematic review.(191) Only those papers of sufficient quality were included. Sufficient quality was primarily determined by the reporting of the results. Only studies that reported multivariate statistics were included. A third reviewer resolved any disagreements between the two reviewers.

Studies were rated as high quality if 9-10 risk of bias items were fulfilled. Moderate quality was assigned for studies with 6-8 items. Low quality was assigned to those studies with ≤5 items being satisfied. For studies with a high risk of bias score (≤5), statistics are reported in the results section but are not included in the practice recommendations due to uncertainty of the reliability and validity of the study findings.

Data collection

Data was extracted from the eligible studies by two independent reviewers using a modified version of the JBI-MAStARI data extraction tool (**Appendix IV**). Additional sections were added to the JBI-MAStARI tool, specifically to ensure adequate data was extracted from studies regarding the prognostic factors studied in each study. The data extracted included specific details about the prognostic factors, populations, study methods and outcomes of significance to the review question and specific objectives. We also extracted data with respect to the phase of prognosis study.(73) The data extraction tool consisted of the following sections:

1. Description of the study: type of study design, study methods, statistical analysis methods, timing, and setting;
2. Prognostic Factor: description and measurement of prognostic/risk factor;
3. Participants; inclusion criteria, exclusion criteria, number of participants (recruited and analysed).
4. Methodological quality of the study;
5. Outcome Measures: Definition of outcome and method of assessment of outcome;
6. Results;
7. Reviewer Comments.

We did not contact authors for missing data.

Data synthesis

Odds or hazard radios were reported wherever possible. Odds ratios were calculated for the analysis from the data obtained from the publication if possible. Only results calculated using multivariate statistics were reported.

For studies examining the effect of a similar or same prognostic factor, a meta-analysis would have been performed to estimate a weighted measure of effect across studies. However, data was not able to be meta-analysed and therefore the data was summarised in narratively. Substantial heterogeneity was identified between the studies. The reasons for heterogeneity were explored based on the date of publication, setting, definition of the prognostic factor and/or outcome measured.

Where studies were rated as being low quality and having a risk of bias score of 5 or less, statistics were reported in the results section but not in the overall or practice recommendation sections.

Deviations from the review protocol

Although we planned to include publications with no language restrictions,(186) we were not able to have all the articles translated for this review. Only Spanish and German full texts were reviewed. It is planned to translate these articles in future updates of this review.

We modified the outcomes to include any work-related outcome. We included an additional outcome: other RTW outcomes of interest including work role functioning. This outcome was not considered in the protocol phase. However, the review authors felt that this outcome should be included due the valuable information it brings to this field of enquiry.

We did not include the secondary outcomes that were listed in the original study protocol due to the number of studies that included the primary outcome of interest. Thus, all included studies examined only a work-related outcome. It is recommended that the secondary outcomes be the focus of future supplementary systematic reviews.

The following inclusion criteria was clarified from the original protocol(186): ‘Study design was appropriate for examining prognosis and the paper reported results with statistical analysis appropriate to prognostic studies, that is multivariate analysis’.

3.8 Results

Study selection

The database searches were performed and a total of 2886 studies were retrieved. An additional 1000 most relevant articles were retrieved from a grey literature Google Scholar search. Seven publications were retrieved from other sources e.g., reference checking of included studies and of relevant systematic reviews on outcomes following CTR known to the authors. There were 140 duplicates removed from the search results. In total, 3893 titles and abstracts of studies were screened. Of these, 3567 were excluded. 176 were retrieved for review of the full text articles. There were 163 publications excluded after detailed examination, as they did not meet the inclusion criteria. Thirteen publications (11 studies) were assessed for methodological quality and included in the final review. Please refer to **Figure 3.1** for the PRISMA flow chart and **Table 3.4** for results of the database search.(199)

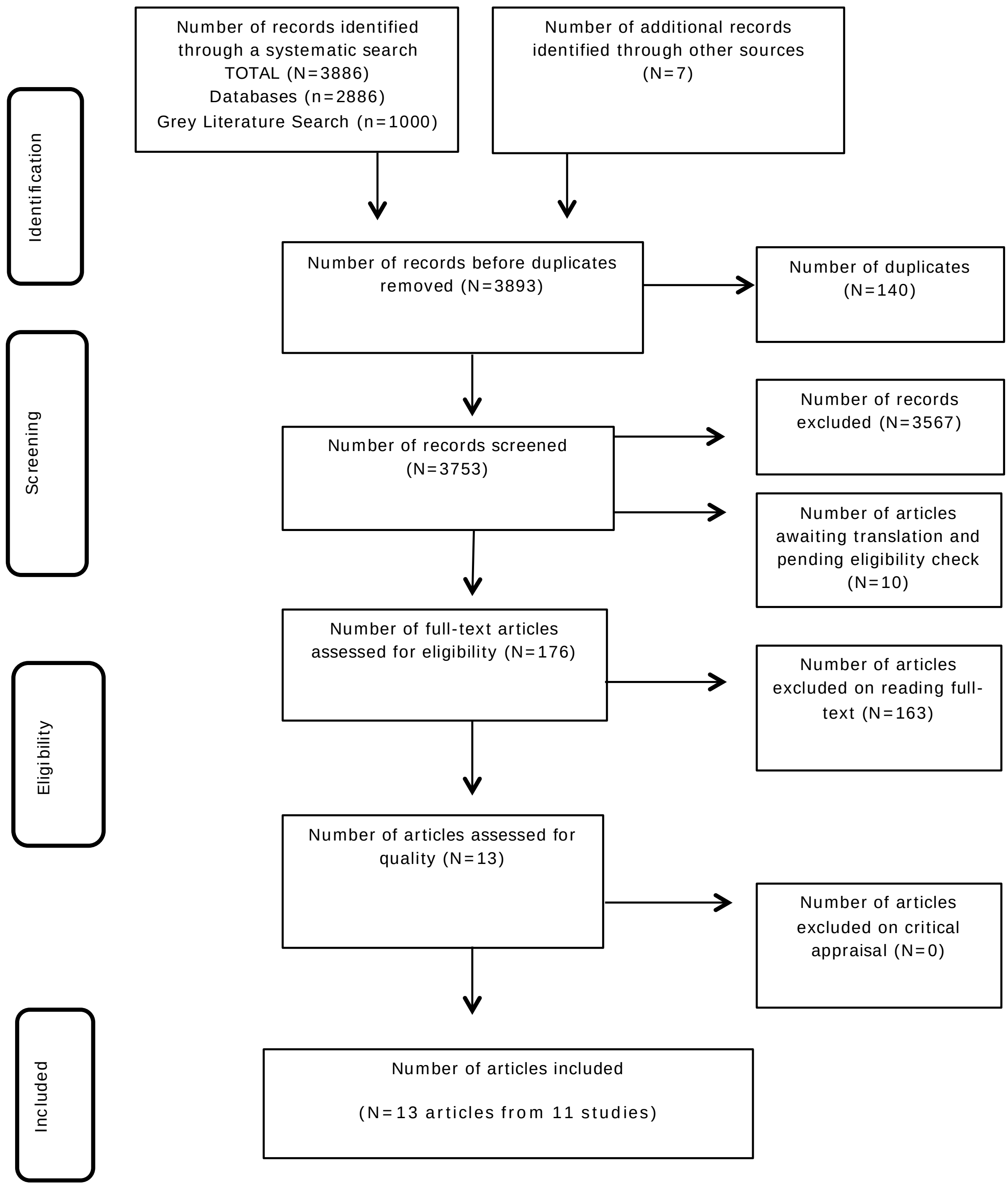


Figure 3.1: PRISMA flow diagram of search and study selection process

Table 3.4: Results of database searches

Database	Date of search	No. of Citations
Medline OVID	25 Aug 2013	142
Medline EBSCO[2]	14 July 2015	80
Cinahl	14 July 2015	69
Pubmed	14 July 2015	293
OT Seeker	14 July 2015	56
Proquest dissertations: Health and Medicine	14 July 2015	542
Web of science	14 July 2015	322
Pedro	14 July 2015	26
ScienceDirect	14 July 2015	1000*
Proquest research library: Health and Medicine	14 July 2015	356
Google Scholar[3]	20 June 2015	1000
TOTAL		**3886**

3.8.3 Description of included studies

The included studies comprised of five prospective cohort studies,(176-178, 192, 193, 200, 201) three cross-sectional studies,(202-204) two retrospective cohort studies,(205, 206) and one retrospective study nested within a larger prospective study.(207) It is important to note that the published papers by Amick et al,(192) Gimeno et al(176) and Katz et al(201) are all sub-sets of the *'Work and CTS in Maine'*, and therefore include the same participants. These papers are treated as one study to avoid double counting of participants. However, results and details of the papers (i.e., prognostic variables and outcomes) are reported separately as each paper investigated different variables from the same study. A summary of the characteristics of the included studies is included in **Appendices V-VII**.

The total number of participants included in the studies was 4187 consisting of 1436 male and 2790 female participants. The sample sizes ranged from 59 to 1697 participants. The studies only included working age participants over 18 years old. All participants were diagnosed with CTS, however the methods of diagnosis varied between studies. Similarly, the types of surgery varied between studies and included ECTR, OCTR and mini-open techniques. Two studies investigated the type of surgery as a prognostic variable.(178, 206)

[2] Medline search from 2013 was included as the search engine platform changed in 2015 and revealed fewer hits then the 2013 search.

[3] Only 1000 most relevant titles and abstracts were scanned

The included studies were conducted in various countries. Nine studies were conducted in several states of the USA.(176-178, 192, 201, 203, 204, 206, 207) Four studies were conducted in European countries including Belgium,(202) France,(205) Denmark,(193) and Sweden.(200)

Data was collected from a variety of sources including: mailed questionnaires;(176, 178, 192, 205) telephone interviews;(204) face to face facilitated interview/completion of questionnaires;(177) patient completed questionnaires and clinical evaluation;(193, 201) administrative data from an insurer database;(206) or a combination of mailed questionnaires and administrative data sources and/or medical file audit.(202, 203, 207)

Various work-related outcomes were studied. Three studies measured time to RTW prospectively using a continuous outcome.(177, 202, 206) Four studies measured RTW as a dichotomous outcome at various time points.(176, 178, 192, 193, 200, 201) Four studies measured RTW at a cross-sectional time point following surgery.(203-205, 207) One study measured work role functioning and participants returned to work at various time points.(192) One study analysed time to RTW in relation to work capacity i.e., modified duty or full duty.(177) One study measured RTW with respect to levels of work role functioning but later converted this into a dichotomised variable of RTW.(176) One study measured both long term overall work disability (including both pre-surgery and post-surgery CTR work absence) and long term post-surgical work disability.(207)

In the studies included in the systematic review, there were 93 prognostic variables for RTW and 27 prognostic variables for work role functioning.

Description of excluded studies

Many studies were excluded because they did not conduct multivariate analysis (for example, only bivariate analysis data were reported). Others were excluded because the population of workers included in the study were poorly defined. Others were excluded if the prognostic variables were not measured pre-operatively. The reasons for exclusion of full text papers is available in the original publication.

Methodological quality

An assessment of the methodological quality of each study was performed using the methods described above (**Table 3.5**). Overall, only three of the publications were high quality; five were moderate quality; and five were low quality. The most adequately addressed items were: i) the sample studied was representative of the population as a whole; i) confounding factors were identified and handled appropriately; and ii) appropriate statistical analysis and reporting. All included studies applied univariate/bivariate statistical analysis to identify significant prognostic factors, followed by multivariate analysis to adjust for confounding factors.

The most inadequately addressed items were: i) participants being at a similar time point post-surgery when the outcome was being measured; ii) outcomes and their measurement were often not defined in sufficient detail; iii) outcomes of people who withdrew were often not described or methods of how they were handled in the analysis; iv) non-significant results were not reported in full (i.e., numerical values with confidence intervals); v) some variables were recorded but were missing from the univariate/bivariate analysis; and v) the prognostic variables were not clearly defined or measured using reliable/valid methods. Other limitations included many of the studies being either cross-sectional or retrospective in their nature and some depended on patient recall of greater than two months for measuring the variables/outcome.

Table 3.5: Results for the critical appraisal of included studies using the JBI – MAStARI critical appraisal instrument for cohort/case control studies

Study	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Total items
Amick 2004(192)	Y	Y	NA	Y	Y	Y	N	Y	U	Y	7
Atroshi 1998(200)	Y	Y	NA	Y	U	Y	Y	U	U	Y	6
Butterfield 1997(203)	Y	N	NA	Y	U	NA	NA	U	U	U	2
Carmona 1998(204)	Y	N	NA	Y	Y	NA	NA	Y	U	Y	5
Cowan 2011(177)	Y	Y	NA	Y	Y	Y	Y	Y	Y	Y	9
De Kesel 2008(202)	Y	N	NA	U	U	NA	NA	N	U	U	1
Gimeno 2005(176)	Y	Y	NA	Y	Y	Y	Y	Y	Y	Y	9
Hansen 2009(193)	Y	Y	NA	Y	U	Y	Y	U	U	U	5
Katz 1997(201)	Y	Y	NA	Y	Y	Y	Y	Y	U	Y	8
Katz 2005(178)	Y	Y	NA	Y	Y	Y	N	Y	U	Y	7
Parot-Schinkel 2011(205)	Y	U	NA	Y	U	NA	U	N	Y	Y	4
Spector 2012(207)	Y	Y	NA	Y	Y	Y	Y	Y	Y	Y	9
Wasiak 2007(206)	Y	NA	NA	Y	Y	NA	NA	Y	Y	Y	6
%	100	72.7	0	90.9	72.7	72.7	54.5	72.7	45.4	90.9	

Key: *Y = Yes, N = No; NA = not applicable*

Findings of the review

An overview of the prognostic factors studied in each included study, and the definitions and tools used to measure the variables, is presented in **Appendix V**. A detailed list of the statistical analysis results (including both significant and non-significant findings results) is presented in **Appendix VI**.

For this section of the review, we report a narrative summary of the individual prognostic factors. Pooling of data was not possible due to lack of homogeneity between studies (that is, compensation settings, outcomes, time points) and also inadequate reporting of non-significant results. Thus, there were a number of reasons why it was not appropriate to undertake a meta-analysis(188, 190, 208):

- The included studies were clinically diverse which could render the meta-analyses meaningless, and, therefore, the effects of the prognostic variables can be concealed. For this review, the outcomes and time points of measurement were diverse. It is recommended in cases of clinical heterogeneity that statistical solutions not be used to combine results using meta-analyses, as interpretation of these results can be misleading.
- There was a high risk of bias in some of the included studies. When bias is present, meta-analyses will magnify the bias and discredits the interpretation of meta-analysed results.
- Many of the studies did not report the actual numerical statistics of their findings. More often, non-significant or even significant findings were not numerically reported or only partially reported (that is, no confidence intervals or p values were specifically reported).

Prognostic factors are detailed in sections with respect to each work-related outcome measured. Work-related outcomes included in this review include: i) RTW outcome as a dichotomous outcome; ii) long term work disability (>12 months); iii) time to RTW as a measure of work capacity; and iv) RTW as a continuous outcome and v) work role functioning. Results were reported either using dichotomous (binary) (e.g., ‘returned to work’ versus ‘not returned to work’) data or continuous data (e.g., duration of work disability or time to RTW).

The review findings are categorised into five subgroups: i) socio-demographic factors; ii) worker clinical and physical factors; iii) psychosocial factors; iv) work-related factors; and v) system/economic/legal factors. Only factors measured pre-operatively are reported.

A total of 93 factors for RTW were identified in this review. There were 27 factors for work role functioning identified. Prognostic factors for RTW (that could be measured pre-operatively) and were reported in more than one study included:
Socio-Demographic factors: age; gender; education; dominance; ethnicity/race; marital status; number of dependent children; geographic location.
Worker Clinical/Physical factors: type of CTR surgery; nerve conduction study results; overall symptom status; CTS/pain interference at work; duration of symptoms pre-surgery; Phalen's sign; Tinel's sign; static 2-point discrimination; grip strength; functional status; general health state/quality of life; bilateral surgery or symptoms; number of associated surgeries; two or more MSD pain sites; number of comorbidities; diabetes, body mass index (BMI); previous hand trauma; previous CTR or episodes of CTS; level of pre-surgery disability; smoking status; alcohol consumption.
Psychosocial factors: mental health status; depression; (pain) catastrophising; recovery expectations; family/peer support.
Work-related factors: occupation; classification of occupation type; overall score for ergonomic demands at work; vibration exposure; frequency of hand intensive tasks; employer offered job accommodation; psychosocial work conditions; worker's perception of cause of injury; job satisfaction.
Economic/legal/system factors: workers' compensation status; attorney involvement; pre-operative sick leave.

For studies of moderate or high quality, and identified prognostic factors associated with a better work-related outcome are reported in **Table 3.6**, and for a poorer outcome in **Tables 3.7-3.10**.

Table 3.6: Prognostic factors associated with a worker being *more likely* to RTW in a moderate to high quality study

Domain	Prognostic Factor
Psychological	Worker expects to have less days off work Worker desired to have less days off work Lower pain anxiety
Work-related	Occupation (desk-based) CTS has not altered work role

Table 3.7: Prognostic factors associated with a worker being *less likely* to have returned to work at 2 months in a moderate to high quality study

Domain	Prognostic Factor
Work-related	High job demands in conjunction with high job control

Table 3.8: Prognostic factors associated with a worker being *less likely* to have returned to work at 6 months in a moderate to high quality study

Domain	Prognostic Factor
Socio-demographic	Household income
Clinical/physical	Greater than two musculoskeletal pain sites
Psychological	Worse mental health status (anxiety / depression)
Work-related factors	High job strain (i.e., high job demands with less job control) Pre-operative work absence due to CTS Poorer baseline work-role functioning Less supportive workplace organisational policies and procedures
System/economic/legal	Workers' compensation status Hiring an attorney

Table 3.9: Prognostic factors associated with a worker being *less likely* to have returned to work at 12 months in a moderate to high quality study

Domain	Prognostic Factor
Socio-demographic	Older age
Clinical/physical	Greater UE related physical limitations
Psychological	Lower recovery expectations
Work-related factors	Less supportive workplace organisational policies and procedures Poor relationships with co-workers Job accommodation availability
System/economic/legal	Workers' compensation status Hiring an attorney Receiving compensation before surgery

Table 3.10: Prognostic factors associated with a worker being *less likely* to have returned to work using a continuous RTW outcome in a moderate to high quality study

Domain	Prognostic Factor
System/economic/legal	Work disabled before surgery Greater number of days waiting to have surgery (related to insurer) Attorney involvement

i) Return-to-work status (dichotomous) at pre-specified time points

Five studies examined RTW status as a dichotomous outcome (that is, whether a participant had returned to work or not) at pre-specified time-points (i.e., >21 days; 2 months; 3 months; 6 months; 12 months). A full description of the included studies is included in **Appendix V** and all analyses are reported in **Appendix VI**.

One study by Hansen and colleagues recorded time to RTW of 75 patients from two hospitals in Denmark as a continuous variable which was later dichotomised into two groups with a cut-off of 21 days.(193)

Two publications reported on prognostic variables for RTW status at two months.(176, 178) Gimeno et al examined prognostic variables to RTW status of 128 workers at two months within Karasek's job strain model.(176) In this study the work role functioning questionnaire was used to create a three level outcome variable: i) had returned to work and were functioning successfully (able to meet job demands at least 90% of the time; ii) had returned to work but were functioning with limitations (unable to meet the job demands at least 90% of the time; iii) had not returned to work for health reasons. These measures of work role functioning were then dichotomised into RTW and those that had not returned to work at the specified time points. Job strain was measured using the Job Content Questionnaire domains of Job Demands and Job Control. The scores from the two domains then allowed a four tiered variable to be created: 1) Low strain i.e., fewer demands and high control; 2) High strain i.e. higher demands and less control; 3) Active i.e., higher demands and more control; 4) Passive i.e., fewer demands and less control. The study by Gimeno et al is part of the larger cohort 'Work and CTS in Maine'.(176) In the study publication authored by Katz et al, the two-month interval data was collected but the results were not reported explicitly in the publication;(178) due to the two-month data being similar to the six-month data.

Atroshi and colleagues prospectively measured prognostic variables for RTW by three months following CTR surgery in 128 patients from a hospital in Sweden.(200)

Three publications examined prognostic variables association with RTW status at six months.(176, 178, 201) In an early study published in 1997 by Katz et al ('Maine CTS Study'), 135 participants were tracked prospectively and participants reported whether they had returned to work by six months following surgery.(201) In a later prospective cohort also authored by Katz et al in 2005 (‘Work and CTS in Maine’), 181 participants were asked whether they were working full time, part time or not working, and this data was later dichotomised to whether the participants were ‘working’ versus ‘not working’.(178) From the same cohort used in the 2005 Katz et al study, Gimeno also analysed 122 workers to evaluate whether domains within Karasek’s job strain model(197) were predictive of RTW status at six months.(176) Again, it is important to note that the papers by Gimeno et al and Katz et al include some participants from the same dataset (‘Work and CTS in Maine’, however different prognostic variables are reported in each publication.(176, 178)

Only one study by Katz et al (2005) investigated associations between prognostic variables and RTW at 12-months in 157 workers.(178)

In most of the studies not all the results and exact p-values were listed for the factors entered into the multivariate analysis.(178, 193, 200, 201) In the 2005 study by Katz et al, a p-value of 0.015 was used to enter the variables into the multivariate analysis, and it is assumed that this was the value set for significance in the multivariate analysis.(178) Statistics were mostly not reported for non-significant results and some prognostic variables were recorded but were missing from the results sections. This risk of bias, and the p-value (i.e., the level of significance set), or lack of reporting the exact statistical value, needs to be considered when interpreting the results of these studies.

a. Socio-Demographic Factors

Return-to-work status at >21 days

One study by Hansen et al examined the association of socio-demographic factors and RTW status at >21 days.(193) No socio-demographic variables were found to be prognostic for RTW at > 21 days. Age and sex were not significant for predicting which workers will not RTW after 21 days.

Return-to-work status at 3 months

One study examined the association of socio-demographic factors and RTW status at three months.(200) No socio-demographic variables were found to be significant in Atroshi et al.(200) Non-significant socio-demographic variables for RTW at three months included: age; sex; and hand dominance.

Return-to-work status at 6 months

Three studies examined the association of socio-demographic factors and RTW status at six months.(178, 200, 201) Lower household annual income was found to be significant of not being at work at six months following CTR (**Table 3.11**).(178) Variables that were not associated with not returning to work at six months included: age;(178, 200, 201) sex;(178, 200, 201) years of formal education;(178, 201) marital status;(178, 201) and hand dominance.(200)

Table 3.11: Socio-demographic factors with a significant association with RTW status at 6 months

Factor	Multivariate analysis result	Study quality
Household income	OR=3.6, 95% CI 1.5-8.8, p<0.15	Moderate

Return-to-work status at 12 months

One study examined the association of socio-demographic factors and RTW status at 12 months.(178) For every ten-year increase in age, the risk of a not returning to work at 12 months increased significantly (**Table 3.12**). Variables that were not associated with being off work at 12 months included: sex; years of formal education; marital status; lower household annual income.

Table 3.12: Socio-demographic factors with a significant association with RTW status at 6 months

Factor	Multivariate analysis result	Study quality
Older age	OR=1.8, 95% CI,1.07-3.01, p<0.15	Moderate

b. Clinical/Physical Factors

Return-to-work status at >21 days

One study examined the association of worker clinical/physical factors and RTW status at >21 days.(193) A worse result from a pre-operative nerve conduction study was prognostic for workers not returning to work until after 21 days in Hansen et al (**Table 3.13**).(193) Non-significant variables for RTW after 21 days included: CTS risk factors; duration of symptoms; comorbidities; self-reported health status; functional status; symptom status; and nerve conduction study results.

Table 3.13: Worker clinical/physical factors with a significant association with RTW status at >21 days

Factor	Multivariate analysis result	Study quality
Worse pre-operative NCS result	OR= 1.74, 95% CI 1.14-2.41, $p<0.05$	Low

Return-to-work status at 3 months

One study examined the association of worker clinical/physical factors and RTW status at three months.(200) In Atroshi et al, no variables were predictive of a non-RTW at three months including: daytime numbness and tingling; nocturnal paraesthesia; diminished sensibility; patient reported weakness; Phalen's test; Tinel's sign; thenar atrophy; static two-point discrimination; grip strength; lateral pinch strength; nerve conduction study results; and ability to perform activities of daily living (ADLs).

Return-to-work status at 6 months

Three studies investigated prognosis for RTW at six months.(178, 200, 201) A worker having more than two musculoskeletal pain sites was found to be predictive of being off work at six months in Katz et al (**Table 3.14**).(178) Variables that were found to be not associated with a non-RTW at six months included: type of surgery;(178, 201) alcohol consumption;(178, 201) smoking status;(178, 201) baseline symptom severity;(178, 201) thenar atrophy;(200) daytime numbness and tingling;(200) nocturnal paraesthesia;(200) diminished sensibility;(200) Phalen's sign;(200) Tinel's sign;(200) patient reported weakness;(200) functional limitations;(178, 200, 201) grip strength;(200, 201) pinch strength;(200) two-point discrimination;(200) bilateral surgery or symptoms;(178, 201) nerve conduction study results;(178, 200) duration of symptoms;(178) and BMI.(178)

Table 3.14: Worker clinical/physical factors with a significant association with RTW status at 6 months

Factor	Multivariate analysis result	Study quality
More than two musculoskeletal pain sites	OR= 4.3, 95% CI 1.2-15.0, $p<0.15$	Moderate

Return-to-work status at 12 months

Only one study examined the association of clinical/physical factors and RTW at 12 months.(178) Greater physical functional limitation (using the Brigham Functional Limitations Scale) measured at baseline was significantly associated with work absence at

12 months (**Table 3.15**). Variables that were not associated with a non-RTW at twelve months included: type of surgery (ECTR versus OCTR); alcohol consumption; smoking status; baseline symptom severity; bilateral CTR surgery or symptoms; worse nerve conduction study results; duration of symptoms; BMI; and more than two musculoskeletal pain sites.

Table 3.15: Worker clinical/physical factors with a significant association with RTW status at 12 months

Factor	Multivariate analysis result	Study quality
Greater UE functional limitations	OR=2.02, 95% CI 1.21-3.39, $p<0.15$	Moderate

c. Psychosocial Factors

Return-to-work status >21 days

One study examined the association of psychosocial factors and RTW status at >21 days.(193) In the study by Hansen et al, blaming oneself for the hand problem was prognostic for workers returning to work after 21 days (**Table 3.16**).(193) Non-significant variables for a RTW after 21 days included: fear of chronicity; belief that the hand problem will be cured by three months after the operation (i.e., recovery expectations); support from family or friends; and feelings of being alone with the hand problem.(193)

Table 3.16: Psychosocial factors with a significant association with RTW status at >21 days

Factor	Multivariate analysis result	Study quality
Worker blaming oneself for the hand problem	OR=1.26, 95% CI 1.01-1.42, $p<0.05$	Low

Return-to-work status at 6 months

Two studies examined the association of psychosocial factors and RTW status at six months.(178, 201) Worse mental health status (anxiety and/or depression) was found to be predictive for workers not returning to work by six months following surgery in the 1997 study conducted by Katz et al (**Table 3.17**).(201) However, both worse mental health state and depression were not found to be predictive in their later 2005 study.(178) Baseline poorer self-efficacy and the worker not having a supportive family were not found to be predictive of workers not returning to work by six months in the 2005 study by Katz et al.(178)

Table 3.17: Psychosocial factors with a significant association with RTW status at 6 months

Factor	Multivariate analysis result	Study quality
Worse mental health status (anxiety/depression)	OR=1.4, 95% CI 1.1-1.7, p=0.01	Moderate

Return-to-work at 12 months

One study examined the association of psychosocial factors and RTW status at 12 months.(178) In the 2005 study by Katz et al, no psychosocial factors were found to be prognostic of RTW status at 12 months. A number of psychosocial factors were not predictive of not being at work at 12 months including: poorer mental health state; depression; baseline poorer self-efficacy; and the worker not having a supportive family.

d. Work-related factors

Return-to-work status >21 days

One study examined the association of work-related factors and RTW status at >21 days.(193) In the study by Hansen et al, no work-related prognostic variables were associated with RTW status at >21 days in the study by Hansen et al.(193) Non-significant variables included: high demands on hand function at work; consideration of job change; lack of support from family/friends; and job dissatisfaction.

Return-to-work status at 2 months

Two studies examined the association of work-related factors and RTW status at two months.(176, 178) However, only one study explicitly reported the two-month data. In the study conducted by Gimeno and colleagues, workers with both high job demands in conjunction with high job control over their work were found to be less likely to RTW at two months (**Table 3.18**).(176) Non-significant work-related variables for RTW status at two months included: low psychological job demands; high job strain i.e., having a job with higher demands and lower control; passive (low job demands and low job control); and high psychological job demands.(176)

Table 3.18: Work-related factors with a significant association with RTW status at 2 months

Factor	Multivariate analysis result	Study quality
High job demands with high control	OR=0.22, 95% CI 0.09-0.59, p=0.014	High

Return-to-work status at 3 months

One study examined the association of work-related factors and RTW status at three months.(200) No factors were found to be significant in the study by Atroshi et al.(200) Type of work and vibration exposure were found to be non-significant for RTW status at three months.

Return-to-work status at 6 months

Four studies examined the association of work-related factors and RTW status at six months.(176, 178, 200, 201) Having a job with higher job demands in conjunction with less job control (i.e., high job strain) was predictive of not returning to work at six months (**Table 3.19**).(176) Variables found to be non-significant for RTW status at six months included: high psychological job demands;(176, 178) low job control only;(176) low job control in conjunction with low job demands;(176) high job demands in conjunction with high job control;(176) low job strain;(176) occupation;(178, 200, 201) self-reported exposure to force and repetitive tasks;(178, 201) keyboard activity;(201) vibration exposure;(200) low job control;(178) less supportive work colleagues;(178) less supportive supervisors;(178) low job security;(178) job (dis)satisfaction;(178) number of employees;(178) and less supportive organisation policies and procedures.(178)

Table 3.19: Work-related factors with a significant association with RTW status at 6 months

Factor	Multivariate analysis result	Study quality
Higher job demands in conjunction with less job control (i.e., high job strain)	OR=0.14, 95% CI 0.04-0.43, p=0.001	High

Return-to-work status at 12 months

One study examined the association of work-related factors and RTW status at 12 months.(178) Less supportive organisation policies and procedures were found to be prognostic for workers being off work at 12 months (**Table 3.20**). Variables that were not associated with not returning to work by six months included: occupation; self-reported exposure to force and repetitive tasks; exposure to keyboard activity; low job control; less supportive work colleagues; less supportive supervisors; low job security; job (dis-) satisfaction; and number of employees.

Table 3.20: Work-related factors with a significant association with RTW status at 12 months

Factor	Multivariate analysis result	Study quality
Less supportive organisation policies and procedures	OR=2.94, 95% CI 1.18-7.34, p<0.15	Moderate

e. Economic/Legal Factors

Return-to-work status >21 days

One study examined the association of economic/legal factors and RTW status at >21 days.(193) Hansen et al's study found that pre-operative sick leave was prognostic for workers returning to work after 21 days (**Table 3.21**).(193) Workers' compensation status was found to be non-significant.

Table 3.21: Economic/legal factors with a significant association with RTW status at >21 days

Factor	Multivariate analysis result	Study quality
Pre-operative sick leave	OR=7.4, 95% CI 2.12-25.03, p<0.05	Low

Return-to-work status at 6 months

Two studies examined the association of economic/legal factors and RTW status at six months.(178, 201) Factors that were significantly predictive of workers not returning to work by six months following CTR were: pre-operative work absence due to CTS;(201) and workers' compensation status (**Table 3.22**).(201) However, the 2005 study by Katz et al, workers' compensation status and pre-operative work absence due to CTS were not found to be significant at six months post-surgery. Union involvement(178) and hiring an attorney(201) were also found to be non-significant for RTW status at six months. (178) Hiring an attorney was found to be predictive of RTW status at six months.(178)

Table 3.22: Economic/legal factors with a significant association with RTW status at 6 months

Factor	Multivariate analysis result	Study quality
Pre-operative work absence due to CTS	OR= 3.6, 95% CI 1.3-9.7, p<0.01	Moderate

Workers' compensation status	OR= 5.7, 95% CI 1.6-21.0, p<0.01	Moderate
Hiring an attorney	OR=8.8, 95% CI 2.0-38.0, p<0.15	Moderate

Return-to-work status at 12 months

One study examined the association of economic/legal factors and RTW status at 12 months.(178) No economic/legal factors were found to be prognostic of RTW status at 12 months.(178) Union involvement; workers' compensation status; pre-operative sick leave; hiring an attorney were not statistically significant prognostic variables for a worker not having returned to work at 12 months.

ii) Long-term work disability

Only one study examined long-term work disability of greater than 12 months duration.(207) Spector and colleagues performed a retrospective analysis on data from the 'Washington State Workers' Compensation Disability Risk Identification Study Cohort'. They interviewed 670 workers in conjunction with data from insurance records. These data collection methods were used to identify prognostic variables for two outcomes. These were: 1) long-term work disability overall (not just related to the CTR claim, that is these workers had all had surgery but may have been work disabled previously) and 2) long-term work disability related specifically to the CTR claim. They dichotomised the data at 12 months to establish whether a worker had returned to work or not at this time point as a measure of long-term work disability. A full description of the included studies is included in **Appendix V** and all analyses are reported in **Appendix VI**.

a. Socio-Demographic factors

Older age was found to not be significant in predicting overall long-term work disability.(207) Older age; smoking status; or alcohol consumption were not predictive of post-surgical work disability.(207)

b. Clinical/physical factors

Worse functional status (>75th percentile using the Levine CTS Questionnaire) was found to be predictive of both overall long-term work disability; and long-term work disability related specifically to the CTR (**Table 3.23**).(207) Variables that were found to be non-significant for predicting overall long-term work disability included: worse functional status (50-75th percentile using the Levine CTS Questionnaire); pain intensity of ≤8 out of 10; smoker; comorbidities; pain interference at work; lower quality of life score (SF-36); bilateral symptoms. Similarly the following factors were not predictive for post-surgery long-term work disability included: pain intensity of ≤8 out of 10; and worse functional status (50-75th percentile using the Levine CTS Questionnaire).

Table 3.23: Clinical/Physical factors with a significant association with long-term work disability related to the CTR only

Factor	Multivariate analysis result	Study quality
Worse functional status	OR= 4.31, 95% CI 1.26-14.72, p<0.05	High

c. Psychosocial factors

Low recovery expectations were found to be predictive of both overall long-term work disability and post-surgery long-term work disability (**Table 3.24**).(207) Variables that were found to not be statistically significant in predicting overall long-term work disability or post-surgery work disability included: high fear avoidance for work; and high pain catastrophising.

Table 3.24: Psychosocial factors with a significant association with long-term work disability related to the CTR only

Factor	Multivariate analysis result	Study quality
Low recovery expectations	OR=2.15, 95% CI 1.15-3.99, <0.05	High

d. Work-related factors

Poorer relationships with co-workers were predictive of both overall long-term work disability and post-surgery work disability (**Table 3.25**).(207) Job dissatisfaction was predictive of overall long-term work disability but not post-surgery work disability (**Table 3.25**). Job accommodation availability was predictive of not being long-term work disabled both overall and after CTR. ‘Being in the job for greater than six months’ was found non-significant in predicting overall long-term work disability.

Table 3.25: Work-related factors with a significant association with long-term work disability related to the CTR only

Factor	Multivariate analysis result	Study quality
Poor relationships with co-workers	OR= 2.26, 95% CI1.17-4.35, p<0.05	High
Job accommodation	OR=0.38, 95% CI 0.18-0.80, <0.005	High

e. Economic/Legal factors

Receiving disability compensation before surgery was predictive of both overall long-term work disability and post-surgery long-term work disability (**Table 3.26**).(207) Having 30 workdays or more off work in the past year was not predictive of either overall long-term work disability or post-surgery work disability.

Table 3.26: Economic/legal factors with a significant association with long-term work disability related to the CTR only

Factor	Multivariate analysis result	Study quality
Receiving disability compensation before surgery	OR= 2.94, 1.57-5.52, <0.0001	High

iii. Time to RTW as a measure of work capacity (modified, part-time, full duty)(continuous)

The association between prognostic factors and time to RTW, dependent on the work capacity that the worker returned to, was examined in only one study.(177) In the prospective community-based cohort study authored by Cowan et al, 66 participants' outcomes for return to modified or part-time work duty were analysed between two and four months.(177) This study also reported return to modified or part-time work duty and full-duty using a multivariate regression model (and these outcomes are reported separately in **Appendix VI**).(177) The focus of this study was variables prognostic of an *earlier* RTW.

Return to modified work

In the study by Cowan et al, the best prognostic model for an earlier return to modified work included the factors 'desk-based work' and the 'number of days the worker expected to have off work following surgery' and 'the number of days the workers desired to have off work'.(177) This model accounted for 68% of the variability for return to modified work (**Table 3.27**).

Additionally in a sub-analysis of desk-based workers, the best multivariable model included the number of days a worker desired to take off work and catastrophic thinking both contributing 61% cumulative variance in the model. For those in non-desk based work, the best model included days the worker expected to have off work, and days the worker desired to have off work (70% of the cumulative model variance). For full-time workers, desired time off work contributed 42% cumulative variance to the model, whilst expected time off work accounted for 57% of cumulative variance for the part-time work duty workers.

Table 3.27: Factors with a significant association with modified work duty (continuous) for all subjects (regardless of occupation or work status)

Factor	Multivariate analysis result	Study quality
	R^{2*}=0.68 F=43.8, p<0.001	High
Less expected time off work	R^{2**}= 0.36	
Less desired time off work	R^{2**}= 0.06	
Work type (desk-based)	R^{2**}= 0.02	

* R^2 is for the variance of all factors in the model

**R^2 reported for the individual factors is the part correlation coefficient squared

Return to full duty

In Cowan et al, predictors of return to full-duty included 'desk-based work', 'altered work role due to CTS', 'lower pain anxiety' and 'fewer number of days a worker expected to take off', which accounted for 43% of the cumulative variance (**Table 3.28**).(177)

Additionally a sub analysis of the full-duty desk-based workers found an association with 'lower pain anxiety' (measured using the Pain Anxiety Symptom Scale) and 'lower post-operative DASH' (post-operative variables are not the focus of this review) accounting for 29% cumulative variance. Earlier return to non-desk based work was associated with 'less expected time off work', accounting for 40% variance. Earlier return to part-time work was associated with 'lower pre-operative DASH' and 'lower pain anxiety' accounting for 47% cumulative variance. Earlier return to unrestricted full-time work was associated with 'desk-based work', 'CTS had not altered the work role' and 'fewer days that a worker desired to have off work', accounting for 47% cumulative variance in the multivariable model.

Table 3.28: Factors with a significant association with full work duty (continuous) for all subjects (regardless of occupation or work status)

Factor	Multivariate analysis result	Study quality
	R^{2*}=0.43 F=12.6, p<0.001	High
Less expected time off work	R^{2**}= 0.18	
Work type (desk)	R^{2**}= 0.06	
CTS had not altered work role	R^{2**}= 0.03	
Lower pain anxiety	R^{2**}=0.03	

* R^2 is for the variance of all factors in the model
**R^2 reported for the individual factors is the part correlation coefficient squared

iv. Time to RTW (any capacity) (continuous)

Five studies reported time to RTW (regardless of work capacity or job accommodation) as a continuous variable.(202-206)

Butterfield and colleagues analysed prognostic variables for total time loss days after CTR in a cross-section of a cohort of workers who had outcomes reported in an Oregon (USA) insurance database.(203) Participants were between five months and three years post-operation at the time of the study and results were analysed as continuous data. Results were reported as variance contributing to the final multivariate regression model.

Carmona et al also used a cross-section of a community-based cohort in which 59 participants (identified through the Californian Health Department) reported time to RTW after CTR.(204) From these responses a continuous outcome variable was created and reported using relative rates of RTW and their 95% confidence intervals with a p-value set at 0.05. A relative rate of RTW of <1.0 indicated a risk of a *slower* RTW.

De Kesel and colleagues analysed 107 hands (some participants contributed more than one hand) from a medical centre in Belgium in a cross-sectional study design to measure prognostic factors for time to RTW (as reported by the participant).(202) The authors reported using multivariate statistics; however, it is unclear how potential confounding variables were addressed, as there is selective reporting of results. Also participants who contributed two hands to the study (i.e., had bilateral CTR) were entered into the analysis twice. It is unclear how this was controlled for in the statistical analysis.

In a retrospective study conducted in France by Parot-Schinkel et al, 935 workers who had CTR were mailed questionnaires to retrospectively record prognostic variables at the time of surgery and the duration of time between surgery and time to RTW.(205) Continuous data was analysed in 30-day intervals up to 360 days using Hazard Ratios with a p-value set at 0.05. It is important to note that the outcome of this study was dependant on participant recall of greater than two months.

Wasiak and colleagues performed a retrospective analysis of insurer databases from California, Illinois, Indiana, Missouri and Texas.(206) A total of 1697 workers were included and prognostic variables were analysed as a continuous outcome for number of compensated days off work.

a. Socio-Demographic factors

Five studies examined the association of socio-demographic factors with RTW (using a continuous outcome).(202-206) Female gender was predictive of delayed RTW in Carmona et al (**Table 3.29**).(204) However, gender was not found to be a strong predictor in Wasiak et al, Parot-Schinkel et al and Butterfield et al,(203, 205, 206) and the contrary was found in De Kesel et al (i.e., females had shorter work disability duration) (**Table 3.30**).(202) Fewer years of education was found to prognostic for longer RTW duration in Butterfield et al (**Table 3.29**),(203) but not in Carmona et al.(204) Age,(203-206) hand dominance,(203, 204) race/ethnicity,(203, 204) BMI,(202) marital status,(202, 203) and number of children(202) were not found to be predictors of delayed RTW.

Table 3.29: Socio-demographic factors with a significant association with *longer* RTW duration

Factor	Multivariate analysis result	Study quality
Female gender	RR=0.5, 95% CI 0.3-0.8, $p<0.01$	Low
Fewer years of education	$\beta=0.182$, $p<0.003$	Low*

*This study scored 1 or 2 (out of 10) on the risk of bias assessment

Table 3.30: Socio-demographic factors with a significant association with *shorter* RTW duration

Factor	Multivariate analysis result	Study quality
Female gender	F=12.7, p<0.05	Low*

*This study scored 1 or 2 (out of 10) on the risk of bias assessment

b. Clinical/physical factors

Five studies examined the association of clinical/physical factors with a continuous outcome for RTW.(202-206) Bilateral CTR surgery,(203, 205) having associated surgeries,(205) and attending pre-operative physiotherapy or occupational therapy(203) were found to be prognostic for longer RTW durations (**Table 3.31**). Surgery type (ECTR versus OCTR) were not predictors for RTW duration in either De Kesel et al or Wasiak et al (after jurisdiction type was controlled for in the study analysis).(202, 206) Other variables that were non-significant for RTW duration included: higher symptom severity;(203, 204) lower functional status;(203, 204) longer duration of symptoms;(202, 204, 205) higher number and type of comorbidities;(204) obesity;(205) previous wrist fracture;(202, 205) wrist arthritis;(202, 205) diabetes; (202, 205) worse nerve conduction study results;(204) previous CTR;(204) other musculoskeletal conditions;(205) operated side;(202) higher alcohol intake;(202) smoking status;(202) lower general health;(203) and, low energy and high fatigue score.(203).

Table 3.31: Clinical/physical factors with a significant association with longer RTW duration

Factor	Multivariate analysis result	Study quality
Bilateral CTR surgery	β=0.172, p=0.006 HR=1.41, 95% CI 1.05-1.87, p=0.02	Low* Low
Associated hand surgeries	HR=1.37, 95% CI 1.13-1.67, p=0.0015	Low
Worker attending pre-operative physiotherapy or occupational therapy	β=0.162, p<0.009	Low*

*This study scored 1 or 2 (out of 10) on the risk of bias assessment

c. Psychosocial factors

One study examined the association of psychosocial factors with a continuous RTW outcome.(203) No psychosocial factors were found to be prognostic of a greater time to

RTW. However very few psychosocial variables were included in the studies. Mental health state was not found to be significant predictive of longer RTW duration. (203)

d. Work-related factors

Four studies examined the association of work-related factors with a continuous RTW outcome.(202-205) Parot-Schinkel et al(205) found that being a farmer, intermediate, lower white-collar worker or blue-collar worker and De Kesel et al(202) found that job classification (none, light, heavy) were associated with longer RTW durations (**Table 3.32**). In the study by Carmona et al, relative risks <1.0 indicated a slower RTW.(204) Exposure to bending/twisting of the hands at work was associated with longer RTW duration (**Table 3.32)**.(204) In De Kesel et al, exposure to hand repetition at work was found to be associated with longer time to RTW (**Table 3.32**),(202) but not in the study by Carmona et al.(204) Exposure to heavy lifting at work had a significant association to time to RTW in the study by De Kesel et al (**Table 3.32**).(202) Surprisingly, De Kesel et al also found that exposure to vibration was associated with shorter RTW duration (**Table 3.33**), but as previously detailed, this study was of very low quality.(202) The diagnosis of CTS being attributed to work by the worker was found to be associated with longer RTW duration in Parot-Schinkel et al,(205) but not in Carmona et al.(204)

Non-significant work-related variables included: decision latitude;(204) psychological workload;(204) job (dis)satisfaction;(202) job environment satisfaction;(202) job accommodation;(203, 205) perceived low control over work tasks;(203) perceived high ambiguity in work role;(203) and being self-employed versus employed.(205)

In the study authored by Carmona et al, a separate sub-analysis was conducted to examine variables predictive for gender (refer to **Appendix VI**).(204) They found a number of work-related variables were associated with delayed RTW in females. These included: ergonomic exposure; psychological workload; and decision latitude.

Table 3.32: Work-related factors with a significant association with longer RTW duration

Factor	Multivariate analysis result	Study quality
Farmer (occupation)	HR=1.47, 95% CI 0.88=2.46, p<0.001	Low
Intermediate (occupation)	HR=2.21, 95% CI 1.49-3.27, p<0.05	Low

Lower white collar worker (occupation)	HR=2.49, 95% CI 1.71-3.61, p<0.05	Low
Blue collar worker (occupation)	HR=3.34, 95% CI 2.28-4.9, p<0.05	Low
Heavier job classification	F=14.8, p<0.01	Low*
Exposure to bending/twisting of the hands	RR 0.7, 95% CI 0.5-0.9, <0.01	Low
Repetitive hand tasks at work	F=14.5, p<0.05	Low*
Exposure to heavy lifting at work	F=16.4, p<0.05	Low*
Diagnosis of CTS being attributed to work by the worker	HR=1.88, 95% CI 1.43-2.48, p<0.0001	Low

*This study scored 1 or 2 (out of 10) on the risk of bias assessment

Table 3.33: Work-related factors with a significant association with shorter RTW duration

Factor	Multivariate analysis result	Study quality
Exposure to vibration	F=2.0,p<0.05	Low*

*This study scored 1 or 2 (out of 10) on the risk of bias assessment

e. Economic/legal factors

Four studies examined the association of economic/legal factors with a continuous RTW outcome.(203-206) Workers' compensation status was found to be associated with delayed RTW in one study in the USA (**Table 3.34**),(204) but not significant in another study conducted in France.(205) Greater number of days until surgery for workers receiving compensation was significantly associated with RTW duration (**Table 3.34**).(206) Attorney involvement was found to predict a delayed RTW and was associated in a 72% increase in duration of post-surgical disability (**Table 3.34**).(206) This was also supported by findings in Butterfield et al.(203) A 10% increase in pre-surgery work disability duration predicted a significant 3.3% increase in post-surgery disability duration in Wasiak et al (**Table 3.34**).(206) Decreased ability to cope financially was predictive of greater work disability duration in Butterfield et al (**Table 3.34**).(203) Being insured by certain workers' compensation jurisdictions was found to strongly influence post-surgical work disability duration with workers from California (β=-2.32, p<0.05), Indiana (β=-0.22, p<0.05), and Missouri (β=-0.88, p<0.01) returning to work more quickly than Texas, Illinois and Florida.(206)

Table 3.34: Economic/legal factors with a significant association with longer RTW duration

Factor	Multivariate analysis result	Study quality
Pre-surgery work disability	β=0.33, p<0.01	Moderate
Greater number of days until surgery for workers receiving compensation	β=0.31,p<0.01	Moderate
Attorney involvement	β=0.54, p<0.01 β=0.22, p<0.01	Moderate Low*
Workers' compensation status	RR 0.2, 95% CI 0.1-0.5, p<0.001**	Low
Decreased ability to cope financially	β=0.27, p<0.001	Low*

* *This study scored 1 or 2 (out of 10) on the risk of bias assessment
**Where RR<1.0 indicates risk of slower RTW

v) __Work role functioning__

One prospective study measured work role functioning using a validated questionnaire.(192) It is important to note that poor work role functioning is also an indicator for not being able to work (i.e., a non-RTW status). Therefore, prognostic variables associated with work role functioning for this section are narratively reported with respect to: i) whether a worker has successful work role functioning ii) has not returned to work; or iii) is functioning poorly at work. A full description of the included studies is included in **Appendix V** and all analyses are reported in **Appendix VI**.

Amick et al (2004)(192) collected data from 128 workers were analysed at two months and 122 were analysed at six months. Outcome data was also collected at 12 months for 80 workers, however this data was not analysed. Overall the majority of the prognostic variables were clearly defined and used valid and reliable measures. However, for the measure of social support, it is unclear whether the scale used was a reliable and valid measure as no psychometric information is reported in the publication. Some prognostic variables were recorded but were not reported in the results. Non-significant results were not numerically reported.

a. Socio-Demographic Factors

Work role functioning at 2 months

No socio-demographic variables were reported to be significant for either successful or reduced work role functioning.(192) Variables found to be non-significant for work role functioning at two months included: gender; marital status; number of children; and percentage of household income provided by the participant.

Work role functioning at 6 months

No socio-demographic variables were found to be significant for either successful or reduced work role functioning in multivariate analysis.(192) Variables found to be non-significant for work role functioning at 6 months included: gender; marital status; number of children and household income.

b. Clinical/physical factors

Work role functioning at 2 months

No variables were found to be significant in multivariate analysis for work role functioning at two months.(192) Non-significant variables for successful work role functioning at two months included: baseline hand and wrist symptoms; physical health state; nerve conduction study results; type of CTR surgery; type of comorbidities; obesity and baseline hand and wrist symptoms.

Work role functioning at 6 months

No variables were found to be significant for work role functioning at six months.(192) Variables that were not significant for work role functioning at six months included: two or more musculoskeletal pain sites; physical health state; nerve conduction studies; type of CTR surgery; comorbidities; obesity; baseline hand and wrist symptoms and bilateral carpal tunnel surgery.

c. Psychosocial factors

Work role functioning at 2 months

In this study, depression was predictive of poorer work role functioning or a non-RTW (**Table 3.35**).(192) Family social support was found to be non-significant for work role functioning at two months in bivariate analysis.

Table 3.35: Psychosocial factors with a significant association with work role functioning at 2 months

Factor	Multivariate analysis result	Study quality
Depression	OR=0.32, 95% CI 0.14-0.74, p=0.008	Moderate

Work role functioning at 6 months

Although depression was predictive of not returning to work at two months, it was not found to be significant at six months.(192) No other psychosocial factors were found to be significant at six months including baseline self-efficacy and family social support.

d. Work-related factors

Work role functioning at 2 months

Baseline work role functioning predicted successful work role functioning at two month (**Table 3.36**).(192) Variables found to be non-significant of work role functioning at two months included: supportive organisation policies and procedures; employer size; psychosocial job demands; job security; job accommodation; high physical work demands; job control and high work-related social support.

Table 3.36: Work-related factors with a significant association with successful work role functioning at 2 months

Factor	Multivariate analysis result	Study quality
Baseline work role functioning	OR= 1.02, 95% CI 1.01-1.04, p=0.005	Moderate

Work role functioning at 6 months

Baseline work role functioning and supportive organisational policies and procedures were predictive of successful work role functioning at six months (**Table 3.37**).(192) Variables found to be non-significant of work role functioning at six months included: high physical work demands; high work-related social support; employer size; psychosocial job demands; and job security.

Table 3.37: Work-related factors with a significant association with successful work role functioning at 6 months

Factor	Multivariate analysis result	Study quality
Baseline work role functioning	OR=1.04, 95% CI 1.02-1.05, $p<0.0001$	Moderate
Supportive organisational policies and procedures	OR=5.20, 95% CI 1.68-16.05, $p=0.004$	Moderate

e. Economic/Legal Factors

Work role functioning at 2 months

Workers' compensation status was found to be predictive of poorer work role functioning/not returning to work at two months (**Table 3.38**).(192) Variables found to be non-significant included union membership; and hiring an attorney.

Table 3.38: Economic/legal factors with a significant association with poorer work role functioning at 2 months

Factor	Multivariate analysis result	Study quality
Workers' compensation status	OR=0.30, 0.14-0.66, $p=0.003$	Moderate

Work role functioning at 6 months

No economic/legal variables were found to be significant for work role functioning at six months. Variables found to be non-significant included: union membership; and hiring an attorney.(192)

3.9 Discussion

The focus of this systematic review was on prognostic factors identified pre-operatively for CTR and their association with work-related outcomes. No pooling of data was possible due to the lack of studies using the same prognostic variable and outcome variable, as well as the high risk of bias in some studies. Therefore, caution is advised with the interpretation of the review findings due to the paucity of studies studying the same prognostic factors and the poor methodological quality of the studies. However, the review does provide a comprehensive synthesis of the current available literature and provides recommendations for clinicians, researchers and key stakeholders.

Of the variables studied in this review, those associated with a worker being more likely to have returned to work in a moderate to high quality study were listed previously in **Table 3.6**. Of the variables studies in this review, those associated with a worker being less likely to have returned to work by two months (or longer) in a moderate to high quality study are listed in **Table 3.39**.

Table 3.39: Prognostic factors associated with a worker being *less likely* to have returned to work at two months or longer duration

Domain	Prognostic Factor
Socio-demographic	· Older age · Household income
Clinical/physical	· Greater UE related physical limitations · Greater than two musculoskeletal pain sites
Psychological	· Lower recovery expectations · Worse mental health status (anxiety / depression)
Work-related factors	· Job accommodation availability · High job strain (i.e., high job demands with less job control) · High job demands in conjunction with high job control · Poor relationships with co-workers · Poorer baseline work-role functioning · Less supportive workplace organisational policies and procedures
System/economic/ legal	· Pre-operative work absence due to CTS · Pre-operative work disability (any cause) · Receiving compensation before surgery · Workers' compensation status · Hiring an attorney · Greater number of days waiting to have surgery (related to insurer)

Discussion of our review findings are compared with the literature on various musculoskeletal disorders and their prognostic association with work-related outcomes, due to the paucity of existing literature focused on UE disorders.

Socio-Demographic Factors

Female gender was found to be prognostic in one study for a poorer work-related outcome(204) and in another it was found to be prognostic for a better outcome.(202) Most of the included studies found that gender was not associated with either a poorer or better work outcome. This could be due to the differing definitions and measurement of outcomes in each study. For the significant findings, one study examined participant reported time to RTW,(204) whilst the other study reported total duration of work disability which infers they may have included more than one period of sick leave absence.(202) In addition, the study setting could have played a role with one study conducted in Washington, USA,(204) whilst the other was conducted in Belgium.(202) These countries provide very different coverage for workers who are sick or injured. Similar conflicting evidence has also been found in other systematic reviews for RTW for other diagnoses including acute low back pain(79) and mental health.(209)

Older age was found to be prognostic for a poorer outcome in one study. This is consistent with a systematic review on factors for RTW following low back pain which found strong evidence from six studies for age, especially for workers older than 51 years,(79) and also in a review of mental health disorders.(209) However, the majority of the studies included in our review also found no significant associations with respect to younger or older age and RTW after CTR. However, as Australia and most high income nations have an aging working population, this risk factor is becoming increasingly more pertinent as we try to understand how age might affect a worker's capacity to remain productive in the workforce.

Clinical/Physical Factors

Type of surgery (i.e., OCTR versus ECTR) was not found to be a significant prognostic variable for RTW. Previous intervention systematic reviews have found that ECTR surgery results in an earlier RTW compared to open surgery, but similar findings for RTW status can be found at later time points.(30, 210) Most of the studies included in our review did not explore RTW status until 2 months or later, at which time the effect of the type of surgery may not have been observed. A systematic review by Sanati et al found that the mean difference between types of surgery for time to RTW was 7.2 days (95% CI 4.4-10 days), and this difference would not have been observed for dichotomous outcomes measured at certain time points.(30)

Pre-surgery functional status was found to be predictive of a poorer outcome in two studies.(178, 207) Limitations in functional ability are often related to the severity of the symptoms, with previous studies finding that pre-surgery CTS severity can influence outcomes. Nerve conduction study results can objectively classify severity of the disease by identifying reduced nerve conduction caused by peripheral nerve damage.(211) In our review, worse pre-operative nerve conduction study results were prognostic for a poorer work-related outcome in one study.(193) Other associated surgeries and bilateral CTR performed at the same time could indicate more severe hand symptoms and in turn could result in longer rehabilitation requirements post-operation, further contributing to longer RTW timeframes. Another prognostic variable, two or more musculoskeletal pain sites, was also found to be predicative of greater work disability duration.(178) Rehabilitation for these workers may be more intensive or job accommodations may be more difficult to allow an earlier RTW.

Psychosocial Factors

Overall, there was a paucity of psychosocial variables examined as prognostic factors in the included studies. Low recovery expectations were found to be prognostic for greater work disability duration in one study.(207) This variable was also found to be one of the most important psychosocial prognostic variables for failure to RTW in workers with low back pain.(86) However, the paucity of included studies that examined this factor highlights the need for more prognostic research including psychosocial variables for UE diagnoses.

A related concept, self-efficacy was examined in two studies.(192, 178) Self-efficacy has been found to be a moderate predictor for RTW for workers with acute low back pain;(180) and acute orthopaedic trauma.(78) Lower self-efficacy has also been found to be prognostic of disability for other UE conditions.(212) However this variable did not reach significance in the included studies in our review.

Similarly, fear avoidance was not a factor included in the majority of the studies, and did not reach statistical significance in any of the included studies. However another review found this to be a strong prognostic factor for RTW for workers with low back pain.(98)

Pain catastrophising has been found to have a strong association with outcomes such as disability in a range of UE conditions including trigger finger, DeQuervains tendinopathy, CTS, arthritis, lateral epicondylalgia, and distal radius fracture.(213) Our review found an association between catastrophising and delayed RTW in one study.(177) Pain catastrophising does not appears to be an oft examined prognostic factor for RTW and Steenstra et al concluded in their systematic review that pain catastrophising does not appear to be prognostic for RTW in low back pain.(180)

Worse mental health (using the mental health sub-score of the SF-36) was found to be prognostic for a poorer work-related outcome, indicating that mental health interventions may facilitate earlier RTW if identified early. However, although depression and anxiety are purported as risk factors for a poorer prognosis for outcomes such as patient satisfaction(214) and disability,(212, 215) our review did not find that a diagnosis of either depression or anxiety is predictive of a delayed RTW. This is similar to the findings of other reviews of different musculoskeletal problems.(79, 180)

Another psychosocial variable, poor family social support was found to be prognostic for a delayed RTW. Social support may help coping with an injury or provide assistance physically, emotionally or financially, thus facilitating an earlier RTW. In a similar theme, Steenstra et al found that social dysfunction and social isolation have been found to be prognostic for RTW following acute low back pain.(79)

Work-related Factors

The association between type of occupation and ergonomic exposures on returning to work can be dependent on the diagnosis. This is because different occupations have different physical demands, and varying diagnoses affecting different body parts (e.g., back pain versus UE) may have different outcomes. Comparison with other diagnoses such as back pain, lower limb injury or general musculoskeletal pain cannot be made due to the differing functional limitations imposed by the various conditions. However, similar to reviews for back pain,(79) job classification into non-manual, light and heavy manual work was found to be prognostic for poorer RTW outcome. Specifically, exposure to heavy lifting, repetitive hand movements and exposure to bending or twisting of the hands at work was predictive of a poorer work outcome. Finding duties that do not include these actions may be difficult especially if they contributed to the initial problem. Unless job accommodations can be put in place to allow early RTW, the worker may remain off work longer than is necessary. Interestingly, exposure to vibration was found to be predictive of a shorter incapacity time in one study.(202) This contradicts much of the literature, which has found that vibration is a risk factor for RTW, and exposure in the early post-operative period is often avoided due to the physiological response to the median nerve when exposed.(216)

Returning to work to a less supportive work organisation was found to be prognostic of lower work role functioning or not returning to work in one study.(192) Shaw et al found similar findings in their review for low back pain.(217) However, a later review by Steenstra and colleagues found conflicting evidence, and surmised that the nature of the support provided by the workplace might influence the outcomes.(79)

Another prognostic variable, job accommodation was found to assist with facilitating an early RTW but lack of job accommodation was not found to cause a delay in RTW or longer duration of work disability. Definitions of job accommodation vary and may include accommodations related to flexibility with working arrangements or modification of job roles, tasks, shifts or setting. In the included studies, job accommodation was poorly defined and this may have led to differing findings. In fact, in a systematic review on prognosis for RTW following acute low back pain, light or modified duties was thought to prolong return to normal unrestricted work duty.(79) However, evidence from the intervention literature indicates that accommodation can address barriers posed by physical demands at work, and therefore can improve RTW outcomes.(180)

Supervisor support and the role of co-workers in influencing early RTW is an emerging field of research that has been found to be important in other reviews.(180, 209) Poor co-worker relations (support) was found to be prognostic for a poorer worker-related outcome in one study.(207) Conflicting evidence exists from the results of other systematic reviews on low back pain,(79) for both co-worker support and supervisory support. However, emerging evidence has found that co-workers provide a key role in facilitating early RTW by providing both physical and emotional support and are integral in the employer's propensity to make job accommodations in some circumstances.(218) To date, there have been no studies investigating supervisor support as a prognostic variable for RTW following CTR.

Job dissatisfaction was found to be prognostic for long-term work disability.(207) However the results of systematic reviews on low back pain,(79, 86) have found that job dissatisfaction is not a strong predictor for RTW. This may be in part due to the definition of the outcome as time to first RTW. Job satisfaction may be more prognostic for workers remaining in a job following an injury or cessation of a workers' compensation claim. Those dissatisfied with their job may be more likely to change jobs or not work following claim closure.

The RTW expectations of the worker i.e., the amount of time that the worker would either like to have off, or desires to have off was found to be predictive of RTW. This may also be associated with the surgeon's medical certification practices, where workers expectations or motivation to RTW may influence physician's certification for work restrictions and capacity on a medical certificate.(219, 220)

High job strain (high demands with low job control) and also occupations that have high demands but with high job control were both found to be predictive of time to RTW.(176) This concept has not been studied in many other studies, and therefore not reviewed thoroughly in other systematic reviews of prognosis for RTW.

Economic/Legal Factors

Pre-operative sick leave and/or receiving compensation before surgery were found to be prognostic for longer duration of work disability and time to RTW after surgery in three studies.(193, 201, 207)

Workers' compensation status had conflicting results across a number of studies. This is similar to other findings,(221) and may be associated with the legal framework surrounding the system of insurance coverage and the associated policies and procedures. Workers' compensation jurisdiction was also found to influence time to RTW in a number of states across the USA.(206) This further supports the compensation setting as being influential on work-related outcomes. Therefore, setting needs to be considered in not only the design of studies and interpretation of results, but also as a potential confounder across studies. In a previous systematic review of severe UE trauma, workers' compensation status was not associated with RTW.(77)

Attorney involvement was found to be prognostic in two studies,(203, 206) but not in two studies. This is similar to findings in other reviews on acute orthopaedic trauma and back pain.(78, 79) It is possible that workers who have an attorney involved may have more complex or significant injuries, such as greater physical limitations, conflict at work or system-related factors which confounds this factor as a predictor.

System factors related to the compensation, insurance or health care systems have also been poorly studied both in the studies included in this review, but also in other reviews.

However, recent evidence suggests that these factors play an important role in influencing RTW.(222)

Limitations of the included studies

There were 60 prognostic factors that failed to achieve statistical significance in any of the multivariate analyses. Although these factors were not significant, careful consideration should be made whether to include them in future large prospective studies investigating similar outcomes. This is because the sample size in some studies may have been insufficient to detect a change. In addition, different workers' compensation jurisdictions may create systematic differences that may result in variable interactions between the prognostic variables and the outcome. Although some factors were found to be prognostic, a number of studies also found the opposite. Reasons for this could include differing study designs and methods with high risk of bias in some studies and small sample sizes. Larger, well-designed longitudinal studies may report different findings. The only study that included a power analysis to determine sample size was Cowan et al.(177) As a result many of the smaller studies may have been underpowered to detect an effect.

Due to the retrospective nature of some of the studies, the types of factors studied were often limited to data contained in insurance or medical databases. Cross-sectional studies are renowned for being limited by issues with participant's recall, with respect to self-reported measurement of variables and outcomes at varying timeframes after the event may have occurred.(51) Moreover, studies tended to focus on socio-demographic, clinical and compensation-related and some pre-defined work-related variables (e.g., occupation, work status) due to the data collection methods implemented.

Prospective studies, whilst stronger in their design, did not consistently study similar variables. Many of the variables were studied in only one or two cohorts. In addition, although prospective studies have the capacity to study psychosocial, work-related and system related factors, they did not. This was possibly due to pragmatic reasons, such as the time, cost and resources to conduct large-scale prospective studies. Psychosocial and work-related factors have been found to be prognostic in studies and systematic reviews for other medical conditions,(78, 79, 86, 180) but there is still a paucity of well-designed studies examining these variables for UE conditions such as CTS. As a result, many factors that may be amenable to intervention have not yet been adequately studied, and their association with work-related outcomes remains unknown.

Clear definitions of how both prognostic variables and outcomes were defined and measured were lacking in many of the included studies, rendering interpretation of results difficult. Recommendations for both defining prognostic variables and work-related outcome measures have emerged since the publication of many of the studies included in this review.(51) Adhering to these recommendations in future study designs may yield differing results.

Many studies omitted reporting the results of some prognostic variables measured. This makes it difficult to ascertain whether results were in fact non-significant or were not entered into the bivariate or multivariate analyses. In addition, many studies did not report the actual results of the non-significant variables. The selective reporting of only significant variables limits the ability to perform meta-analyses of both significant and non-significant results for factors in more than one cohort.

Another limitation was the unclear reporting of the multivariable analysis. That is, which variables and the order they were entered into the analysis was rarely stated. Many of the studies did use stepwise regression analyses but selectively reported only those factors that remained in the final model.

Another methodological consideration is that the studies included in this review were conducted in various compensation and social insurance settings. In countries like the USA, workers are eligible for workers' compensation, whereas in some European countries injured workers are covered by a universal insurance scheme that provides wage reimbursement regardless of causal factors.(223) Interpretation of the results of studies need to be considered in light of these jurisdictional difference. Generalisation of study results to different compensation settings should be done with caution. Variations in compensation settings across studies could have influenced RTW, however with the limited number of included studies, sub-analysis was not possible.

It is also important to consider the timeframe when the data collection occurred and the duration of the workers' compensation claim (for cohorts with workers receiving compensation), when interpreting the results. Laws and regulations and processes affecting workers' compensation claimants change over time, which may impact the results of the study. Future studies need to clearly describe the setting, workers' compensation system, and the time frame so that results can be clearly interpreted.

Limitations of this systematic review

This review has identified limitations that are similar to those reported by previous reviews of prognostic factors.(78, 87) There was lack of uniformity in diagnostic criteria, definitions for outcome measurements, and even prognostic factors. Many of the studies were of poor methodological quality and lacked clarity in reporting the statistical analysis, and measurement technique used for some of the prognostic factors and outcome measures. Many of the cohort studies implemented weaker study designs, such as retrospective or cross-sectional designs. In particular, retrospective studies are often criticized when used in studies of prognosis, as they may miss factors, or data that may influence the results.(87) Studies that provide incomplete, or unclear description of their study methods, participant population, setting, factors, outcomes and statistical analyses also add to the complexity in interpreting the results of the included studies. As a result, we were unable to perform a meta-analysis, due to lack of statistical reporting and also clinical and study design heterogeneity.

The poor quality of the studies may have contributed to conflicting results and small effects. For studies with significant findings, large confidence intervals were observed for many of the results. This means that these point estimates lack precision in the magnitude of their association with the measured outcome, thus making it difficult to draw conclusions on their prognostic value. Due to these limitations, we have only included the results from the moderate and high quality studies in our clinical practice recommendations.

Limitations also included the inability to translate some papers and perform a complete search of the grey literature. Due to the age of some of the studies we also did not contact authors for missing data, which may have increased the strength of this review had it been available.

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3.10 Conclusion

This systematic review synthesised the current and best available evidence for prognostic factors for work-related outcomes following CTR. The results of this study should be considered with respect to the methodological quality of the included studies.

Implications for clinical practice

Understanding prognostic variables for first RTW and other work-related outcomes (such as, sustained RTW and work role functioning), following CTR are important for identifying workers at risk of a poorer work outcome and in the development of (cost-) effective interventions. The factors identified in this review support the use of a biopsychosocial approach to managing workers with CTR to facilitate early RTW, successful work role functioning and less long-term work disability.

Clinicians should consider the following modifiable factors that may act as barriers to recovery following CTR: Poor pre-surgery functional status; two or more musculoskeletal pain sites; lower recovery expectations; poor family support; blaming oneself for the condition; poorer mental health; higher pain catastrophising; less supportive work organisation; poor co-worker support; high job demands with high job control; high job strain; exposure to bending/twisting of the hands; exposure to heavy lifting; exposure to highly repetitive work; worker's expectation for time until RTW; worker's desired time until RTW; and a greater number of days waiting to have surgery. They should also consider the following modifiable factors may act as facilitators for recovery following CTR surgery: a supportive work organisation and, job accommodation.

Recommendation for Practice:

People who are older, have a lower house hold income, greater UE functional limitations, greater than two musculoskeletal pain sites, lower recovery expectations, worse mental health status, job accommodation issues, high job strain, high job demands with high job control, poor co-worker relationships, poor baseline work role functioning, less supportive workplace policies, pre-operative work absence due to CTS or work disability of any cause, are claiming workers' compensation, have an attorney involved or have more days waiting to have surgery after their diagnosis are less likely to RTW at two months or longer. Therefore, this should be a consideration when devising clinical and RTW interventions (Grade A).

People who expect or desire fewer days off work, have a desk-based occupation, lower pain anxiety; and state that their CTS has not altered their work role are more likely to have an earlier RTW. These factors may act as facilitators in rehabilitation programs (Grade A).

Implication for policy and compensation systems

Understanding the prognostic factors for work-related outcomes will assist in curtailing the cost of work disability to stakeholders and society. Efforts to prevent long-term work disability and promote early RTW following CTR should focus on identifying those workers at greater risk of a poorer work-outcome. However, care should be taken not to label the worker prior to implementation of appropriate clinical, psychosocial or workplace interventions that will facilitate a safe, successful and early RTW. Identification of prognostic variables following CTR should focus on those that are amenable to change, rather than those that are not, such as, gender, age or workers' compensation status. Similarly, prognostic variables may be different for first RTW, and sustained RTW, return to modified duty or return to full duty. Hence, this needs to be considered when developing systems- based RTW interventions and policies. Compensation systems should focus on interventions for identifying and managing prognostic factors for work-related outcomes following CTR considering biopsychosocial and work disability prevention frameworks.(9, 62)

Implications for research

In this review, there was limited evidence for any of the prognostic variables studied, due to both the lack of studies examining the same prognostic variable and weak or conflicting results. There is a lack of well-designed prospective longitudinal studies investigating prognosis for work-related outcomes following surgery for CTS. Future research studies need to focus on prognostic factors amenable to intervention. Studies should attempt to understand the similarities and differences across jurisdictions to allow for generalizability of study findings.

Psychosocial variables (including work-place factors) were poorly examined in any of the included studies. This is similar to the findings of other systematic reviews.(79, 86) Our review supports their recommendation that prognosis studies need to take a more comprehensive approach and explore variables within a biopsychosocial and work disability framework.(9) Due to the vast number of prognostic variables that could be studied,(24) researchers need to use broader and more inclusive methods to develop the most important variables to be included in future studies. These could include surveys of key RTW stakeholders, Delphi studies of experts and/or utilisation of systematic reviews.

In addition, researchers need to clearly define the variables and outcomes, their methods of measurement, and reporting of all results of variables included in the study for both bivariate and multivariate analyses. Few studies focused on better work-related outcomes. However these may be equally as important to study as those focussing on barriers to RTW. These may also include studies focusing on work role functioning or work ability. In line with future recommendations for other diagnostic conditions such as back pain(180) and mental health(209) there is an overall lack of studies that clearly examine time to first RTW in relation to capacity (modified/light or full) and sustained RTW beyond the first sickness absence.

3.11 Acknowledgements

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CHAPTER 4: Perspectives from employers, insurers, lawyers and healthcare providers on factors that influence workers' return-to-work following surgery for non-traumatic upper extremity conditions

4.1 Chapter Introduction

Stakeholders' involved in the return-to-work (RTW) process can include health care providers (HCPs), employers, insurers and lawyers. We sought to find out what key stakeholders perceived influences a workers' ability to RTW. We focused on post-surgical non-traumatic conditions (e.g., carpal tunnel release (CTR) or rotator cuff surgery), as these are more prevalent in the Australian workforce as compensable claims, and thus, stakeholders might be better acquainted with these types of upper extremity (UE) conditions.(3)

This paper summarizes the stakeholder's perspectives on factors influencing RTW from a larger study that surveyed Australian stakeholders. This study builds on the findings of the systematic review (**Chapter 3**). It aimed to generate a list of factors that stakeholder perceive influence RTW (**Aim 2**).

4.2 Publication

Peters SE*, Coppieters MW, Ross M, Johnston V. Perspectives from employers, insurers, lawyers and healthcare providers on factors that influence workers' RTW following surgery for non-traumatic upper extremity conditions. Submitted to Journal of Occupational Rehabilitation.*

4.3 Abstract

Purpose*:* RTW stakeholders have unique roles and may therefore hold their own perspectives regarding factors that may influence outcomes. This study aimed to determine stakeholders' perspectives on factors influencing RTW following surgery for non-traumatic UE conditions.

***Methods**:* A valid and reliable questionnaire was distributed to RTW stakeholders via gatekeeper organizations. Stakeholders rated 50 potential prognostic factors from 'not' to 'extremely' influential. Data were dichotomized to establish stakeholders' level of agreement. Disagreements between stakeholder groups were analysed using χ^2. The relationship between stakeholder demographic variables and rating of a factor was determined via regression analysis.

***Results**:* One thousand and eleven stakeholders completed the survey: HCPs (77.8%); employer representatives (12.2%); insurer representatives (6.8%); and, lawyers (3.2%). Factors with the highest stakeholder agreement for influencing RTW were: self-efficacy (92.2%); post-operative psychological status (91.8%); supportive employer/supervisor (91.4%); employer's willingness to accommodate job modifications (90.7%); worker's recovery expectations (88.3%); mood disorder diagnosis (86.6%); post-operative pain level (86.4%); and whether the job can be modified (86.3%). Disagreements between stakeholder groups were found for 19 (36%) factors. The strongest disagreements were for: age; gender; obesity; doctor's RTW recommendation; and presence of a RTW coordinator. Respondents' characteristics (e.g., age, workers' compensation jurisdiction, work experience, stakeholder group) were associated with factor rating.

***Conclusion**:* The factors stakeholders rated as having the greatest influence on RTW were predominately psychosocial and modifiable. These variables should be the focus of future research to determine prognostic factors for RTW for workers with UE conditions, and to develop effective RTW interventions.

Ethical Approvals: School of Health and Rehabilitation Sciences, The University of Queensland (2012SHRS_OT007)

Keywords: hand; wrist; shoulder; workers' compensation; prognosis; disability

4.4 Introduction

The incidence of UE symptoms in the working population has been reported to be as high as 53%.(224) In Australia from 2001 to 2012, claims requiring time off work increased by over 70% to a median claim cost of approximately $9000 and a RTW duration of nearly six weeks.(3) Of these, more were related to the upper extremities than to any other bodily location.(3) Non-traumatic conditions of the upper extremity, such as CTS and tendinopathies of the shoulder, wrist and hand, account for a significant proportion of these UE conditions. Surgery (e.g., carpal tunnel release (CTR), rotator cuff decompression) is frequently offered to workers with more severe symptoms or those who do not respond adequately to conservative management. However, despite surgical intervention, delayed RTW and long-term work disability often persists.(91, 225)

There are many stakeholders whose role it is to assist in the recovery process and support injured workers to RTW quickly and safely. The stakeholders involved often play an important role in both identifying factors influencing RTW outcomes and establishing interventions that facilitate an early and safe RTW.(60, 226) In the Australian workers' compensation setting, key stakeholders consist of injured workers, employers, administrators/insurers and external service providers, e.g., HCPs.(227)

Many factors have been identified as influencing RTW.(24) However, previous research has tended to focus on workers with diagnoses such as low back pain, (79, 98, 180) trauma,(78, 228) and mental health.(88) Research on stakeholder perspectives have often used qualitative research designs.(229-235) Little is known about the perspectives of stakeholders involved in the RTW process who may yield valuable real-world experience of the factors influencing RTW for workers with UE conditions. Therefore, the purpose of this study was to determine stakeholder's perspectives on factors that influence a worker's ability to RTW following surgery for a non-traumatic UE conditions. The main research questions were:

1) What factors do stakeholders identify as being influential on a worker's ability to RTW following surgery for a non-traumatic musculoskeletal disorder of the UE?
2) What, if any, differences exist between the stakeholder groups?
3) What demographic and job-related variables of the respondents may have influenced the rating of a factor?

4.5 Methods

A cross-sectional study of RTW stakeholders was conducted across Australia from August 2013 to January 2014 using both a web-based survey platform and hard-copy surveys.

Survey questionnaire

The factors for the questionnaire were developed based on systematic reviews in the work disability field,(24, 77-80, 85, 88, 98, 180, 184, 236) with 48 factors identified as potentially influencing RTW. The survey was piloted among ten stakeholders representing each stakeholder group. Each stakeholder had greater than 10-years experience managing workers with UE conditions. They provided feedback on the survey, including content, item structure and clarity. They suggested two additional factors they thought had been omitted from the original list. Responses were collated and changes made to the survey. The 50-factor questionnaire was then piloted on another ten stakeholder representatives in both electronic and hardcopy formats. Hardcopy and electronic copies were administered at least one day apart to establish reliability of the formats. Stakeholders agreed that the final questionnaire provided a comprehensive list of potential prognostic factors.

For the survey we categorized the 50 variables into sections including 8 socio-demographic, 16 worker-related (e.g., pain, psychological status), 19 workplace and 7 compensation/ procedural factors. This was based on the feedback provided in the first round of the pilot phase. Participants completed questions regarding demographic information and responded to the following question: "*Please rate the degree of influence you think these work-related (or socio-demographic, or compensation or worker-related) factors have on a worker's ability to RTW"* with respect to workers who have had surgery for a non-traumatic UE condition. Participants were provided with examples of the types of conditions such as CTS, rotator cuff tendinopathy, lateral epicondylalgia, trigger finger. Each factor was rated on a five point Likert scale, ranging from "1- Not at all influential" to "5- Extremely influential", with a separate option for "No opinion".

Appropriate ethical approvals were obtained from the School of Health and Rehabilitation Sciences at The University of Queensland. Informed consent was obtained from all individual participants included in the study.

Reliability

The reliability of the electronic and hard copy questionnaire was determined based on the ten stakeholders that completed the questionnaire in both formats in the second pilot round. Weighted kappas were calculated for each factor in its original (5-point scale) format and kappa statistics for the factors in their dichotomized state. Reliability results for both kappa statistics found that all kappa values were above 0.74. These findings are in agreement with a recent systematic review, which found paper-based and web-based questionnaires were reliable when used interchangeably.(237)

Participants and Recruitment

Key stakeholders were identified from four groups nominated in the work disability model developed by Loisel et al(9): HCPs; employer representatives; insurer representatives; and legal counsel. Our study did not include workers' perspectives as these are being studied separately using different methods.

Key gatekeeper organizations for healthcare provider and insurer groups distributed the survey via email and/or in the organization's newsletter (see *Acknowledgements* for details). We also engaged in key stakeholder events, such as conferences. Participants were provided with a link to the electronic survey or provided with hard copy surveys to complete. We utilized a "snow-ball" method whereby participants were encouraged to forward this link to other stakeholders who managed workers with UE conditions.

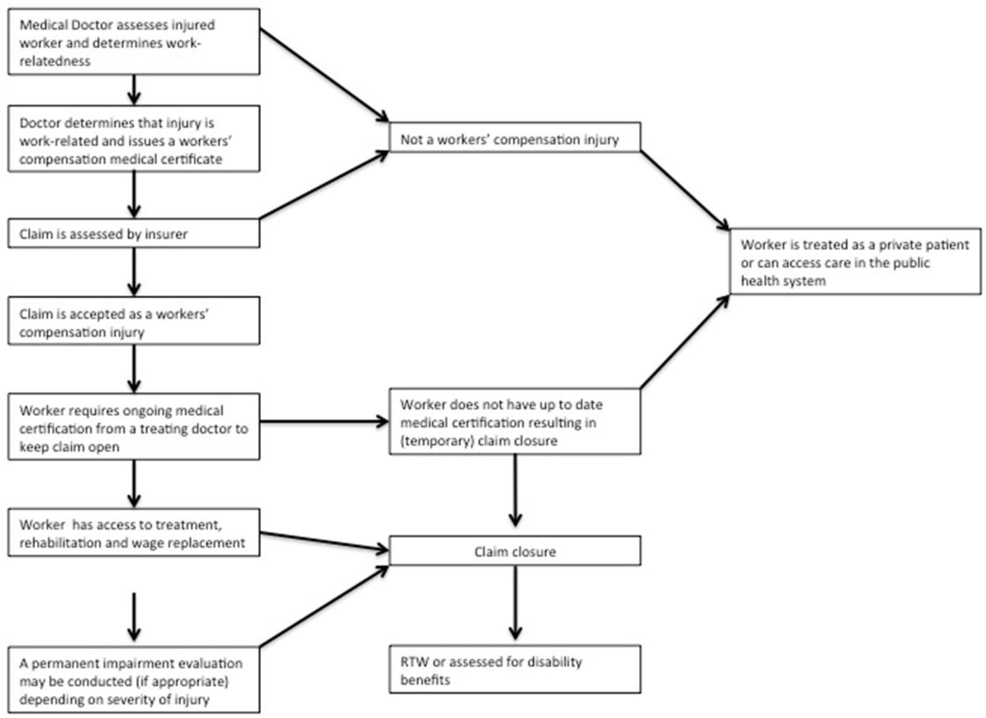
Compensation setting

The study was conducted in Australia, which has systems for sickness and disability support, and compensation coverage for motor vehicle and workplace injuries. It comprises of the following key elements (**Fig. 4.1**): a universal healthcare scheme supplemented by private health insurance; sick leave entitlements under national labour laws; social security benefits including both temporary sickness allowances and longer-term disability pensions; state statutory no-fault cause-based compensation schemes for motor-vehicle and work-related injury; common law damages claims for pain and suffering and economic loss arising out of negligence.

Workers' compensation for work-related conditions is provided to eligible workers. They are entitled to income replacement during the recovery period, medical and rehabilitation costs, RTW plans, death benefits, and lump sum compensation for permanent impairment. Workers' compensation insurance is regulated within each State (or Territory) of Australia and a national scheme for Australian Government employees. Whilst there are small differences between the coverage, duration of compensation and amount of compensation paid to workers, there are two main differences with regards to how the compensation fund is managed within the states or territories. The States of Queensland, Victoria, South Australia as well as employees of the Australian Government are managed by a central government-managed fund; where as New South Wales, Western Australia, Tasmania, Northern Territory and Australian Capital Territory are managed by external private funds that are regulated by the state government.

Key stakeholders involved in the RTW process include those that are the focus of this study. The insurer pays for salary reimbursement, approved rehabilitation and RTW services. The insurer also has a role to ensure that stakeholders operate within the legislative boundaries. The medical practitioner is the gatekeeper of the compensation process and determines work-relatedness and recommends the type and timing of appropriate treatment. Other healthcare providers deliver rehabilitation and RTW interventions (e.g., worksite assessments). Employers pay mandatory insurance premiums to a workers' compensation insurer to cover their employed staff. Employers have a responsibility to provide a safe working environment for their staff, prior to the injury and on their return. They also are responsible for reporting the injury, providing suitable duties and supporting early RTW. In some Australian states, workers may have the right to claim common law damages to compensate for the loss, harm or injury suffered, in which case they would engage legal counsel.

Figure 4.1: Australian Workers' Compensation System flow diagram



Statistical analysis

Data were imported from Survey Monkey into SPSS (Version 22, Armonk, NY) for analysis. Descriptive statistics were used to profile the participants. The data from the Likert scale responses were dichotomized with the responses "1- Not at all influential", "2- Slightly influential" and "3- Somewhat influential" forming one category, while the second category contained the "4- Very influential" and "5- Extremely Influential" responses. The dichotomized cut-off was determined by the factors that stakeholders perceived as having the greatest influence on RTW. The "No-opinion" responses were not counted in the analysis as it was unknown why the stakeholder may have selected this response (e.g., not familiar with the factor, did not understand the factor, or unsure on whether the factor was influential or not). Frequency data were tabulated for the categorical values. Pearson Chi Square statistics were used to determine the level of disagreement between stakeholders for each of the 50 factors. For factors with less than five counts per cell in the contingency table, Fisher's Exact Test was used. A cut-off of 75% was used as a consensus of stakeholder agreement.(238) The biopsychosocial model was used to organize the variables into the biological, psychological and social domains as it has been proposed as an ideal model for understanding and managing work-related UE musculoskeletal disorders.(62)

Logistic regression was performed to evaluate the impact of respondents' demographic variables on the likelihood of rating a response as either 'not to somewhat influential' or 'very to extremely influential'. The variables entered into the model were: age; sex; occupation category; percentage of their work that involves workers with UE conditions; percentage of workers they manage who receive workers' compensation; years experience working in their current role; and whether they work primarily in a workers' compensation jurisdiction that has a centrally or externally managed fund. Significance was set at $p<0.05$.

4.6 Results

One thousand and twenty-two stakeholders participated in the study. Twelve respondents did not complete >80% of the questionnaire and were therefore excluded, leaving 1011 responses for analysis. **Table 4.1** contains the demographic information of the sample. Stakeholders included HCPs (77.8%), employer representatives (12.2%), insurer representatives (6.8%) and lawyers (3.2%). Ten participants (<1.0%) did not indicate their profession. Most participants were female (65.8%); aged between 30 - 49 years (31%); and had more than ten years experience working in the field (55.1%). The majority of the stakeholders managed at least 11 workers with UE disorders per month. Forty six percent indicated that greater than 50% of their caseload was funded through a workers' compensation insurer.

Agreement (>75%) on factors influencing a worker's ability to return to work

Stakeholders' responses to the questionnaire for all 50 factors are detailed in **Table 4.2** and the dichotomized responses illustrated in **Fig. 4.2**. Stakeholders agreed on twenty-one factors that they perceived influenced a worker's ability to RTW following UE surgery and two factors they perceived were 'not to somewhat' influential on RTW.

The factors that stakeholders perceived were 'very to extremely influential' on RTW included four biological factors, five psychological factors and 12 social factors. The *biological* variables were: worker displays difficulty coping with pain/injury (94.8%); post-operative pain level (86.4%); poor overall body function (75.9%); and two or more musculoskeletal pain sites (75.4%). The *psychological* variables were: worker's RTW self-efficacy (92.2%); post-operative psychological status (91.8%); worker's recovery expectations (88.3%); diagnosed mood disorder e.g., depression, anxiety (86.6%); and pre-operative psychological status (82%). The *social* factors were: supportive employer or supervisor (91.4%); employer's willingness to accommodate job modifications (90.7%); worker's job satisfaction (87.7%); availability of alternate or suitable duties (86.6%); whether the job can be modified (86.3%); worker's perception that the job can be modified (84%); exposure to hand and wrist repetition at work (82.3%); exposure to heavy lifting at work (81.4%); supportive work colleagues (78.2%); supportive family or spouse (77.2%); whether the worker has sought legal advice (75.5%); and amount of control a worker has over his/her job (75.4%).

Factors that stakeholders agreed were least influential on RTW were gender (89.5%) and whether the worker had a pre-employment medical evaluation (84.1%).

No agreement (<75%) on factors influencing a workers' ability to RTW

There was no consensus for 27 (54%) of the factors (**Fig. 4.2**).

Differences in agreement between stakeholder groups

There were also significant differences in the level of agreement between stakeholder groups for 19 (38%) of the 50 variables (**Table 4.2**). Stakeholders disagreed on the degree of influence on ten *social* and four *demographic* variables. There were no disagreements between stakeholder groups for the *psychological* variables.

Influence of demographic variables of the respondents on factor rating

Stakeholder group affiliation, years of experience, and management of more UE conditions, gender and age influenced the rating of certain factors and can be viewed in **Table 4.3**.

Table 4.1: Demographic profile of stakeholder groups (N=1011)

	Healthcare n (%)	Employers n (%)	Insurers n (%)	Lawyers n (%)	All n (%)
TOTAL	**787 (77.8)**	**123 (12.2)**	**69 (6.8)**	**32 (3.2)**	**1011**
Gender					
Female	515 (65.4)	88 (71.5)	49 (71)	13 (40.6)	665 (65.8)
Male	272 (34.6)	35 (28.5)	20 (29)	19 (59.4)	346 (34.2)
Age					
21-39 years	142 (18)	11 (8.9)	12 (17.4)	6 (18.7)	171 (16.9)
30-39 years	242 (30.8)	38 (30.9)	26 (37.7)	7 (21.9)	313 (31)
40-49 years	193 (24.5)	35 (28.5)	19 (27.5)	7 (21.9)	254 (25.1)
50-59 years	130 (16.5)	34 (27.6)	9 (13.1)	12 (37.5)	185 (18.3)
≥60 years	80 (10.2)	5 (4.1)	3 (4.3)	0	88 (8.7)
Years working in current profession					
Less than 1 year	29 (3.7)	3 (2.4)	8 (11.6)	1 (3.1)	113 (11.1)
1-5 years	133 (16.9)	39 (31.7)	27 (39.1)	3 (9.4)	202 (20.0)
6-10 years	161 (20.5)	30 (24.4)	8 (11.6)	0	199 (19.7)
>10 years	464 (59)	51 (41.4)	26 (37.7)	16 (50)	557 (55.1)
Not reported	0 (0.0)	0 (0.0)	0 (0.0)	12 (37.5)	12 (1.2)
Fund Type					
Centrally managed	360 (45.7)	86 (69.9)	60 (87)	21 (65.6)	527 (52.1)
Privately insurer / managed	405 (51.5)	24 (19.5)	8 (11.6)	11 (34.4)	448 (44.3)
Both/ Unknown / Not reported	22 (2.8)	13 (10.6)	1 (1.4)	0 (0.0)	36 (3.6)
Number of workers with UE conditions managed / month					
< 5	171 (21.7)	86 (70)	10 (14.5)	14 (43.8)	281 (27.8)
6-10	140 (17.8)	17 (13.8)	24 (34.8)	4 (12.5)	185 (18.3)
11-20	125 (15.9)	9 (7.3)	19 (27.5)	5 (15.6)	158 (15.6)
21-50	107 (13.6)	10 (8.1)	9 (13)	4 (12.5)	130 (12.9)
>50	165 (21)	0	2 (2.9)	1 (3.1)	168 (16.6)
Not reported	79 (10)	1 (0.8)	5 (7.3)	4 (12.5)	89 (8.8)
Percentage workers managed that are claiming workers' compensation					
0%	0 (0.0)	11 (8.9)	1 (1.4)	2 (6.3)	14 (1.4)
1-25%	195 (24.8)	43 (35.0)	7 (10.1)	6 (18.8)	251 (24.8)
26-50%	160 (20.3)	14 (11.4)	12 (17.4)	5 (15.6)	191 (18.9)
51-75%	132 (16.8)	5 (4.1)	13 (18.8)	10 (31.3)	160 (15.8)
>75	221 (28.1)	49 (39.8)	31 (44.9)	5 (15.6)	306 (30.3)
Not reported	79 (10.0)	1 (0.8)	5 (7.2)	4 (12.5)	89 (8.8)

Table 4.2: Stakeholder rating of factors using the 5-point Likert scale

Factor	1 Not influential %	2 Slightly influential %	3 Somewhat influential %	4 Very Influential %	5 Extremely influential %
Worker displays difficulty coping with pain/injury	0.4	0.4	4.4	32.0	62.8
Worker's RTW self-efficacy	0.4	0.7	6.7	32.1	60.1
Post-operative psychological status	0.5	0.8	6.9	32.5	59.3
Supportive employer/supervisor	0.5	0.8	7.2	34.6	56.8
Employer's willingness to accommodate job modifications	0.7	0.5	8.1	34.2	56.5
Worker's expectation r.e. their recovery	0.5	0.8	10.4	39.0	49.3
Job satisfaction	0.5	1.3	10.5	34.0	53.6
Diagnosed mood disorder	0.4	2.1	10.1	33.0	54.5
Availability of alternate/ suitable work tasks	0.9	2.5	9.9	37.7	49.0
Post-operative pain level	0.7	2.0	11.0	46.0	40.4
Whether the job can be modified on the worker's RTW	1.0	2.0	10.7	41.6	44.6
Worker's perception that the job can be modified	0.9	1.7	13.4	41.5	42.4
Exposure to hand/wrist repetition at work	0.7	1.7	15.4	42.7	39.6
Pre-operative psychological status	0.5	1.7	15.8	33.9	48.0
Exposure to heavy lifting at work	0.8	2.4	15.4	44.1	37.3
Supportive work colleagues	0.9	3.4	17.4	41.4	36.8
Supportive family or spouse	0.7	2.6	19.5	41.3	35.9
Poor overall body function prior to the surgery	1.1	2.9	20.1	43.4	32.5
Whether the worker has sought legal advice	1.6	6.2	16.7	31.2	44.3
Two or more musculoskeletal pain sites	1.1	2.6	20.9	46.8	28.7
Amount of control worker has over job	0.9	2.9	20.8	43.0	32.5
Worker's occupation	0.8	3.3	21.2	42.8	31.9
Having a structured Suitable Duties Program	0.4	3.8	21.3	41.5	33.0
Doctor's recommendation for work absence	0.8	4.1	20.9	38.6	35.6
Exposure to frequent bending or twisting of arm at work	0.7	4.2	22.9	44.9	27.3
Psychosocial demands of the workplace	0.5	3.7	23.6	41.8	30.4
Worker's compensation experience	1.3	6.1	20.5	40.2	31.9
Claiming workers' compensation	2.2	5.9	21.6	33.9	36.4
Policies and practices of the workplace	0.7	6.0	23.6	42.1	27.7
Worker is the primary breadwinner	3.2	5.4	22.5	37.8	31.1
Exposure to vibration at work	1.5	5.3	25.5	42.4	25.3
Worker is claiming third party	1.4	4.7	27.1	37.2	29.5

insurance/compensation					
Worker has alcohol/drug abuse problem	1.8	8.9	25.8	32.7	30.8
Worker's understanding of the compensation system	2.0	5.5	29.7	39.9	22.9
Pre-operative pain level	1.2	7.5	29.9	40.3	21.1
UE diagnosis	1.8	8.4	28.5	37.6	23.7
Health-related comorbidities	1.3	10.6	31.5	36.1	20.5
Multiple HCPs involved in worker's treatment	0.8	4.1	20.9	38.6	35.6
Education level of worker	4.0	11.4	34.6	33.3	16.8
Presence of in-house RTW coordinator	1.9	14.3	36.0	30.2	17.6
Obesity	2.7	14.4	37.0	27.2	18.8
Annual income	8.1	14.9	33.3	27.5	16.2
Worker's age	4.6	15.5	37.0	31.4	11.5
Hand Dominance	15.5	16.0	29.9	25.8	12.8
Pre-operative cardiovascular fitness	4.2	20.5	42.0	22.9	10.5
Which insurer is managing the claim	10.3	19.9	36.6	21.7	11.5
Smoker	8.8	25.1	35.2	20.3	10.6
Ethnicity	12.4	23.5	36.5	18.2	9.4
Whether the worker had a pre-employment medical evaluation in the last 12 months	25.3	35.7	23.1	9.9	6.0
Gender	31.7	26.8	31.0	8.3	2.1

Figure 4.2: Dichotomised responses for all factors

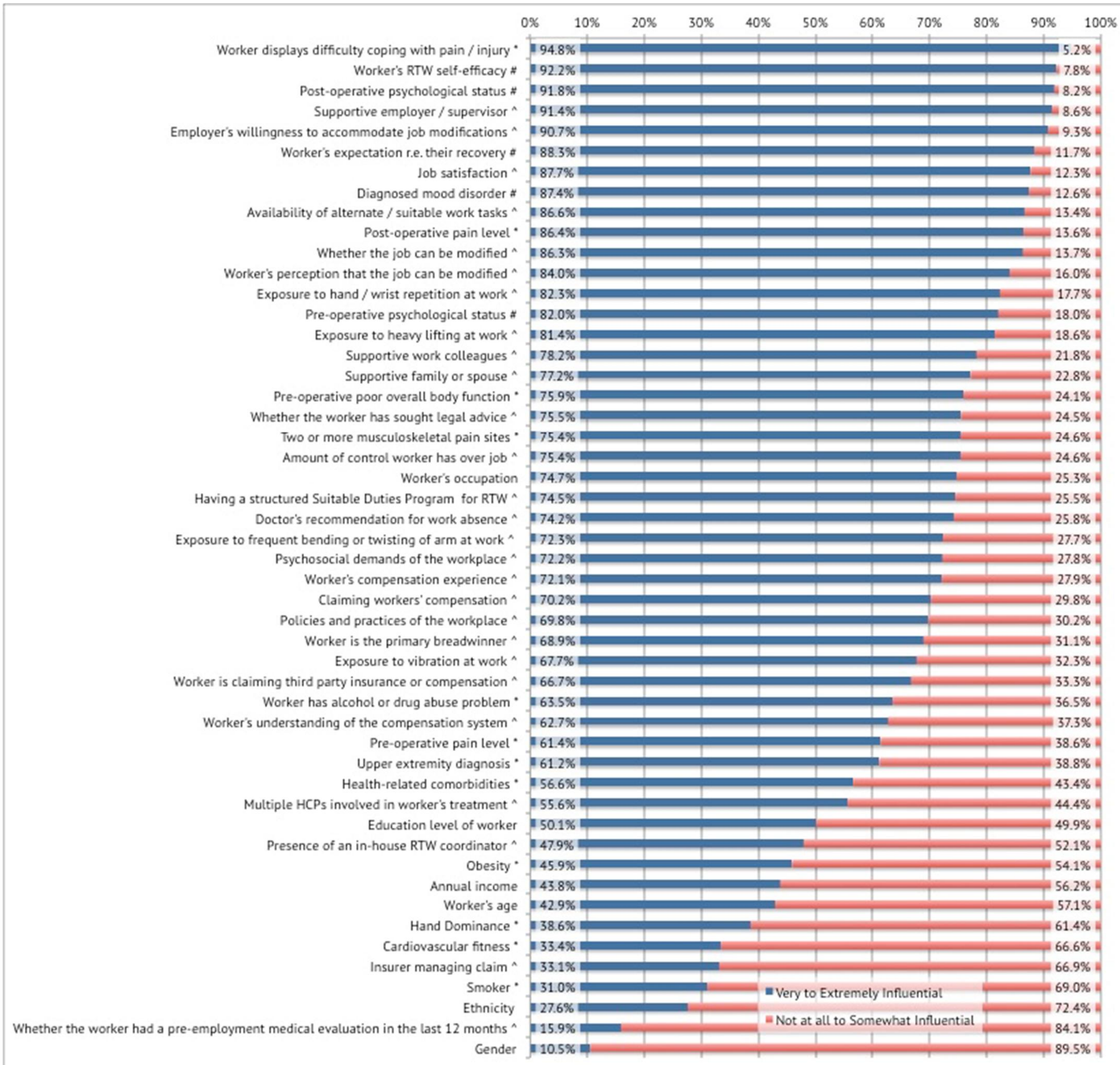


Table 4.3: Logistic Regression Analysis including Odds Ratios for the likelihood of respondents selecting 'very to extremely influential' for a factor

Factor (Dependent Variable)	Respondent characteristic (Independent variable	B	SE	Wald	p	Odds Ratio	95% CI for Odds Ratio
Age	Age: 40-49yrs	0.59	0.27	4.71	0.03	1.81	1.06-3.09
	Lawyer	1.79	0.65	7.49	0.01	5.98	1.66-21.53
	Insurer	0.91	0.28	10.41	0.001	2.49	1.43-4.33
	**21-50 UE workers/mo.	-0.53	0.26	4.26	0.04	0.59	0.34-0.97
	Constant	-0.13	0.40	0.10	0.75	0.88	
Gender	Age: 60+ years	0.81	0.41	3.97	0.05	2.25	1.01-5.01
	Age: 30-39 yrs.	1.0	0.51	4.03	0.05	2.80	1.03-7.66
	Lawyer	1.78	0.61	8.62	0.003	5.92	1.81-19.42
	Insurer	0.80	0.40	4.13	0.04	2.23	1.03-4.85
	Constant	-1.88	0.67	8.01	0.01	0.15	
Workers' compensation status	**Male	-0.49	0.19	6.64	0.01	0.61	0.42-0.89
	**Age:3 0-39 years	-0.90	0.34	6.98	0.01	0.41	0.21-0.73
	**>50 UE workers / mo.	-0.68	0.27	6.35	0.01	0.51	0.30-0.86
	Constant	1.680	0.45	14.27	<0.001	5.36	
Worker's income	Insurer	0.67	0.28	5.71	0.02	1.95	1.13-3.37
	Constant	-0.12	0.40	0.09	0.76	0.89	
Worker is the primary breadwinner	**≤5 years experience	-0.65	0.31	4.45	0.04	0.52	0.29-0.96
	Constant	1.32	0.44	9.14	0.003	3.75	
Worker's education level	**Male	-0.38	0.17	5.15	0.02	0.68	0.49-0.95
	**Insurer	-0.05	0.28	3.93	0.05	0.58	0.33-0.99
	Constant	0.11	0.39	0.07	0.79	1.11	
Hand dominance	Male	0.46	0.18	6.63	0.01	1.58	1.12-2.23
	Lawyer	1.36	0.54	6.36	0.01	3.88	1.35-11.14
	**> 50 UE workers / mo.	-0.65	0.28	5.43	0.02	0.52	0.30-0.90
	Externally managed WC fund	0.34	0.17	4.04	0.05	1.41	1.01-1.72
	Constant	-1.41	0.42	11.33	0.001	0.24	
Worker's UE diagnosis	>5 UE workers / mo.	0.79	0.27	8.41	0.004	2.19	1.29-3.74
	Externally managed WC fund	0.38	0.17	4.97	0.03	1.46	1.05-2.04
	Constant	-0.15	0.41	0.01	0.97	0.99	
Worker's ability to cope with injury	> 5 UE workers / mo.	1.44	0.71	4.17	0.04	4.21	1.06-16.78
	**1-25% WC workers / mo.	-4.29	1.78	5.80	0.02	0.01	0.00-0.45
	**> 10 years experience	-.1.50	0.71	4.42	0.04	0.22	0.06-0.90
	Constant	3.51	1.00	12.40	<0.001	33.29	
Worker has a diagnosis of a mood disorder, e.g., anxiety,	**51-75% WC /mo.	-0.79	0.31	6.34	0.01	0.46	0.25-0.84
	Constant	2.70	0.61	19.96	<0.001	14.90	

depression							
Worker has family support	Male	0.42	0.19	4.58	0.03	1.51	1.04-2.21
	**>50 UE workers /mo.	-0.65	0.31	4.45	0.04	0.52	0.29-0.96
	**51-75% WC /mo.	-0.59	0.25	5.52	0.02	0.55	0.34-0.91
	Constant	2.29	0.49	21.65	<0.001	9.86	
Worker has other comorbidities	Male	0.36	0.17	4.47	0.03	1.43	1.03-1.99
	Insurer	0.68	0.31	4.94	0.03	1.97	1.08-3.58
	**>75% WC / mo.	-0.57	0.23	5.98	0.01	0.56	0.36-0.89
	Constant	0.50	0.41	1.54	0.22	1.65	
Worker’s cardiovascular fitness	Male	0.39	0.19	4.34	0.04	1.47	1.02-2.12
	**<5 UE workers / mo.	-0.64	0.29	4.86	0.03	0.53	0.30-0.93
	Constant	-0.72	0.43	2.81	0.10	0.46	
Worker has alcohol abuse problem	Age: 60+ years	0.63	0.28	5.27	0.02	1.88	1.10-3.23
	Constant	0.69	0.42	2.71	0.1	1.99	
Worker is exposed to UE vibration at work	Male	0.59	0.18	10.82	0.001	1.80	1.27-2.55
	Age: 40-49 years	0.63	0.31	4.17	0.04	1.87	1.03-3.42
	Lawyer	1.90	0.87	4.79	0.03	6.67	1.22-36.53
	Constant	0.62	0.43	2.13	0.15	1.86	
Worker is exposed to heavy lifting at work	Male	0.70	0.21	10.57	0.001	2.00	1.32-3.04
	**>10 years experience	-0.97	0.41	5.69	0.02	0.38	0.17-0.84
	Constant	1.38	0.55	6.32	0.01	3.98	
Worker is exposed to UE repetition at work	Male	0.89	0.22	16.90	<0.001	2.42	1.59-3.69
	Age: 40-49 years	1.26	0.49	6.86	0.01	3.52	1.37-9.03
	**1-25% WC / m	-3.21	1.56	4.23	0.04	0.04	0.002-0.86
	Constant	1.16	0.54	4.58	0.03	3.18	
Job control	**Employer	-0.92	0.35	6.84	0.01	0.40	0.20-0.79
	Constant	0.74	0.45	2.68	0.10	2.10	
Availability of alternative tasks at work	Male	0.58	0.24	6.13	0.01	1.79	1.13-2.84
	Constant	1.20	0.56	4.68	0.03	3.33	
Job modification available	Male	0.66	0.24	7.52	0.01	1.93	1.21-3.08
	Age: 40-49 years	1.09	0.45	5.86	0.02	2.99	1.23-7.24
	**26-50 WC / mo.	-0.60	0.30	3.93	0.05	0.55	0.31-0.99
	**>75% WC /mo.	-0.89	0.34	6.93	0.01	0.41	0.21-0.80
	Constant	1.16	0.57	4.13	0.04	3.19	
Employer’s willingness to modify the job	**26-50% WC /mo.	-0.90	0.37	6.03	0.01	0.41	0.20-0.83
	Constant	2.87	0.69	17.58	<0.001	17.65	
Workplace’s RTW policies and procedures	Age: 50-59 years	0.69	0.24	8.28	0.004	1.99	1.25-3.18
	Age: 60+ years	0.99	0.29	12.11	0.001	2.70	1.54-4.73
	Age: 30-39 years	1.02	0.38	7.38	0.01	2.79	1.33-5.83
	**<5 UE workers / mo.	-0.65	0.27	5.68	0.02	0.52	0.30-0.89
	**≤5 years experience	-0.71	0.30	5.49	0.02	0.49	0.27-0.89

	Constant	0.95	0.43	4.76	0.03	2.58	
Worker's job satisfaction	**1-25% WC /mo.	-3.05	1.32	5.335	0.02	0.05	0.004-0.63
	**>10 years experience	-1.12	0.393	8.115	0.004	0.33	0.15-0.71
	Constant	3.07	0.647	22.509	<0.001	21.53	
Supportive employer	Male	0.59	0.28	4.33	0.04	1.81	1.035-3.15
	**1-25% WC /mo.	-2.90	1.45	4.02	0.05	0.06	0.003-0.94
	**51-75% WC /mo.	-0.89	0.42	4.41	0.05	0.41	0.18-0.94
	Constant	2.84	0.71	16.01	<0.001	17.02	
Supportive colleagues	Male	0.43	0.20	4.54	0.03	1.53	1.04-2.26
	Age: 60+ years	0.68	0.33	4.21	0.04	1.98	1.03-3.79
	Age: 30-39 years	0.92	0.45	4.15	0.04	2.51	1.04-6.07
	**1-25% WC /mo.	-3.69	1.42	6.81	0.01	0.03	0.002-0.40
	Constant	1.12	0.48	5.55	0.02	3.07	
Worker's RTW self-efficacy	**1-25% WC /mo.	-3.00	1.38	4.74	0.03	0.05	0.003-0.74
	**51-75% WC /mo.	-1.01	0.44	5.35	0.02	0.36	0.16-0.86
	Constant	2.85	0.76	14.02	<0.001	17.33	
Worker has suitable duties plan on RTW	Age: 60+ years	0.63	0.30	4.42	0.04	1.87	1.04-3.35
	Insurer	1.10	0.38	8.22	0.004	3.01	1.42-6.38
	Externally managed WC	0.41	0.19	4.95	0.03	1.52	1.05-2.20
	Constant	0.06	0.46	0.02	0.90	1.06	
Workplace has RTW Coordinator	Age: 60+ years	0.71	0.27	7.19	0.01	2.04	1.21-3.44
	Insurer	1.04	0.30	11.80	0.001	2.82	1.56-5.10
	**>50 UE workers /mo.	-0.77	0.27	8.00	0.01	0.46	0.27-0.79
	**≤ 5 years experience	-0.84	0.29	8.65	0.003	0.43	0.25-0.76
	Constant	0.14	0.41	0.12	0.73	1.15	
Worker has had a pre-employment medical examination	**>10 years experience	-0.84	0.38	4.96	0.03	0.43	0.21-0.90
	**≤5 years experience	-0.96	0.39	6.01	0.01	0.38	0.18-0.83
	Constant	-1.41	0.58	5.86	0.02	0.24	
Worker's occupation	Age: 30-39 years	0.81	0.40	4.20	0.04	2.25	1.04-4.87
	Constant	0.95	0.45	4.461	0.04	2.59	
Worker is exposed to frequent UE twisting/bending at work	Male	0.51	0.19	7.37	0.01	1.66	1.15-2.40
	Age: 40-49 years	0.88	0.35	6.32	0.01	2.40	1.21-4.76
	Age: 60+ years	0.65	0.28	5.53	0.02	1.92	1.12-3.31
	Age: 30-39 years	0.94	0.37	6.46	0.01	2.56	1.24-5.28
	Employer	2.25	1.12	4.00	0.05	9.44	1.05-85.13
	**≤5 years experience	-0.80	0.32	6.35	0.01	0.45	0.24-0.84
	Constant	0.68	0.45	2.27	0.13	1.97	
Worker is claiming any type of compensation	**Male	-0.74	0.19	15.09	<0.001	0.48	0.33-0.70
	Employer	0.93	0.44	4.54	0.03	2.54	1.08-5.98
	Constant	2.06	0.44	21.75	<0.001	7.84	
Worker has legal representation	**Male	-0.42	0.20	4.25	0.04	0.66	0.45-0.98

	**Lawyer	-1.36	0.51	7.05	0.01	0.26	0.09-0.7
	**Externally managed WC fund	-0.46	0.19	5.82	0.02	0.63	0.44-0.92
	Constant	2.46	0.48	26.60	<0.001	11.66	
Doctor's recommendation for RTW	Male	0.56	0.19	8.55	0.003	1.75	1.20-2.54
	Insurer	0.94	0.41	5.16	0.02	2.55	1.14-5.71
	**21-50 UE workers /mo.	-0.81	0.31	6.98	0.01	0.45	0.24-0.81
	**>50 UL workers /mo.	-0.91	0.29	9.74	0.002	0.40	0.23-0.71
	**1-25% WC / mo.	-2.99	1.38	4.72	0.03	0.05	0.003-0.74
	Constant	1.47	0.48	9.54	0.002	4.35	

Key: UE=upper extremity; WC=workers' compensation; mo.=month

- Only dependent variables with significant independent variable associations are reported. All other dependent variables can be assumed to have no significant respondent related factors contributing to the selection of a factor.
- Significant variables contributing to the model with $p<0.05$. All independent variables not reported can be assumed to be not significant. Compared to Age – 10-19 years; Occupation – HCP; 6-10 UE workers / month;
- ** -ve B values indicate less likely to select very to extremely influential.

4.7 Discussion

The purpose of this study was to determine stakeholders' perspectives on the factors they perceive influence a worker's ability to RTW following surgery for a non-traumatic musculoskeletal disorder of the UE. Furthermore, the study aimed to determine whether these opinions differed between stakeholder groups or with respect to the demographic data of the respondents.

Overall, >75% of respondents (irrespective of stakeholder group) agreed on 46% of the factors' influence on RTW. No consensus (<75%) was found for 27 factors. There were statistically significant differences between stakeholder groups for 19 (36.5%) factors. In addition, we also found that there were a number of respondent-related variables that influenced the rating of certain variables.

Agreement (>75%) on factors influencing a worker's ability to return to work

More than 75% of respondents agreed on 21 factors that they perceived were greatly to extremely influential on RTW following surgery for UE conditions and two factors they perceived as being least influential. When applying the biopsychosocial model to the factors identified, most were from the social domain, and more specifically, the workplace. Whilst the literature supports the importance of psychosocial factors influencing RTW,(58, 106, 239) what is interesting is that some of the specific factors that were identified by stakeholders have conflicting evidence for their prognostic effect on RTW outcomes in the literature. These will be discussed below.

In a recent systematic review of prognostic variables for RTW following carpal tunnel surgery, a number of work-related factors were found to be prognostic in one or more studies: less supportive workplace, less supportive co-workers, job dissatisfaction, high job strain, exposure to bending or twisting of the hands, exposure to heavy lifting, exposure to repetition, and worker's RTW expectations.(85) In the same review, job accommodation was found to be prognostic for a better RTW outcome, but not for a poorer outcome. In our study, we found that multiple factors related to job accommodation were thought to have a strong influence on RTW. These included a worker's perception of how the job can be modified and the willingness of employers to modify jobs to accommodate a worker's impairments. Workplace-related barriers have also been highlighted as important prognostic factors for RTW for workers with back pain.(79) Steenstra et al also suggested that the nature of the support received from stakeholders might impact on the success of workplace interventions.(79) Therefore based on our findings and those from the existing literature it might be beneficial for interventions to include components that focus on stakeholder education to improve both processes for identifying barriers to RTW and facilitating job accommodation.

Our study also found that stakeholders considered supervisor support and worker's job control important. Previous studies have focused on supporting supervisors in their role in managing injured workers.(240, 241) This is also supported by various studies on the unique role and importance of supervisor support in the RTW process.(230, 231, 242) However, conflicting evidence exists for both co-worker support and supervisory support from the results of a systematic review on carpal tunnel surgery.(85) This could perhaps suggest that supervisory support may be more relevant for some types of injuries or job demands. However it is important to note, that there is a dearth of prognosis studies for non-traumatic UE diagnoses, outside of carpal tunnel surgery, for comparison. Hence, this could simply be due to the lack of high quality studies on this topic for UE conditions.

Psychological factors including psychological state, recovery expectations and RTW self-efficacy, were rated as factors with a high influence on RTW. While it is not conclusive that psychological status is prognostic for RTW,(85) a number of studies have shown that low recovery expectations(86, 207) and poor self-efficacy(78, 79) do play an important role in influencing poorer outcomes, and vice versa for better outcomes. Stakeholders also perceived that diagnosis of a mood disorder influences RTW outcomes. However, a number of systematic reviews do not conclusively support this finding.(79, 85, 180)

Biological factors considered most influential were dominated by pain coping, severity and distribution over two or more pain sites. Two or more musculoskeletal pain sites has also been found predictive of greater work disability duration following carpal tunnel surgery; however severity was not found to be prognostic.(85) Stakeholders also agreed that coping with pain was greatly to extremely influential on RTW. Despite all pain factors being categorized as biological for the purpose of this study due to their biological origin, considered attention needs to be given to the complex and multidimensional nature of pain. Pain, and in particular coping with pain, has strong psychological and social dimensions. Workers who do not cope with their pain may catastrophise symptoms. Pain catastrophising has been found to have a strong association with outcomes such as disability in a range of UE conditions including trigger finger, DeQuervains tendinopathy, CTS, arthritis, lateral epicondylalgia, and distal radius fracture.(177, 213) Therefore although we classified pain as biological in this study, we acknowledge that pain also has important psychosocial dimensions, and hence should be managed as such.

Differences in agreement between stakeholder groups

There were differences between stakeholder groups on 19 (36.5%) factors. The strongest disagreements included: age; gender; obesity; doctor's recommendation for RTW; and the presence of a RTW coordinator. These differences may arise from the unique standpoint each stakeholder has in the RTW process.(243) Ideally, stakeholders work together and communicate regularly to facilitate a successful RTW. However, in reality stakeholders often have their own motivations and goals based on their perceived role in the RTW process.(60) For example, more employers considered the presence of a RTW coordinator as influential compared to the other stakeholder groups, likely due to their familiarity and appreciation of the unique role RTW coordinators play in the RTW process assisting injured workers back to work.

The professional background of the stakeholder may mean they adopt different frameworks to conceptualize both the injury and RTW outcomes.(244) These differences may lead stakeholders to place more importance on those factors they perceive to have a greater influence on RTW. This has been thought to result in tension and conflict.(226) Therefore, it is not surprising that the stakeholders disagreed on some of these factors. However, the percentage of factors for which disagreements existed (36.5%) is concerning. The reasons for this warrant further exploration, as they may interfere with the success of RTW interventions. Decreasing sources of miscommunication and misinformation whilst increasing stakeholder's awareness of their professional paradigms and motivations is purported to improve RTW outcomes.(60)

It is important to consider that it might also be unrealistic for stakeholders to agree on all factors that they believe influence RTW. The evidence supports collaboration and effective communication as two key components of successful RTW interventions.(245) Therefore, discussing discordant views of goals for RTW, perceived barriers and facilitating factors could theoretically improve RTW, regardless of the divergent perspectives. Baril et al suggested that key ingredients influencing either the success or failure of RTW interventions appear to be trust and communication between stakeholders, which might be used to discuss differing perspectives and to develop interventions.(235)

Respondent-related variables and their association with the rating of factors

For 34 (68%) of the factors that stakeholders rated as being 'greatly to extremely' influential on RTW, there was a higher likelihood of a respondent rating a factor based on their demographic and occupation-related variables. It is more likely that those who have greater experience in working with workers with UE conditions or higher number of workers' compensation claimants may respond differently to those who have less experience or see fewer workers' compensation workers. This was the case for the following respondent-related variables: workers' compensation status, hand dominance, worker having other comorbidities, job modification availability, supportive employer, the workplace having a RTW coordinator and doctor's recommendation for RTW. Workers who are claiming through workers' compensation and those that are privately insured have been found to have different RTW experiences,(246) and stakeholders' perspectives reflected this. This may also explain why those from an externally managed fund were more likely to rate 'the worker has a suitable duties plan in place when returning to work'. Similarly, stakeholders may respond differently depending on their role in the RTW process. For example, lawyers were less likely to select 'the worker has legal representation' as a factor influencing RTW outcomes. Employers were more likely to rate 'the worker is claiming any type of compensation' and 'worker is exposed to frequent UE twisting at work' and insurers were more likely to select 'worker has a suitable duties program on RTW', 'workplace has a RTW coordinator' and 'worker's pre-injury income' as influential for RTW.

Methodological considerations and implications for future research

Strengths of this study were the large sample size with broad representation across jurisdictions, age and sex of the respondents. Also, respondents were mostly experienced in their role and dealt with a considerable number of UE cases on a monthly basis. One limitation of this study was that we were unable to obtain an equal number of participants from each stakeholder group. There was a predominance of healthcare providers compared to lawyers, insurer or employer representatives. Although equal representation across groups would be ideal, this is most likely a reflection of the relative proportion of stakeholders who actually manage workers with UE conditions.

Factors garnered for this study were identified from various systematic reviews of the literature. However, this may not constitute an exhaustive list of all factors that may influence RTW. Likewise, due to the nature of this study, the factors identified by stakeholders cannot be considered to be prognostic for RTW. Furthermore, this study also highlighted the complexity of categorizing many of the factors included in this study using a specific model (i.e., biopsychosocial model), the relationship of the factors with RTW and the difficulty capturing these in both research and management. What this study does contribute is an insight into the perspectives of stakeholders who regularly deal with injured workers with UE conditions. It provides a list of factors with prognostic potential that warrant further investigation in longitudinal studies. As there is a dearth of literature investigating the prognostic factors for RTW following surgery for common UE conditions, high quality cohort studies are urgently needed.

4.8 Conclusion

Stakeholders play important roles in the RTW process and hold valuable insight into the factors influencing a worker's RTW. This study has revealed important findings that we recommend be considered in future research, such as longitudinal studies exploring prognosis for RTW and the development of RTW interventions. In our study of Australian stakeholders dealing with injured workers, more than 75% of stakeholders agreed on 23 factors. These factors were mostly related to the workplace or were psychological. These factors were generally modifiable and amenable to intervention. There was no consensus (<75%) on 27 factors. There were differences between stakeholder groups for 19 (36.5%) of the factors. Moreover, a number of respondent-related variables were associated with the likelihood of rating 34 of the factors. The primary recommendation from this study is that future prognostic studies should focus on establishing the value of the identified factors on RTW. This may in turn improve interventions aimed to facilitate RTW.

4.9 Acknowledgements

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Surgery of the Hand, Occupational Therapy Australia, Australian and New Zealand Society of Occupational Medicine, Australian Faculty of Occupational and Environmental Medicine, Australian Rehabilitation Providers Association, RTW Matters, Queensland Law Society, QComp, Self Insurers Association (Australia). This study was partially supported by a research grant from the Australian Hand Therapy Association.

CHAPTER 5: Healthcare providers' perspectives on factors influencing return-to-work after surgery for non-traumatic conditions of the upper extremity.

5.1 Chapter Introduction

The health care providers (HCPs) included in the survey of Australian stakeholders in **Chapter 4** were a homogenous group. Therefore, this chapter examines the factors that were identified by the 787 HCPs in more detail.

5.2 Publication

***Peters SE**, Coppieters MW, Ross M, Johnston V. Healthcare providers' perspectives on factors influencing return-to-work after surgery for non-traumatic conditions of the upper extremity. Submitted to Disability and Rehabilitation.*

5.3 Abstract

Purpose: HCPs are key stakeholders in the return-to-work (RTW) process. This study aimed to: 1) examine HCPs' opinion on factors that influence RTW following surgery for non-traumatic upper extremity (UE) conditions; and 2) determine whether HCPs from different disciplines shared the same opinion on these factors.

Methods: Using a questionnaire, HCPs rated the influence of 50 factors on a worker's ability to RTW. Each factor was scored on a 5-point Likert-scale ranging from 'not' to 'extremely' influential later dichotomised for analysis. Agreement was indicated at 75%. The level of disagreement between disciplines was examined.

Results: Among 787 respondents, there was agreement on 20 factors. The ten highest were: pain coping; post-operative psychological state; RTW self-efficacy; employer/supervisor's support; employer's willingness for job modification; worker's recovery expectations; job satisfaction; suitable duties availability; whether the job can be modified; and mood disorder diagnosis. No agreement was found for 28 factors. There

was disagreement between disciplines on six factors (obesity; comorbidities; doctors RTW recommendation; diagnosis; fitness; income).

Conclusions: The factors that stakeholders agreed as having the greatest influence were mainly related to the worker (pain and psychological factors) and the workplace, and are amenable to RTW interventions. Few disagreements between disciplines existed.

Ethical Approvals: School of Health and Rehabilitation Sciences, The University of Queensland (2012SHRS_OT007).

5.4 Introduction

Work disability associated with non-traumatic work-related musculoskeletal conditions of the UE is a significant and costly societal problem.(1, 4) Diagnoses of the wrist and hand account for 38% of work-related injuries resulting in hospitalization and incapacity for work.(247) Surgery is frequently offered to workers who have more severe symptoms or do not respond adequately to conservative management. Despite the success of surgery for certain conditions, such as CTS(164) and rotator cuff pathology,(248) work disability often persists.(91, 177) This results in a burden on healthcare services, and greater associated costs for a number of key stakeholders, including workers, employers and insurers.(1) Importantly, there is evidence that work disability affects workers' physical and psychological health, resulting in poorer quality of life.(49, 249)

The literature has identified many factors influencing the ability for a worker to RTW The biopsychosocial model is often used to categorize the prognostic variables for RTW.(62) These variables can include worker-related (e.g., demographic, biological, psychological), workplace and societal factors. However, few studies have focused on prognosis following surgery of the UE, with most being retrospective or cross-sectional in nature, and few being high quality.(250) In addition, few variables that have been identified as being prognostic for other diagnostic groups, such as low back pain, have not yet been studied in UE conditions.(250)

Stakeholders are individuals who have a direct interest in the RTW process.(60) Workers often receive sickness and medical benefits through either a workers' compensation or a national social insurance scheme. Regardless of the jurisdiction, various stakeholders are involved in the RTW process with a common goal of returning the injured work back to work. Stakeholders can be instrumental in identifying factors, which may delay a worker's RTW and cause unnecessary work disability.(49) HCPs are important stakeholders who not only provide clinical interventions, but are also instrumental in the decision making process on legitimization of work-relatedness, readiness to RTW, as well as providing guidelines on a worker's functional capacity and prescription of suitable duties.(51, 70, 226, 251) HCPs are essential members of the multidisciplinary team and, hence, are almost always included in both the development and implementation of RTW interventions.(72, 107, 108, 252) Understanding which factors HCPs perceive are influential in a worker's ability to RTW will assist in designing research studies to explore prognostic variables to RTW, and to develop successful assessment tools and interventions focused on facilitating early RTW and preventing (work-) disability.

The aims of this study were to: 1) establish HCPs perspectives on factors influencing RTW following surgery for non-traumatic conditions of the UE and 2) examine the level of agreement between different HCP disciplines.

5.5 Method

This paper outlines the findings of the HCP stakeholder group from a large cross-sectional study that also determined perspectives on RTW among insurers, employers and lawyers.

A questionnaire was distributed either electronically (www.surveymonkey.net) via gatekeeper organisations (for the list of gatekeeper organisations, see *Acknowledgements*) or by hardcopy at relevant stakeholder events. The questionnaires were distributed between August 2013 and January 2014. Completion of the survey was voluntary. Hardcopy responses were later entered into SurveyMonkey and a second independent person external to the study checked data.

Development of the questionnaire content

The first section of the survey obtained demographic and professional information about the participants. The second section asked participants to rate their opinion of the degree of influence that 50 pre-determined factors have on RTW. Participants were asked to consider their responses with respect to workers who had surgery for non-traumatic UE conditions. The included factors were extracted from systematic reviews on prognostic factors for RTW.(24, 77-80, 86, 88, 180, 184, 236, 250) Participants were provided with examples of the types of surgery and conditions, such as CTS and tendinopathies. Each factor was rated on a five point Likert scale, ranging from “1-Not at all influential” to “5-Extremely influential”, with a sixth option for “No opinion”.

The survey was piloted prior to distribution. Participants of the pilot round were stakeholders with various roles in the RTW process and over ten-years experience managing workers with UE conditions. Modifications were made to the survey on content, and format. Following this, the questionnaire was distributed to another ten stakeholder representatives to establish reliability between the electronic and hardcopy. They completed each format of the questionnaire with a minimum of 24 hours between each. Weighted kappas were calculated for each factor in its original (5-point scale) format and kappa in its dichotomized state. Weighted kappa and kappa results for the factors of the questionnaire were all above 0.74. These findings are in agreement with a recent systematic review, which showed that paper-based and web-based questionnaires when used interchangeably are reliable.(237)

Recruitment procedure

We recruited HCPs who dealt with injured workers as part of their occupational role. Key national and state-based gatekeeper organizations distributed the survey via email and/or in their organization’s newsletter. In addition, the survey was disseminated by the ‘RTW Matters’ online newsletter (www.RTWmatters.org). This newsletter is distributed nationally to HCPs, employer representatives, and insurer claims advisors and case-managers. We also engaged in key stakeholder events to distribute and advertise the survey. At these events, participants were provided with a generic link to the electronic survey or provided with a hard copy to complete. We utilized a “snow-ball” sampling method by inviting participants to forward the web-based link to other HCPs that dealt with workers with UE conditions.

Setting

The study was conducted in Australia and should be considered within this context. Australia has systems of both publicly and privately funded health care and insurance arrangements for injured workers, public liability insurance and motor vehicle accidents.(253, 254) Workers’ compensation is provided to eligible workers who are employed at the time of the injury and have a work-related injury. They are entitled to a percentage of income replacement during the recovery period, insurer-approved medical and rehabilitation coverage, RTW suitable duties plans, and lump sum compensation for significant permanent impairment. Financial compensation is based on the worker's lost income at the time of the injury or claim. Workers' compensation insurance is regulated within each State or Territory of Australia. There are minor differences between coverage, duration of compensation and amount of compensation paid to workers.(254) There is also a difference in how the compensation fund is managed within the States or Territories.(254) The States of Queensland, Victoria and South Australia, and employees of the Australian Government are managed by a central government managed fund whereas New South Wales, Western Australia, Tasmania, Northern Territory and Australian Capital Territory are managed by externally managed/privately managed funds that are regulated by the government. Large employers are able to self-insure in each state but are still regulated by the state's government authority.

Statistical Analysis

Data were exported from Survey Monkey to SPSS (Version 22) for analysis. Descriptive statistics were used to profile the participants. The data from the Likert scale responses were dichotomized into two categories. The first category contained the "1- Not at all influential", "2- Slightly influential" and "3- Somewhat influential" responses. The second category contained the "4- Very influential" and "5- Extremely Influential" responses. The response option "No opinion" was not counted in the analysis. Frequency data were tabulated for the categorical values. All analyses were performed using $p < 0.05$ as the level of significance. For the overall sample, we considered that there was agreement if at least 75% of all stakeholders (regardless of discipline) indicated that the factor belonged in one of the dichotomized categories. This cut-off has been used previously.(238) We also tested the proportion of HCPs by discipline whom had selected either dichotomized category using the χ^2 statistic or Fisher's Exact Test (for factors with less than five participants per cell in a contingency table) to determine differences between groups.

5.6 Results

Participant characteristics

A total of 787 participants completed the questionnaire (electronic (n=739); hard copy (n=48)). **Table 5.1** displays the characteristics of the participants. The majority were female, allied health professionals and were HCPs in primary care. The majority of HCPs also indicated that they had more than ten-years experience in their field.

Table 5.1: Participant Demographic Profile (N=787)

Characteristic	n (%)
Gender	
Male	272 (34.6)
Female	515 (65.4)
Age Group (years)	
21-29	142 (18)
30-39	242 (30.8)
40-49	193 (24.5)
50-59	130 (16.5)
60 or older	80 (10.2)
Scope of practice	
Primary care	427 (54.3)
Secondary care	209 (26.6)
Both primary and secondary care	130 (16.5)
Other (e.g., management)	21 (2.7)
Years of experience	
Less than 1 year	29 (3.7)
1-5 years	133 (16.9)
6-10 years	161 (20.5)
Greater than 10 years	464 (59)
Profession	
Hand Therapist (HTs)	200 (25.4)
Physiotherapist (PTs)	178 (22.6)
Occupational Therapist (OTs)	138 (17.6)
Surgeon (SURG)	91 (11.6)
General Practitioner (GP) / Occupational Physician (OP)	59 (7.5)
Exercise Physiologist (EPs)	58 (7.4)
Psychologist / Rehabilitation Counsellor (PSY)	28 (3.5)
Others (Nurse, Social Worker)	36 (4.6)
State*	
New South Wales	324
Queensland	213
Victoria	113
Western Australia	59
South Australia	50
ACT	28
Tasmania	14
Northern Territory	10

***36** participants nominated working across two workers' compensation jurisdictions

Agreement (>75%) on factors influencing return-to-work

The results of the 50 factors (**Table 5.2**) and their distribution in their dichotomised state are presented (**Fig. 5.1)**. Twenty factors were rated by more than 75% of the HCPs as 'greatly to extremely' influencing RTW. These included four biological factors: 1) the worker has difficulty coping with the pain (94.5%); 2) pain intensity after the surgery (e.g., the higher the pain intensity, the more it influences RTW) (85.6%); 3) two or more musculoskeletal pain sites (75.5%); and 4) poor overall pre-operative function (75.7%). Five psychological factors were rated by greater than 75% of HCPs as being 'greatly to extremely influential: 1) post-operative psychological status of the worker (e.g., emotional and mental state, someone who either displays psychological manifestations with or without a diagnosed mental illness) (92.3%); 2) worker's RTW self-efficacy (91.9%); 3) worker's recovery expectations (88.7%); 4) diagnosis of a mood disorder (e.g., depression or anxiety disorder) (86.9); and 5) psychological status of the worker before surgery (82.7%). Ten social factors related to the workplace were also selected: 1) having a supportive employer or supervisor (90.9%); 2) employers willingness to modify the job (90.6%); 3) job satisfaction (87.9%); 4) availability of suitable duties (87.5%); 5) whether the job can be modified (87%); 6) workers perception that the job can be modified (84.1%); 7) exposure to UE repetition (79.9%); 8) heavy lifting (79.2%); 9) job control (77.9%); and 10) supportive work colleagues (75.2%). One other social factor outside the workplace was selected, namely supportive family (76.2%). All of these factors are potentially modifiable and amenable to intervention.

The factors that were rated by the greatest proportion of HCPs as being 'not to somewhat' influential on RTW were gender (92.2%) and whether the worker had a pre-employment medical (85.2%).

No agreement (<75%) on factors influencing return-to-work

There was no agreement on 28 (56%) of the factors (**Fig. 5.1**).

Differences between HCP disciplines

Only six factors showed statistically significant discrepancies in rating between different professions. These included: annual income; UE diagnosis; presence of another health-related comorbidity; obesity; pre-surgery cardiovascular fitness; and doctor's recommendation for duration of work absence. Details about differences are summarised in **Table 5.3.**

Figure 5.1. Dichotomised stakeholders’ findings

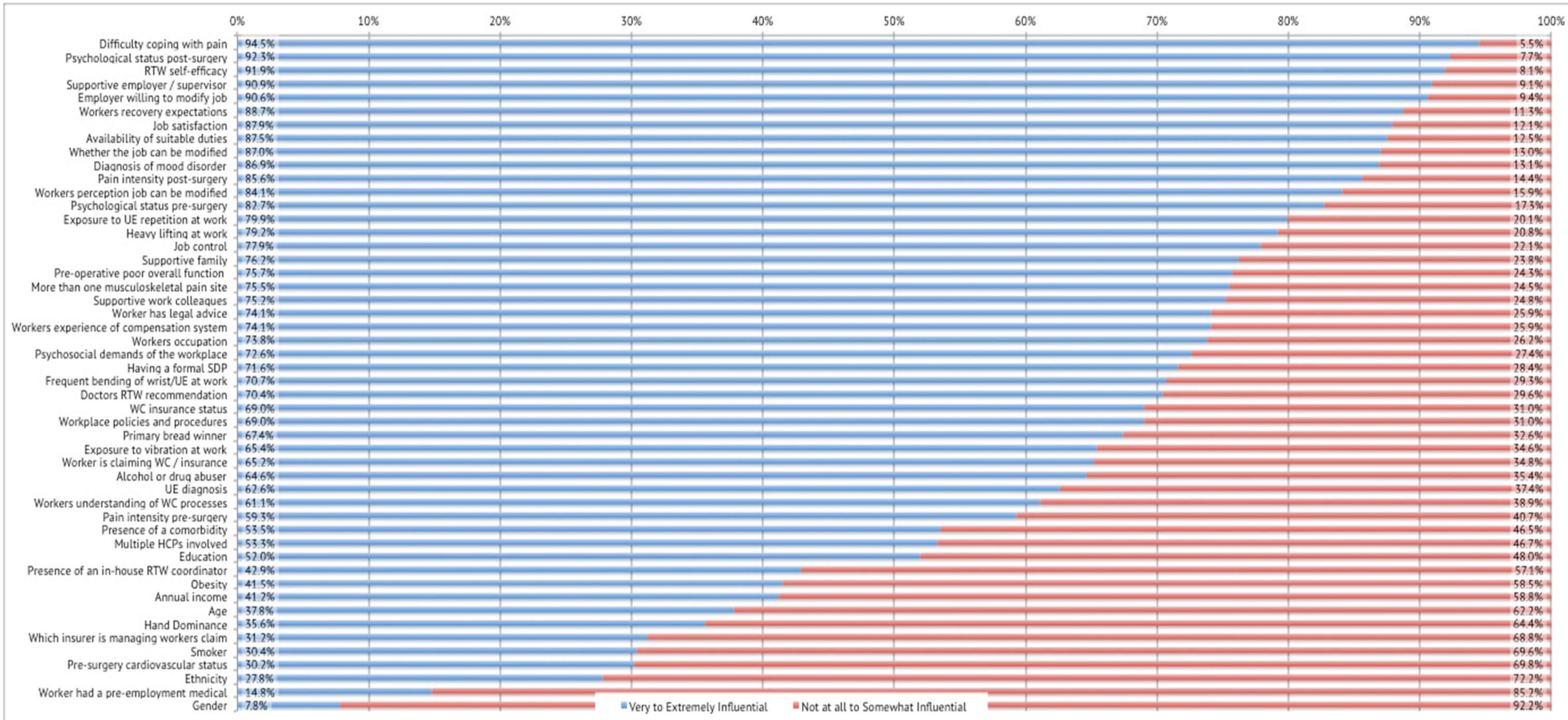

Table 5.2. Stakeholders rating of factors

Factor	1 Not at all %	2 Slightly %	3 Somewhat %	4 Very %	5 Extremely %	Mean average
Worker displays difficulty coping with pain /injury	0.33	0.33	4.78	30.48	64.09	4.58
Worker's RTW self efficacy	0.33	0.50	7.35	32.72	59.10	4.50
Post-operative psychological status	0.50	0.33	6.79	33.61	58.77	4.50
Willingness of the employer to accommodate job modifications	0.33	0.50	8.51	34.89	55.76	4.45
Supportiveness of the employer or supervisor	0.33	0.67	8.03	35.79	55.18	4.45
Worker's job satisfaction	0.34	0.84	10.79	35.08	52.95	4.39
Worker has a mood disorder diagnosis	0.34	2.02	10.59	34.62	52.44	4.37
Worker's expectations regarding their recovery	0.33	0.66	10.23	39.77	49.01	4.36
Availability of suitable /alternative work tasks	0.33	2.16	9.95	39.30	48.26	4.33
Whether the job can be modified on the worker's RTW	0.50	1.66	10.78	42.62	44.44	4.29
Pre-operative psychological status	0.50	1.67	15.17	34.50	48.17	4.28
Worker's perception that the job can be modified	0.67	1.67	13.67	42.50	41.50	4.23
Post-operative pain intensity	0.66	1.81	11.82	46.63	39.08	4.22
Exposure to repetitive UE tasks at work	0.50	2.00	17.47	41.76	38.27	4.15
Exposure to heavy lifting at work	0.50	2.81	17.52	42.81	36.36	4.12
Amount of control a worker has over his/her job	0.67	2.17	19.17	43.00	35.00	4.10
Whether the worker has sought legal advice	1.34	6.05	18.49	32.44	41.68	4.07
Supportive family or spouse	0.67	2.50	20.47	41.93	34.44	4.07
Supportiveness of worker's colleagues	0.67	3.85	20.10	40.20	35.18	4.05
Pre-operative poor overall body function	1.01	3.02	20.27	42.71	33.00	4.04
Type of occupation	0.66	3.29	22.24	41.52	32.29	4.01
More than one musculoskeletal pain site	0.67	2.50	21.13	46.26	29.45	4.01
Having a structured suitable duties program	0.33	4.16	23.63	39.27	32.61	4.00
Psychosocial demands of the workplace	0.33	3.68	23.41	41.47	31.10	3.99

Doctor's recommendation for amount of work absence	0.83	4.65	23.92	39.53	31.06	3.95
Workers' Compensation claim	2.00	5.32	23.46	34.28	34.94	3.95
Worker's experience of the compensation system	1.34	5.88	21.34	41.85	29.58	3.92
Frequent bending/twisting of the wrist or arm at work	0.50	4.49	24.13	45.76	25.12	3.91
Policies and practices of the workplace	0.51	5.90	24.28	43.34	25.97	3.88
Worker has an alcohol or drug abuse problem	1.58	7.19	26.67	33.68	30.88	3.85
Being the primary breadwinner	2.68	5.86	23.95	38.69	28.81	3.85
Whether the worker is claiming compensation	1.49	4.47	28.64	38.91	26.49	3.84
Exposure to vibration to the affected UE at work	1.17	5.54	27.68	41.11	24.50	3.82
Worker's UE diagnosis	1.83	7.49	27.79	38.44	24.46	3.76
Worker's understands workers' compensation processes	1.85	5.70	31.21	40.77	20.47	3.72
Pain intensity or symptom severity PRIOR to surgery	1.17	7.67	31.50	39.83	19.83	3.70
Presence of a comorbidity	1.00	10.85	34.56	35.39	18.20	3.59
Multiple HCPs involved	1.69	10.34	34.41	35.93	17.63	3.57
Education level	3.51	10.02	34.22	35.56	16.69	3.52
Presence of in-house RTW coordinator	1.70	15.65	39.46	27.89	15.31	3.39
Obesity	2.59	16.06	39.72	25.56	16.06	3.36
Annual Income	7.84	15.84	34.92	26.58	14.82	3.25
Age	5.32	17.30	39.27	29.78	8.32	3.18
Worker's pre-surgery cardiovascular fitness	4.04	22.67	42.88	21.44	8.96	3.09
Which insurer is managing the worker's claim	9.24	20.29	38.95	21.92	9.60	3.02
Worker is a smoker	7.96	26.19	35.40	19.82	10.62	2.99
Hand dominance	17.69	15.82	30.61	25.34	10.54	2.95
Ethnicity	10.77	23.08	38.29	18.46	9.40	2.93
Worker had a pre-employment medical evaluation <12 months	25.53	36.08	23.63	8.86	5.91	2.34
Gender	34.69	27.24	30.12	6.77	1.18	2.13

Table 5.3: Factors rated differently between professions

Factor	Overview of disagreements	Statistics
Annual income	**Very to extremely influential:** EP: 55% PSY: 55% SURG: 50% **Not at all to somewhat influential:** HT: 69% OT: 63% GP: 57% PT: 56%	X^2(7,N=582)=15.44, p=0.017
Worker's UE diagnosis	**Very to extremely influential:** SURG: 72% HT: 70% EP: 64% OT: 60% PT: 55% GP: 54% **Not at all to somewhat influential:** PSY: 62%	X^2(7,N=597)=16.74, p=0.010
Presence of a comorbidity	**Very to extremely influential:** PT: 68% EP: 64% PSY: 59% OT: 55% GP: 51% **Not at all to somewhat influential:** SURG: 68% HT: 52%	X^2(7,N=594)=30.16, p=<0.001
Obesity	**Very to extremely influential:** PSY: 57% EP: 52% PT: 52% **Not at all to somewhat influential:** SURG: 67% OT: 66% HT: 65% GP: 57%	X^2(7,N=576)=16.45, p=0.012
Worker's pre-surgery cardiovascular fitness	**Very to extremely influential:** PSY: 57% **Not at all to somewhat influential:** SURG: 87% OT: 76% HT: 73% GP: 72% EP: 63% PT: 58%	X^2(7,N=566)=29.1, p=<0.001

Doctor's RTW recommendation	**Very to extremely influential:** EP: 83% PSY: 77% PT: 76% GP: 74% HT: 65% **Not at all to somewhat influential:** SURG: 53%	$X^2(7,N=597)=28.9$, p=<0.001

Key: EP=Exercise Physiologist; GP=General Practitioner; HT=Hand Therapist; OT=Occupational Therapist; PT=Physiotherapist; PSY=Psychologists; SURG=Surgeon

5.7 Discussion

This cross-sectional study identified HCPs opinion on the level of influence of 50 factors for RTW after surgery for non-traumatic UE conditions. Stakeholders agreed on 20 (40%) factors that they perceived greatly-to-extremely influenced RTW, and two (4%) factors that were not-to-somewhat influential on RTW. Interestingly, no agreement was reached on 58% of factors. However, few disagreements between different disciplines were found. As there is a dearth of studies examining stakeholders' perspectives of factors influencing RTW, we will discuss our findings with respect to the existing epidemiology literature on prognostic factors for RTW.

Agreement (>75%) on factors influencing return-to-work

Three factors that were rated as being greatly influential by more than 75% of HCPs were pain-related. The selection of these factors is particularly interesting as there is inconsistent evidence in the literature to either support or refute these factors as being influential. Pain intensity was not found to have a strong association with RTW timeframes for both non-traumatic(250) and traumatic(77) UE conditions. The HCPs may have selected pain intensity as this is the focus of many clinical and psychological treatments in their practice. Therefore, they may be more likely to see workers experiencing high levels of pain who have difficulty returning to work. An American study found that hand surgeons were more likely to certify a worker off work if they reported high levels of pain.(220) Little research has focused on the association of coping with pain following UE surgery with work-related outcomes. However coping strategies have been shown to have a positive association with overall health and decreased sickness absence in patients with general health problems.(255) Although rated by 75% of respondents as being influential, there is conflicting evidence to support number of musculoskeletal pain sites influencing RTW.(178, 205)

Nearly fifty-percent of the identified factors that were rated by more than 75% of HCPs were related to the workplace. Those ranked highest included: supportive employer or supervisor; the employer's willingness to modify the job; job satisfaction; availability of suitable duties; and whether the job can be modified. The evidence is inconsistent when it comes to the supportiveness of the employers, and their willingness to accommodate job modifications.(72) A systematic review found moderate evidence that early contact between the workplace and an injured worker can significantly reduce work disability duration.(226) There is also strong evidence to suggest that job accommodation at work reduces work disability duration across a number of diagnoses.(226) Similarly a review on carpal tunnel surgery found that job accommodation facilitates early RTW.(250) However, the reverse was not true (i.e., lack of job accommodation was not found to cause a delay in RTW or longer duration of work disability).(250)

The HCPs identified six psychological variables as greatly-to-extremely influencing RTW. A mood disorder diagnosis of either depression or anxiety has been found to be a prognostic factor for RTW in a number of systematic reviews,(78, 79) including one focused on carpal tunnel surgery.(250) Yet, psychological status before and after surgery, have had mixed reports in the literature.(78, 79, 107) Workers RTW self-efficacy was also rated highly. RTW self-efficacy has been found to have a positive association with RTW following various musculoskeletal injuries,(78, 180) including the UE.(212, 256) However, a review on factors influencing RTW following CTR found few studies that studied self-efficacy or reached statistical significance.(250) However, recovery expectations, a related concept, have been found to be prognostic for RTW for workers with an UE condition.(207) Likewise, recovery expectations are considered to be one of the most influential factors for RTW for workers with low back pain.(86, 98)

Our findings also demonstrated a common perspective between HCPs that gender has little influence on RTW outcomes in patients with UE conditions, which is consistent with findings from a systematic review on carpal tunnel release.(250) The worker having a pre-employment medical evaluation was also rated by the majority of stakeholders as not being very influential on RTW. Although its importance in injury prevention has been surmised, it has yet to be studied as a prognostic variable to RTW.(257)

Overall the results suggest that HCPs are cognisant of the biopsychosocial factors influencing RTW. This may be due to various Australian workers' compensation insurers advocating for HCPs to consider this model in the practice in their treatment guidelines;(258-260) as well as being supported by empirical evidence.(62) Previous research also suggests that HCPs are well placed to identify biopsychosocial barriers to RTW and in fact, their own expectations of recovery are potentially associated with poorer outcomes.(133)

It is also important to note that the majority of the 20 factors identified by greater than 75% of HCPs as being greatly influential were modifiable and amenable to intervention. Perceived risk factors may be those that are being commonly remediated in their clinical practice or may remind them of a cluster of patients with similar presentations, therefore being front-of-mind.

Differences between HCP disciplines

The HCPs only disagreed on six of the fifty factors included in the questionnaire. There is strong evidence that higher-income workers with a traumatic hand injury are more likely to RTW sooner compared to their lower-income counterparts.(77) However this finding has not been supported for non-traumatic UE conditions.(250) It may be likely that individuals receiving higher-income levels have a greater discrepancy between their work-income and injury-compensation income, which may promote faster RTW.

For worker's UE diagnosis, the highest level of disagreement was observed between psychologists and the other professions. Psychologists rated this factor as not influential, whereas other HCPs rated the UE diagnosis as being very-to-extremely influential. This demonstrates a focus on the physical diagnosis of a worker's condition, and concurs with evidence in the literature that some HCPs traditionally use medical or physical findings when making decisions about musculoskeletal conditions.(261)

Disagreement was found for presence of a comorbidity and obesity. Obesity is a comorbidity that has been associated with decreased physical activity,(262) and CTS.(263) There is also a strong association between depression and obesity.(264) People with mental health issues may be at greater risk of developing obesity, while obesity may also increase risk for depression.(264) This could explain why psychologists rated obesity as being very-to-extremely influential as they are likely to be dealing with a relatively greater population of people with mental health issues. Exercise physiologists and physiotherapists are specialists in exercise interventions and physical activity education, which are mainstays of the management of obesity. It may not be surprising then that these HCPs rated obesity as influencing RTW compared to other disciplines. However it is important to note that despite the differences in HCP perspectives on this variable, the literature has not found either factor to be strongly prognostic for RTW.

The majority of all HCPs except for psychologists agreed that pre-surgery cardiovascular fitness is not as influential RTW. Psychologists may place greater emphasis on the psychological and procedural aspects of RTW, with little experience with cardiovascular fitness training. However, again this factor has not been found to be prognostic for RTW in the literature.

Overall, most HCP professions agreed that the doctor's recommendation influences time to RTW, except for the surgeons. Doctors are usually the first primary care provider who will also provide advice following surgery. Thus, it is natural that other HCPs (such as allied health) take reference from the doctor's recommendation for amount of work absence. A study by Ratzon et al found that the doctor's recommendation for RTW was the most influential factor for determining RTW.(219)

Methodological considerations for this study

Due to the privacy policies of the gatekeeper institutions and the snowball recruitment method, it is unknown how many stakeholders received the invitation to participate; hence response rate could not be calculated. However, this may also be considered a strength as it ensured wide dissemination and representation of stakeholder groups across Australia.

One limitation was that we were unable to obtain an equal number of participants from each HCP discipline. There was a predominance of allied health professions, with fewer medical doctors who are the gatekeepers for entry into the Australian workers' compensation system. Also, not all disciplines involved in RTW were represented. Limited participation (<5) by nurses and social workers meant that they were not included in the analysis. Although equal representation of all disciplines would be ideal, the current sample is a reflection of the relative proportion of those disciplines that commonly manage workers with UE conditions.

This study provides insight into HCPs perceptions of factors influencing RTW. This information may be used to enhance RTW interventions and opens a dialogue regarding potential prognostic variables that warrant further investigation. Due to the nature of this study, the factors identified by stakeholders should not be regarded as prognostic factors for RTW. However, it also cannot be overlooked that these factors may potentially be prognostic. There is a dearth of literature investigating the prognostic factors for RTW following surgery for common UE conditions. Nonetheless, this study provides a list of factors that HCPs strongly believe influence RTW, warranting further study using methods, such as a prognostic cohort.

5.8 Conclusions

Our results found that HCPs agreed on 20 factors that greatly influence RTW following surgery for non-traumatic UE conditions. These factors are modifiable and amenable to interventions. The stakeholders rated two factors as being least influential on RTW. Few disagreements existed between disciplines. This may open a common dialogue between stakeholders to discuss their opinions on factors influencing RTW in mutual goal setting to overcome barriers. Future research should explore how the variables stakeholders rated as being greatly influential impact on prognosis for RTW outcomes.

5.9 Acknowledgements

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CHAPTER 6: Expert consensus on facilitators and barriers to return-to-work following surgery for non-traumatic upper extremity conditions.

6.1. Chapter Introduction

More than one hundred different prognostic factors for return-to-work (RTW) following injury or disease have been listed in the literature.(24, 75) Such high numbers of potential factors make it unfeasible to conduct adequately powered prospective prognostic studies. Thus, we conducted a Delphi study to determine expert consensus on the most plausible facilitators and barriers to RTW that warrant inclusion in a future longitudinal study of prognostic variables for RTW (**Aim 2**).

6.2 Publication

This study has been prepared for submission to the Journal of Hand Surgery (European): ***Peters SE****, Coppieters MW, Ross M, Johnston V. Expert consensus on facilitators and barriers to return-to-work following surgery for non-traumatic upper extremity conditions. A Delphi study.*

6.3 Abstract

This Delphi study aimed to reach consensus on important facilitators and barriers for RTW following surgery for non-traumatic upper extremity (UE) conditions. In Round 1, experts (n=42) listed 130 factors, which were appraised in Round 2 and 3. Consensus (≥ 85% agreement) was achieved for 13 facilitators (high motivation to RTW; high self-efficacy for RTW and recovery; availability of modified/alternative duties; flexible RTW arrangements; positive coping skills; limited heavy work exertion; supportive RTW policies; supportive supervisor/management; no catastrophic thinking; no fear avoidance to RTW; no fear avoidance to pain/activity; return to meaningful RTW duties; high job satisfaction) and 6 barriers (mood disorder diagnosis; pain/symptoms at more than one musculoskeletal site; heavy UE exertions at work; lack of flexible RTW arrangements; lack of support from

supervisor/management; high level of pain catastrophising). Future prognostic studies are required to validate these biopsychosocial factors and to further improve RTW outcomes.

Keywords: hand; wrist; shoulder; prognostic factors; work disability; sickness absence

Ethical Approval: School of Health and Rehabilitation Sciences, The University of Queensland (*#2011SHRS-OT008).*

6.4 Introduction

Globally, the incidence of work-related UE conditions is high.(1) Yet, prognostic factors for RTW and remaining at work following surgery for non-traumatic UE conditions (e.g., carpal tunnel syndrome (CTS)), lateral epicondylalgia and rotator cuff tendinopathy) are poorly understood and inadequately researched. For workers with musculoskeletal conditions, establishing the prognostic value of factors that are internal or external to the injured worker (e.g., in the workplace) using the biopsychosocial framework, is one way of identifying who may be at greater risk of poorer outcomes. This information can be used to tailor interventions, to facilitate the best possible results.

There are several options available to assist in identifying the prognostic factors for RTW. However, recent systematic reviews revealed that only a few studies have used high-quality prospective methods to examine prognostic factors for a delayed RTW or longer-term work disability for UE conditions.(77, 85) Most studies used inferior retrospective and cross-sectional study designs, and often reported differing results for the same prognostic variable.(53, 180) Furthermore, the predictive factors investigated were often derived from administrative data from insurance agency databases or medical records, which typically fail to capture the multifaceted nature of the condition. In addition, there is a dearth of evidence on psychosocial factors that determine RTW following UE conditions.(77, 85)

More than 100 prognostic factors for RTW and work disability have been identified in the literature.(24, 75) Such a high number of potential predictors render adequately powered prospective prognostic studies unfeasible.(87, 188) Thus, it is still largely unknown which variables should be the primary focus in both research and clinical practice. One method of establishing a more discrete set of variables that warrants further examination is to conduct a Delphi study.(265) The Delphi survey technique is designed to transform expert opinion into group consensus using an iterative multi-stage process.(266) on a range of topics, including prognostic variables for both recovery,(267, 268) and prevention of disability.(269) It has advantages over other methods as it allows agreement to be achieved in areas of uncertainty when there is a dearth of empirical evidence.

The purpose of this study was to seek consensus on important facilitators and barriers to RTW following surgery for non-traumatic UE conditions, using a Delphi survey design.

6.5 Methods

A three-round Delphi study was conducted to identify important facilitators and barriers contributing to a delayed RTW following surgery for non-traumatic UE conditions. We adhered to the recommended six steps to conduct a Delphi study: 1) selection of experts and formal invitation of involvement; 2) determination of the number of rounds; 3) development of the questionnaires; 4) facilitation of participation in each round; 5) analysis of data from each round; and 6) dissemination of data.(270) In each round, experts were able to clarify their responses using open-ended comments for each question. The Delphi study was distributed electronically using a web-based survey program (www.surveymonkey.net).

Expert panel

Researchers and clinicians with at least one publication on work disability for workers with UE conditions, or at least three publications on prognosis for delayed RTW met the criteria to participate in this study. The participants (n=102) were identified through a literature search of peer-reviewed papers or doctoral theses published in the last 20 years. Both first and senior/corresponding authors of these publications were contacted. Six additional experts who met the criteria were not contacted as they were known to either have retired or were deceased. The compiled list provided a global representation of experts, and represented various disciplines, including epidemiology, hand surgery, occupational health, occupational therapy and physiotherapy.

Procedure

In the first round, experts were asked via two separate open-ended questions to nominate facilitators and barriers contributing to prolonged RTW following surgery for non-traumatic UE conditions. Experts were also asked to indicate ('yes' or 'no') whether the factors they nominated were prognostic for all non-traumatic UE conditions, regardless of the diagnosis.

Based on the responses from the first round, three authors (SP, VJ, MC) used an iterative process to combine and summarise the answers where possible and to generate a concise list of facilitators and barriers to RTW and work disability. An independent member external to the research team checked the two lists. This was to ensure that all factors listed by the participants were included in the two lists developed by the authors. The final list was also crosschecked with factors derived from a systematic review(250) and factors derived for a previous study.(271)

In the second round, the participants received the lists of facilitators and barriers. They were asked to rate the factors on a 5-point Likert scale. The response anchors were: 1) not at all influential; 2) slightly influential; 3) somewhat influential; 4) very influential; and 5) extremely influential. There was also an option 'unable to comment on this factor', which was not counted in the analysis.

The median and interquartile ranges were determined to document the distribution of responses. For each factor, the responses of the experts were dichotomised. A score of four ('very influential') was used as the cut-off score to create two categories: 1) 'not-to-somewhat influential' (Score 1, 2 and 3) and 2) 'very-to-extremely influential' (Score 4 and 5).(271, 272) Factors that were rated by at least two-thirds of the experts as 'very-to-extremely influential' were retained on the short-lists and advanced to the third round.(265) Two short-lists were generated: one for facilitators and one for barriers to RTW.

In the third round, participants received the short-listed facilitators and barriers. They were asked to indicate ('yes' or 'no') for each factor whether they believed the factor should be included in future prognostic studies of workers focussing on either RTW or work disability following surgery for non-traumatic UE conditions. In all rounds, four reminders (with two-to-four weeks between reminders) were sent to those who had not yet completed the round.

In order to analyse the responses and to determine the level of consensus for the factors on the short-lists, we used the following criteria: strong consensus: ≥85% of experts agreed; moderate consensus: 66-84% of experts agreed; low consensus: 33-65% of experts agreed; and lack of consensus: ≤32% of experts agreed.(269) We determined *a priori* that only factors with strong consensus (i.e., ≥85% agreement) would be recommended to be included in future studies.

6.6 Results

Expert panel

Forty-two experts (41% response rate) completed the first round; 34 experts participated in the second round; and 31 in the third round. Most participating experts were based in either Europe or North America. The various professions involved in RTW were represented. The vast majority was actively involved in research and approximately one third was also involved in clinical practice. Demographic details of the participants for each round are detailed in **Table 6.1**.

Consensus on facilitators to RTW

Based on the answers from Round 1, a list of 64 potential facilitators for RTW was generated (**Table 6.2**), which was presented to the experts in Round 2. Fifteen of these factors were considered 'very-to-extremely influential' by at least two thirds of the experts (**Table 6.2**) and therefore progressed to Round 3. In Round 3, strong consensus (i.e., ≥85% agreement) was reached for 13 facilitators. These factors were: high motivation to RTW; high self-efficacy for RTW and recovery; availability of modified/alternative duties; flexible RTW arrangements; positive coping skills; limited heavy UE work exertion; supportive RTW policies; supportive supervisor/management; no catastrophic thinking; no fear avoidance to RTW; no fear avoidance to pain/activity; return to meaningful RTW duties and high job satisfaction (**Table 6.2**).

Consensus on barriers to RTW

A list of 66 potential barriers to RTW was generated from the first round responses (**Table 6.3**). Twelve of these factors were considered 'very-to-extremely influential' by at least two thirds of the experts and therefore advanced to Round 3. In Round 3, there was strong consensus for six factors: mood disorder diagnosis; pain/symptoms at more than one musculoskeletal site; heavy UE exertions at work; lack of flexible RTW arrangements; lack of support from supervisor/management; high level of pain catastrophising (**Table 6.3**).

In Round one, thirty-five participants (85.4%) agreed that the factors they nominated were the same across non-traumatic conditions of the hand, wrist, elbow or shoulder.

Table 6.1: Demographic data of the experts by round

		Round 1 N(%)	**Round 2 N(%)**	**Round 3 N(%)**
Number of experts who completed each round		42	34(81.0)	31(73.8)
Gender	Male	25(59.5)	21(61.8)	19(61.3)
	Female	17(40.5)	13(38.2)	12(38.7)
Age	20-29 years	1(2.4)	1(2.9)	1(3.2)
	30-39 years	5(11.9)	3(8.8)	3(9.7)
	40-49 years	11(26.2)	10(29.4)	7(22.6)
	50-59 years	19(45)	16(47.1)	16(51.6)
	60 years or older	6(14.3)	4(11.8)	4(12.9)
Country	Canada	11(26.2)	11(32.4)	11(35.5)
	The Netherlands	8(19)	7(20.6)	6(19.4)
	USA	8(19)	5(14.7)	4(12.9)
	Australia	3(7.1)	3(8.8)	3(9.7)
	United Kingdom	3(7.1)	1(2.9)	0(0.0)
	France	3(7.1)	1(2.9)	1(3.2)
	Denmark	1(2.4)	1(2.9)	1(3.2)
	Finland	1(2.4)	1(2.9)	1(3.2)
	Slovenia	1(2.4)	1(2.9)	1(3.2)
	Sweden	1(2.4)	1(2.9)	1(3.2)
	South Africa	1(2.4)	1(2.9)	1(3.2)
	Israel	1(2.4)	0(0.0)	0(0.0)
	China	1(2.4)	0(0.0)	0(0.0)
Discipline	Physical Therapist	10(23.8)	9(26.5)	8(25.8)
	Orthopaedic Surgeon	7(16.7)	6(17.6)	5(16.1)
	Academic or Professor in occupational health	5(11.9)	4(11.8)	4(12.9)
	Occupational Physician	5(11.9)	4(11.8)	4(12.9)
	Occupational Therapist	4(9.5)	3(8.8)	3(9.7)
	Research Scientist	4(9.5)	2(5.9)	1(3.2)
	Biostatistician	2(4.8)	2(5.9)	2(6.4)
	Human Movement Scientist	2(4.8)	2(5.9)	2(6.4)
	Plastic Surgeon	2(4.8)	1(2.9)	1(3.2)
	Neurologist	1(2.4)	1(2.9)	1(3.2)
Current practice	Research, Academia and clinical	14(33.3)	12(35.3)	12(38.7)
	Academia and research			
	Research only	11(26.2)	8(23.5)	7(22.6)
	Clinical only	10(23.8)	8(23.5)	7(22.6)
	Academia (teaching) only	2(4.8)	2(5.9)	1(3.2)
	Clinical and Research	2(4.8)	2(5.9)	2(6.5)
		2(4.8)	2(5.9)	2(6.5)
Focus of research and/or practice within RTW*	UE	28	22	21
	General musculoskeletal	27	21	19
	Back	16	13	13
	Neck	9	8	8

*Experts were able to nominate more than one category, so the number of experts who nominated each category is detailed in the table

Table 6.2: Agreement regarding facilitators to return-to-work

	Round 2			Round 3
	Median	**IQR**	**% Agreement** (Score 4 or 5)	**% Agreement** (Yes/No)
High motivation to RTW (I/P)	5.0	1.0	87.9	96.8
High self-efficacy (or recovery expectations) for recovery and RTW (I/P)	4.0	1.0	81.8	96.8
Availability of modified, alternate duties or host employment (W/S)	4.0	1.0	78.8	96.8
Flexible RTW arrangements possible (e.g., working hours, shifts, locations or duties) (W/S)	4.0	1.0	78.8	93.5
Positive coping skills (I/P)	4.0	1.0	75.8	93.5
No or limited forceful or heavy UE exertions at work (W/S)	4.0	1.0	75.8	93.5
Supportive RTW policies and procedures (W/S)	4.0	2.0	66.7	90.3
Supportive supervisor or management (W/S)	4.0	2.0	66.7	90.3
No catastrophic thinking (I/P)	4.0	2.0	66.7	90.3
No fear avoidance to RTW (I/P)	4.0	2.0	72.7	87.1
No fear avoidance to pain or activity (I/P)	4.0	2.0	69.7	87.1
Worker is able to perform meaningful duties on RTW (IW/S)	4.0	1.0	69.7	87.1
High level of job satisfaction (IW/PS)	4.0	2.0	66.7	87.1
Worker is empowered to take part in own recovery (I/PS)	4.0	2.0	72.7	83.9
No diagnosis of mood condition (e.g., anxiety, depression) (I/P)	4.0	1.0	72.7	83.9
Returning to a safe working environment (W/S)	4.0	2.0	60.6	
Worker feels a level of responsibility towards their job (IW/PS)	4.0	2.0	60.6	
No physical comorbidities (e.g., arthritis, obesity) (I/B)	4.0	1.0	60.6	
High resilience to life and/or work stressors (I/P)	4.0	1.0	60.6	
No or limited repetitive UE use at work (W/S)	4.0	1.0	60.6	
Early identification for risk factors for delayed RTW (IW/BPS)	4.0	1.0	60.6	
Supportive work colleagues (W/S)	4.0	2.0	57.6	
Supportive external resources (family, friends, social networks, financial, general health) (IW/S)	4.0	2.0	57.6	
Being self-employed (I/S)	4.0	2.0	57.6	
Active locus of control in the RTW process (IS/PS)	4.0	1.0	57.6	
No or very little psychological distress at work (IW/PS)	4.0	1.0	57.6	
Doctor's recommendation for early RTW (S/S)	4.0	1.0	57.6	
Early commencement of rehabilitation following surgery (S/B)	4.0	1.0	57.6	
Low levels of pain following surgery (I/BP)	4.0	1.0	54.5	
Early contact between supervisor / employer and injured worker (W/S)	4.0	2.0	51.5	
Having a high level of education (i.e., high school or tertiary education completed) (I/D)	4.0	1.0	51.5	
No psychological distress at work (IW/PS)	4.0	1.0	51.5	
High task latitude at work (W/PS)	4.0	1.0	51.5	
High financial incentives to RTW from insurer or employer (WS/S)	4.0	1.0	51.5	
High decision latitude at work (W/PS)	4.0	1.0	48.5	
No surgical complications (I/B)	4.0	1.0	48.5	
No attorney involvement (IS/S)	4.0	1.0	51.5	
Stakeholders focus on capacity rather than incapacity (WS/S)	3.5	1.0	48.9	
Being a white collar worker (I/D)	3.0	1.0	48.5	
Someone other than the worker has responsibility for coordinating RTW (WS/S)	3.0	1.0	48.5	
Appropriate communication and collaborative approach between stakeholders involved in RTW process (WS/S)	3.0	1.0	48.5	
Having a high socio-economic status (I/D)	3.0	1.0	45.5	
High rating of quality of life (I/BPS)	3.0	1.0	45.5	
Worker has a clear understanding of condition and treatments (I/B)	3.0	1.0	45.5	
HCPs are specialists in managing UE conditions (S/BS)	3.0	1.0	42.4	
Adherence to rehabilitation or RTW program (I/BPS)	3.0	1.0	42.4	
Appropriate pain control following surgery (I/B)	3.0	1.0	42.4	
No adequate compensation for loss of income thus ‘forcing’ RTW (S/S)	3.0	1.0	39.4	

Supportive insurer policies (S/S)	3.0	1.0	39.4
No previous work-related injury for another condition (I/B)	3.0	2.0	36.4
Less invasive surgical procedures (e.g., arthroscopic or endoscopic) (I/B)	3.0	2.0	33.3
No request for pain medication following surgery (I/BP)	3.0	1.0	33.3
Supportive insurer representative dealing with the worker (S/S)	3.0	1.0	33.3
No time off work before the surgery related to the injury (I/BPS)	3.0	1.0	30.3
High job security (W/S)	3.0	2.0	30.3
No previous workers' compensation claim (IS/S)	3.0	2.0	30.3
Clear diagnosis (I/B)	3.0	1.0	27.3
Early diagnosis (I/B)	3.0	1.0	27.3
Systems that provide compensation (e.g., wage replacement regardless of the cause) (S/S)	3.0	1.0	27.3
No exposure to vibration at work (W/S)	3.0	2.0	27.3
Operation is on non-dominant side (I/B)	3.0	1.0	21.2
Good cardiovascular fitness (I/B)	3.0	1.0	18.2
Worker is aware of entitlements (IS/S)	3.0	1.0	18.2
Being 45 years of age or younger (I/D)	3.0	1.0	15.2
Living in an urban area (I/D)	2.0	2.0	6.1
Being a non-smoker (I/B)	2.0	2.0	6.1
Living in a non-tropical environment (I/D)	1.0	1.0	0.0

Key: I=Individual worker-level; W=Workplace-level; S=Systems-level/
D=Demographic; B=Biological; P=Psychological; S=Social

Factors rated 'very-to-extremely' influential by ≥ two thirds of experts in Round 2

Factors for which there was strong consensus (i.e., >85% agreement) in Round 3

Table 6.3: Agreement regarding barriers to return-to-work

	Round 2			Round 3
	Median	IQR	% Agreement (Score 4 or 5)	% Agreement (Yes/No)
Mood condition (e.g, depression, anxiety) (I/P)	4.0	1.0	79.4	93.5
Pain or symptoms at more than one musculoskeletal site (I/B)	4.0	0.0	79.4	93.5
Heavy UE exertions at work (W/S)	4.0	1.0	73.5	93.5
Lack of flexible RTW arrangements (e.g., working hours, shifts, locations or duties) (W/S)	4.0	2.0	67.6	90.3
Lack of support from work supervisor or management (W/S)	4.0	1.0	67.6	90.3
High level of pain catastrophising (I/P)	4.0	2.0	67.6	87.1
Low expectations regarding RTW (I/P)	4.0	1.0	79.4	83.9
Dissatisfaction with work (I/PS)	4.0	2.0	73.5	83.9
Low UE functional capacity following surgery (I/B)	4.0	1.0	70.6	80.6
Being unemployed at the time of surgery (IW S/S)	4.0	2.0	67.6	80.6
Fear avoidance to RTW (I/P)	4.0	2.0	67.6	80.6
Worker dissatisfied with the outcome of the UE surgery (I/BPS)	4.0	2.0	67.6	74.2
Attorney involvement (S/S)	4.0	2.0	64.7	
Low expectations regarding recovery from surgery (I/P)	4.0	2.0	64.7	
High perceived physical workload by the worker (I/PS)	4.0	2.0	64.7	
Lower resilience to life and/or work stressors (I/P)	4.0	2.0	61.8	
Alcohol or drug abuse/addiction (I/BP)	4.0	1.0	61.8	
Fear avoidance to pain and activity (I/P)	4.0	1.0	61.8	
HCPs hold low expectations for recovery and/or RTW (S/S)	4.0	1.0	61.8	
Unresolved symptoms following surgery (I/B)	4.0	1.0	61.8	
Management of the insurance or workers compensation claim that dissatisfies/displeases the worker (IS/S)	4.0	1.0	61.8	
Repetitive UE use at work (W/S)	4.0	1.0	58.8	
Stigmatisation of the injury by colleagues / supervisors (W/S)	4.0	1.0	58.8	
Repeated surgery for the same condition (I/B)	4.0	1.0	55.9	
High levels of pain following surgery (I/B)	4.0	1.0	55.9	
Burnout (emotional exhaustion) (I/P)	4.0	1.0	52.9	
Physical comorbidities (e.g., arthritis, obesity) (I/P)	4.0	1.0	52.9	
Precarious employment or low job security (e.g., casual employment, immigrant worker, contract worker) (W/S)	4.0	1.0	52.9	
Inadequate workplace policies and procedures regarding injury and RTW (W/S)	4.0	1.0	52.9	
Passive locus of control in the RTW process (i.e., having a passive role) (W/PS)	4.0	1.0	50	
Surgical complications (I/B)	4.0	1.0	50	
Personal stressors unrelated to the injury (e.g., divorce, death, finance) (I/PS)	3.5	1.0	50	
Lack of support from work colleagues (W/S)	3.0	1.0	47.1	
No or poor communication between various stakeholders in the RTW process (IW/S)	3.0	1.0	47.1	
Use of narcotics (opioids) to manage pain e.g., morphine, codeine (I/B)	3.0	1.0	47.1	
No rehabilitation following surgery (IS/B)	4.0	2.0	47.1	
No or inadequate compensation system for loss of income or treatment costs (e.g., adversarial health or compensation system) (S/S)	3.5	1.0	44.1	
Low perceived quality of life (I/BPS)	3.0	1.0	44.1	
Poor support from family, friends and social networks (I/S)	3.0	1.0	44.1	
Doctor makes RTW recommendation without being fully informed of available work duties (IW S/S)	3.0	1.0	44.1	
More severe symptoms before surgery (e.g., high levels of pain) (I/B)	3.0	1.0	44.1	

Focus on incapacity rather than capacity (WS/B)	3.0	1.0	44.1
Previous workers' compensation claim (IS/D)	3.0	1.0	44.1
Having a low socio-economic status (I/D)	3.0	1.0	44.1
Having a low education level (i.e., not completed secondary/high school) (I/D)	3.0	2.0	44.1
High psychological job demands (W/PS)	3.0	1.0	41.2
Limited decision latitude at work (W/PS)	3.0	1.0	38.2
Worker does not adhere to treatment recommendations (I/BPS)	3.0	1.0	38.2
Multiple HCPs involved (S/S)	3.0	1.0	38.2
Being the primary breadwinner (I/D)	3.0	3.0	35.3
Limited task latitude at work (W/S)	3.0	1.0	32.4
Longer duration of symptoms before surgery (I/B)	3.0	1.0	32.4
Low UE functional capacity before surgery (I/B)	3.0	1.0	32.4
Two or more weeks off work before surgery (I/BPS)	3.0	2.0	32.4
Higher number of visits to HCPs (I/B)	3.0	1.0	29.4
Exposure to vibration at work (W/S)	3.0	2.0	26.5
No clear diagnosis (I/B)	3.0	1.0	23.5
More invasive or serious surgery (I/B)	3.0	1.0	23.5
Operation on the dominant side (I/B)	3.0	2.0	23.5
Being over 45 years of age (I/D)	3.0	2.0	23.5
Living in a rural/remote area (I/D)	3.0	2.0	17.6
Being a smoker (I/B)	2.0	2.0	17.6
Poor cardiovascular fitness (I/B)	3.0	1.0	14.7
Cold work environment (W/S)	3.0	2.0	14.7
Tropical work environment (W/S)	2.0	2.0	5.9
Being female (I/D)	2.0	2.0	5.9
Living alone (I/D)	2.0	2.0	5.9

Key: I=Individual worker-level; W=Workplace-level; S=Systems-level/
D=Demographic; B=Biological; P=Psychological; S=Social

Factors rated 'very-to-extremely' influential by ≥ two thirds of experts in Round 2

Factors for which there was strong consensus (i.e., >85% agreement) in Round 3

6.7 Discussion

The main finding of this study was the agreement among experts over a set of 19 key factors that were considered to influence RTW following surgery for non-traumatic UE conditions. Initially, the experts identified 130 potential facilitators and barriers. Similar large number of factors have been found in previous reviews.(24, 75) However, such numbers of potential predictor variables make it unfeasible to conduct adequately powered prospective prognostic studies due to the high number of participants required.(53) Following two additional rounds, the experts reached consensus (i.e., ≥85% agreement) on 13 facilitators and 6 barriers from the original list of 130 factors. These factors should be included in future studies on RTW following surgery for non-traumatic UE conditions.

The factors that achieved consensus could be largely grouped at the level of the worker, or externally to the worker at the level of the workplace. Similar models have been used to identify barriers to RTW, with a focus on factors either influencing the worker (internally); or interacting through organisations (externally to the worker), that is, at the workplace, healthcare or insurance-system levels.(9, 273) The level at which the factor can be measured has implications for the focus of RTW evaluations and interventions. At the level of the worker, there were six facilitators (high motivation to RTW; high recovery and/or RTW self-efficacy; positive coping skills; no catastrophic thinking; no fear avoidance to RTW; no fear avoidance to pain or activity) and four barriers (two or more musculoskeletal pain sites; lower recovery expectations; diagnosis of a mood disorder; high level of pain catastrophising). At the workplace level, there were six facilitators (availability of suitable duties (modified, alternate or host employment); no or limited forceful or heavy UE exertions; supportive RTW policies and procedures; supportive supervisor/management support; worker is able to perform meaningful duties on RTW; high level of job satisfaction) and three barriers (lack of job accommodation availability; poor supervisor or management support; heavy UE exertions at work). Interestingly, no factors related to health care or insurance systems (e.g., compensation status, days waiting to have surgery for the condition) reached consensus, despite the fact that these have been found to be prognostic for RTW for other musculoskeletal conditions.(78, 79, 250)

It is well established that the factors influencing RTW are multi-dimensional and biopsychosocial.(9, 58, 62) Using the biopsychosocial model, the 13 facilitators that reached strong consensus, did not include biological factors; six were psychological (high motivation to RTW; high self-efficacy; positive coping skills; no catastrophic thinking; no fear avoidance to RTW; no fear avoidance to pain or activity); six were social (availability of suitable duties; flexible RTW arrangements; no or limited forceful or heavy UE exertions; supportive RTW policies and procedures; supportive supervisor/management; worker can return to meaningful duties) and one an interaction between the psychosocial domains (high level of job satisfaction). Of the six barriers, one was biological (pain or symptoms at more than one musculoskeletal site); two were psychological (mood condition; high level of pain catastrophising); and three were social (heavy UE exertions at work; lack of flexible RTW arrangements; lack of supervisor or management support). The categorization of these variables reveals the importance of including psychosocial factors in future studies.

There are also other reasons why these variables warrant further study to establish their association with a particular outcome. Firstly, biological and psychological risk factors can be assessed at the level of the worker – through questionnaires (such as, risk-based screening tools),(58, 121, 122) interviews,(118, 128) or functional capacity evaluations.(274, 275) These evaluation methods are simple to use in both research and clinical practice. Furthermore, risk-based questionnaires completed by the worker, are not resource intensive or costly. Second, social factors can be assessed at the level of the workplace through methods such as work-place evaluations (e.g., to assess job modification availability) and ergonomic assessments (e.g., to assess heavy UE loads). Furthermore, biopsychosocial interventions at a worker- or workplace-level are also easier to implement and less resource intensive than interventions at a systems-level. Interestingly, although the factors identified in this Delphi study were mainly psychosocial, studies that have included RTW as an outcome for workers with UE conditions to date, have focused primarily on clinical interventions to remediate biological factors.(139, 140, 147) This supports the need to study the prognostic value of the psychosocial factors identified in this Delphi study.

In contrast, there were no systems-related variables that reached strong agreement in this Delphi study. Evaluation of systems-related variables can be more difficult and resource-intensive due to the complexity of health-care and insurance systems, and the laws in place to regulate how these systems operate. In addition, these variables are not as easily modifiable.

Another key finding was the high number of facilitators that reached strong consensus, more than double the number of barriers. Notably, whilst considerable focus in recent years has been on identifying barriers,(58, 121, 122) there is a stark lack of studies focusing on facilitators to RTW in the work disability literature regardless of diagnosis.(78, 79, 85, 98) Our findings suggest that greater attention is needed in identifying facilitators that build on worker's capabilities and external supports. Focusing excessively on barriers may result in both clinicians and researchers missing the potential benefit of facilitators.

For a number of the factors that reached consensus, their presence was a barrier (or a facilitator) and their absence was a facilitator (or barrier). For example, heavy UE exertions at work, flexible RTW arrangements; supervisor or management support and pain catastrophising. It is a common misconception to believe that for every barrier to RTW, the absence of this barrier consequentially becomes a facilitator and vice versa.(24)

Methodological considerations

This study used Delphi methodology, which allowed broad representation of experts from various backgrounds using an accessible electronic format. It may be questioned whether one publication is sufficient to be considered an expert. However, few experts with more than one publication on RTW for workers with UE conditions existed; therefore, a low threshold for the number of publications was necessary. Increasing the threshold would have resulted in too few experts. There was also 13.5% reduction in participant responses from first to third rounds, despite several reminders. It has been suggested that a level of drop-out is inevitable due to unforeseen changes in priorities, illness or life events, and the reduction seen in our study is consistent with that found in previous studies.(276) In Round 1, experts indicated that they believed the factors to be relevant regardless of the diagnosis. However, as this was not asked again in later Rounds, (and although it could be assumed that this holds true), there is not data to support this. It would have been beneficial to ask this question again in Round 3 to establish if the final list was also representative regardless of diagnosis.

A strength of this study is that the factors nominated in the Delphi study were also identified in previous reviews that have explored variables that influence work outcomes,(24, 75) which validates our expert panel. Also, this may mean that the factors identified by 'strong-consensus' are most likely generalizable across other diagnoses and settings. However, researchers may also need to deliberate on including some factors that might not have made the cut-off for strong consensus (>85%) in future research studies, which may be plausible when considering their local setting.

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SECTION D: Stakeholders’ perspectives of barriers and strategies to facilitate return-to-work for a worker with a complex case

CHAPTER 7: Stakeholders identify similar barriers but different strategies to facilitate return-to-work: A vignette of a worker with an upper extremity condition

7.1 Chapter Introduction

This sub-study was completed as part of the survey of Australian stakeholders detailed in **Chapters 4-5**. It aimed to understand how stakeholders perceive barriers to, and strategies facilitating, return-to-work (RTW) when faced with a worker with an upper extremity (UE) condition and a complex case in the current Australian worker's compensation setting.

7.2 Publication

This chapter is a first revision of a manuscript submitted to the *Journal of Occupational Rehabilitation*:

Peters SE*, Troung A, Johnston V. Stakeholders identify similar barriers but different strategies to facilitate return-to-work: A vignette of a worker with an upper extremity condition. Journal of Occupational Rehabilitation.*

7.3 Abstract

Purpose: To explore the perspectives of Australian stakeholders of the barriers and strategies (or interventions) to facilitate RTW for a worker with an UE condition and a complex workers' compensation case vignette.

Methods: Using a case vignette, stakeholders were asked to identify barriers and recommend strategies to facilitate RTW. Content analysis was performed on open-ended responses to isolate the barriers and strategies. The biopsychosocial model was used to categorise RTW barriers and strategies. Pearson's Chi Square (or Fisher's Exact Test) and ANOVA were performed to establish between group differences.

Results: 621 participants (488 healthcare providers (HCPs), 62 employers, 55 insurers and 16 lawyers) identified 36 barriers (31 modifiable): 4 demographic; 8 biological; 15 psychological and 9 social barriers. 484 participants reported 16 RTW strategies: 4 biological; 6 psychological and 6 social strategies. Using the biopsychosocial model, stakeholders nominated similar barriers to RTW, but different strategies. The most frequently nominated barriers were: 'Work relationship stressors' (83.4%) and 'Personal relationship stressors' (64.7%). However, HCPs nominated significantly more strategies. They also most frequently nominated 'Pain management' (49.6%), whilst employers, insurers and lawyers nominated 'RTW planning /Suitable duties programs' (40.5%; 42.9%; 80%).

Conclusions: Stakeholders perceived similar barriers for RTW. However, they identified different strategies to overcome the modifiable barriers. It seems that stakeholders are more proficient in identifying barriers to RTW than developing strategies. Future research should focus on tools to assist in identifying barriers to RTW and concomitant interventions to facilitate RTW.

Ethical approval: School Health and Rehabilitation Sciences, The University of Queensland (2012SHRS_OT007).

Keywords: sick leave; rehabilitation; hand; wrist; return-to-work

7.4 Introduction

The end goal of rehabilitation after a workplace injury is timely, safe and durable return to employment. While the majority of workers RTW within a reasonable timeframe, some require the involvement of multiple stakeholders, such as HCPs; case managers and insurer representatives; supervisors and employers; lawyers; and importantly, the workers.(9, 60, 226) Stakeholders share the common goal of returning the injured worker back to work, however they may also have other competing goals, such as financial implications, workforce productivity and the client's overall health.(60)

The stakeholders involved have different experiences, qualifications and skill sets which will vary depending on their role in the RTW process. Consequently, they are not always on the 'same page' and their perspectives regarding the most important barriers for RTW and the subsequent strategies to facilitate RTW may differ. Recent evidence suggests that cooperation between stakeholders is important for effective RTW interventions.(60, 235, 277) Essential elements of these relationships include mutual understanding of the different perspectives each stakeholder holds, an ability to identify barriers for RTW and communication of these to other relevant stakeholders.

Previous research has used realistic case vignettes containing information about a patient's history, presenting complaints and occupational requirements to compare the level of agreement between HCPs for RTW recommendations.(261, 278) This methodology is also frequently utilized to establish stakeholders perspectives and behaviours including the decision-making processes, clinical judgements and recommendations for treatment.(279) These methods have been found to be valid and highly generalizable to real life behaviours.(279)

There is a dearth of literature on the perspectives of the various stakeholders with respect to barriers for RTW, and their knowledge of the strategies that might help overcome them. Previous qualitative studies have focused on the perspectives of one or more stakeholder groups for other diagnoses, such as work supervisors' perspectives for cancer survivors,(280) employer stakeholders following stroke,(229) or physiotherapists perspectives for workers with musculoskeletal conditions.(281) We used case vignette methodology to explore the viewpoints of across various stakeholder groups including HCPs, employers, insurers and lawyers, with respect to the barriers to RTW, and strategies (or interventions) that could be implemented to facilitate RTW, following a non-traumatic UE disorder. Non-traumatic UE disorders can include carpal tunnel syndrome (CTS), tendinopathies of the shoulder, wrist and hand account for a significant proportion of these UE conditions. These common workplace injuries were selected as the condition of choice as there is little systematic research available on the barriers for RTW following UE disorders, despite their high incidence in the Australian working community.(3, 36)

The aim of this study was to explore the level of agreement between Australian stakeholders on the barriers and subsequent strategies for RTW using a vignette of a worker with a non-traumatic UE disorder with a complex case history. Given the different qualifications, experiences and roles of stakeholders, we hypothesize that HCPs will focus on biological and psychological-related barriers and strategies, while insurers, employers and lawyers will generally emphasize social-related (including work-related) barriers and strategies. It is vital to understand the perspective of all stakeholders making RTW decisions to increase stakeholders' awareness of the viewpoint of others, minimize the prevalence of miscommunication and improve stakeholder cooperation.(226)

7.5 Methods

Setting

Australia's employers are legislated to provide workers' compensation insurance under a 'no fault' scheme. To be eligible for compensation, injuries must be work-related. Workers are entitled to receive income replacement, reimbursement of costs associated with medical treatment and rehabilitation, RTW planning, death benefits, and lump sum compensation for irreversible damages. The Australian health system broadly contains these key components: i) a national health care scheme accompanied by the private health insurance sector; ii) national labour laws permitting sick leave entitlements; iii) temporary sickness benefits and long-term disability pensions provided by social security benefits; iv) a 'no-fault' based workers' compensation scheme; v) common law damages claims for pain and suffering and economic loss if employer negligence is demonstrated. Each state or territory in Australia has an independent workers' compensation system. They differ slightly in coverage, duration and amount of compensation. However, the most distinct difference is how the states or territories manage the compensation funds (i.e., centrally managed with one fund or managed through a number of private insurers). A comprehensive list of the Australian insurers and their characteristics is contained on the Safework Australia website (www.safeworkaustralia.gov.au).

Case Vignette Development

A hypothetical vignette of a worker with CTS and subsequent surgical release was developed (**VII**). This diagnosis was chosen due to the high incidence of this problem and therefore stakeholders would likely be familiar with this compensable diagnosis. The vignette contained 36 potential RTW barriers, 31 of them being modifiable. The potential barriers were determined following a scoping review of the work disability literature, a systematic review on prognostic factors following carpal tunnel release(85) and a piloting process which allowed the piloted participants to refine or suggest the barriers to RTW to be included in the vignette. Study participants were asked to respond to two open-ended questions using free text to nominate the barriers they believed would most influence the worker's ability to RTW; and what strategies or interventions they believed would address the barriers to facilitate RTW.

Socio-demographic information was also sought from the respondents. This included: stakeholder group; age; gender; Australian state/territory in which the respondent works; and years of experience managing workers with UE conditions.

The vignette was piloted on five stakeholder representatives who commonly work with workers with UE injuries with complex claims. They were from various stakeholder groups (hand therapist, hand surgeon, occupational physician, insurer representative and an employer representative). They provided recommendations regarding the formatting, readability and content of the case vignette and questions. Piloted responses were collated, modifications made and then redistributed to a further five stakeholder representatives (hand therapist, general practitioner, psychologist, hand surgeon, employer representative). No further changes were made following the second pilot round.

The vignette was embedded in a larger survey exploring stakeholders' perspectives of factors influencing RTW for workers with non-traumatic UE conditions. The survey was disseminated between August 2013 and January 2014. Both electronic (n=573) (SurveyMonkey Inc. Palo Alto, California, USA; www.surveymonkey.com) and hard copy (n=48) survey formats were used.

Recruitment

Participants within four stakeholder groups were recruited: (i) HCPs; (ii) employers; (iii) insurers; and (iv) legal professionals. To identify relevant stakeholders, a snowball sampling method was used to ensure representation across all stakeholder groups within Australia. Key gatekeeper organizations for HCP and insurer groups distributed the survey via email or their organization's newsletter (participating gatekeeper organizations are mentioned in the *Acknowledgements* section). An online newsletter (www.RTWmatters.com.au) also distributed the survey nationally. This is a subscription-based newsletter, which is targeting insurer and employer groups. There is no known statistics in Australia indicating the number of individuals working in each stakeholder group. Key stakeholder events including state and national conferences, and stakeholder professional development events were used as a platform to disseminate the survey. Participants were also able to forward the survey to other stakeholders known to deal with the RTW of workers with UE conditions.

Data Analysis

Descriptive statistics were used to profile the participants. Standard content analysis of the free text responses was performed to formulate lists of barriers to RTW and strategies or specific interventions to facilitate RTW.(282) The biopsychosocial (BPS) model was used to categorize the coded responses into domains for both barriers and strategies/interventions: i) Biological; ii) Psychological; iii) Social.(8) This model was selected as it advocates for the integration of medical/biological, psychosocial, environmental and ergonomic factors into a systems based approach and has been applied to both determinants of RTW and RTW interventions.(12) It also conceptualizes RTW disability as a consequence of complex interactions of these factors and its use in UE conditions has been supported.(12, 283) The percentage of responses from each of the stakeholder groups was mapped against the BPS model using tri-axial radar charts. An additional category was created for the demographic barriers.

One researcher independently coded and categorized participants' responses. These were then discussed with other members of the research team in an iterative process, back and forth, until all researchers were satisfied with the content coding. Responses within the main codes were subcategorized using child-codes where appropriate. For example, 'pain' was then sub-categorized into 'high pain intensity, 'chronicity of condition/pain, 'poor pain management'. Analyses were conducted at the level of the child codes. Ambiguous responses, those that were too broad to categorize, were outside the scope of, or were unrelated to the vignette were excluded from the analysis. For example this response, "ascertain necessary components of a successful RTW and with permission seek assistance in those areas as required", was too broad for categorisation.

Once the codes for the barriers and strategies were developed, the free-text responses were recoded using a numerical coding scheme. Multiple response cross tabulations of the frequency of responses across stakeholder groups was performed. Pearson's Chi Square Test (or Fisher's Exact Test) was performed on each of the barriers and strategies that had been nominated by more than 25.0% of at least one stakeholder group to allow adequate cell count for comparison across groups using a significance level of $p<0.05$. Analysis of variance (ANOVA) was used to analyse the differences between the stakeholder groups for the number of barriers and strategies nominated. Significance was p<0.05. SPSS (IBM SPSS Statistics, Version 22.0) was used for all analyses.

7.6 Results

Participants

Six hundred and twenty one participants completed the vignette section of the survey (electronic n=573; hard copy n=48) by identifying at least one RTW barrier (**Table 7.1**). These included 488 HCPs, 62 employers, 55 insurers and 16 lawyers. The HCP stakeholder group consisted of occupational therapists (32%), physiotherapists (29%), surgeons (13%), exercise physiologists (7%), occupational physicians (6%), hand therapists (5%), general practitioners (2%), rehabilitation counsellors (2%), occupational nurses (2%), psychologists (1%), registered nurses (<1%), social workers (<1%) and a speech pathologist (<1%).

The age of the majority of HCPs and lawyers was 30-39 years while the majority of employers and insurers were aged between 40-49 years. The HCPs mainly practiced in New South Wales, employers and insurers were primarily from Queensland and lawyers were from Victoria. The largest proportion of stakeholders had greater than 10 years of experience in their current occupation.

Barriers for RTW

Participants (n=621) identified a total of 36 barriers to RTW: 4 demographic; 8 biological; 15 psychological; and 9 social. 86.1% (n=31) of RTW barriers identified were modifiable. On average, each HCP nominated more barriers (mean (SD) (5.9(2.4)), than the insurers (5.3(2.4), employers (5.3(2.4)) and lawyers (4.8(2.3)). However, this difference was not significant, $F\ (3,617) = 2.33$, $p=0.07$ (**Table 7.2**).

Stakeholders nominated more psychological (49.9%), than social (26.6%), biological (19.4%) or demographic barriers (4.0%) (**Table 7.3**). The radar graph (**Fig. 7.1**) illustrates that each stakeholder group nominated a similar percentage of barriers from each of the domains.

Barriers that were nominated by the greatest percentage of all of the stakeholders (**Table 7.2**) included: 'work relationship stressors' (83.4%); 'personal relationship stressors' (64.7%); 'seeking legal advice' (49.2%); 'poor recovery expectations' (41.9%); 'physical demands of work' (40.5%); and 'high pain intensity levels' (36.9%). For barriers with sufficient counts in each group, analysis was conducted to establish whether there were significant differences between groups. Interestingly significant differences ($p<0.05$) did exist for six barriers. A number of these were also the barriers that received the greatest number of nominations. This indicates that there was a large number of one or more of the stakeholder group/s that nominated this barrier, compared to the other groups. These barriers included: 'lack of RTW planning' ($p<0.001$), 'seeking legal advice' ($p<0.001$), 'personal relationship stressors' ($p=0.001$), 'poor recovery expectations ($p=0.015$)', 'work relationship stressors' ($p=0.027$) and 'high pain intensity levels' ($p=0.047$). The different proportion of each stakeholder group that nominated these as barriers is depicted in **Fig. 7.2**.

Strategies for RTW

Of the 621 participants who reported barriers to RTW, 484 (407 HCPs; 37 employers; 35 insurers; 5 lawyers) indicated at least one strategy that they believe would facilitate RTW. 77.9% of participants nominated a RTW strategy, with the percentage of non-responders being highest in lawyers (68.8%). The average number of nominated strategies was also considerably lower among all stakeholders in comparison to the barriers they nominated.

The HCPs nominated significantly more strategies, on average, than the other stakeholder groups, $F(3,617) = 15.34$, $p<0.0001$. The HCPs nominated a mean (SD) of 2.5(1.7), whereas employers nominated 1.4(1.6), insurers 1.3(1.6) and lawyers 0.6(1.0) (**Table 7.2**).

Respondents proposed a total of 16 RTW strategies including: 4 biological; 6 psychological; and 6 social strategies. The radar graph (**Fig. 7.1**) illustrates that each stakeholder group did not nominate a similar proportion of biological, psychological or social strategies. The HCPs' responses were more equally distributed across biological (31%), psychological (34.8%) and social (34.2%) strategies (**Table 7.3**). In comparison, employers and insurers identified more psychological (46% and 47.3% respectively) and social (43.7%, 40%) strategies than biological strategies (10.3%, 12.6%). Lawyers identified only 10 strategies in total, with 60% being social strategies.

The most frequently nominated strategies from all stakeholder groups (**Table 7.2**) were: 'Pain management' (44%); 'RTW planning/Suitable duties programs' (41.9%); 'Psychological interventions' (40.9%); and 'Improve stakeholder communication' (35.5%).

HCPs most frequently nominated 'Pain management' (49.6%), whilst employers, insurers and lawyers nominated 'RTW planning/Suitable duties programs' (40.5%; 42.9%; 80%). For strategies with sufficient counts in each group, analysis was conducted to establish whether there were significant differences between groups. There was a significant difference for four RTW strategies (**Fig. 7.2)**. There were a significantly higher percentage of HCPs that indicated 'psychological intervention' ($p < 0.001$), such as referral to a psychologist or cognitive behaviour therapy to help the worker RTW, in comparison to employers and insurers. Also, HCPs more often reported 'pain management' as a strategy that included referring to pain specialists or performing pain management techniques when compared to employers and insurers ($p < 0.001$). 'Workplace relationship counselling' (p =<0.001) and 'adjustment to injury counselling' ($p < 0.001$) were nominated by more insurers than HCPs and employers.

Table 7.1: Characteristics of participants

Demographics %(N)		**HCPs** (N=488)	**Employers** (n=62)	**Insurers** (n=55)	**Lawyers** (n=16)
Gender	Male	35% (169)	35% (22)	22% (12)	56% (9)
	Female	65% (319)	65% (40)	78% (43)	44% (7)
Age (years)	21-29	16% (79)	0% (0)	0% (0)	0% (0)
	30-39	31% (150)	15% (9)	13% (7)	38% (6)
	40-49	26% (127)	36% (22)	38% (21)	25% (4)
	50-59	17% (83)	26% (16)	26% (14)	6% (1)
	>60	10% (48)	23% (14)	18% (10)	31% (5)
State/Territory of Work	Australian Capital Territory	3% (16)	2% (1)	0% (0)	0% (0)
	New South Wales	35% (172)	8% (5)	4% (2)	6% (1)
	Northern Territory	1% (3)	0% (0)	0% (0)	6% (1)
	Queensland	30% (146)	58% (36)	86% (47)	31% (3)
	Tasmania	1% (7)	2% (1)	0% (0)	0% (0)
	South Australia	6% (29)	2% (1)	4% (2)	0% (0)
	Victoria	13% (65)	13% (8)	4% (2)	38% (6)
	Western Australia	7% (35)	3% (2)	0% (0)	19% (3)
Years of Experience in managing workers with UE problems	<1 year	3% (14)	3% (2)	7% (4)	0% (0)
	1-5 years	16% (77)	29% (18)	38% (21)	13% (2)
	6-10 years	21% (101)	31% (19)	13% (7)	44% (7)
	>10 years	61% (295)	37% (23)	42% (23)	44% (7)

Table 7.2: Barriers and strategies identified by healthcare professionals, employers, insurers and lawyers categorized using the Biopsychosocial Model

		Stakeholder Group				
		HCPs %(n)[b]	**Employers** %(n)[b]	**Insurers** %(n)[b]	**Lawyers** %(n)[b]	**Total** %(n)[c]
Demographic Barriers						
Age[a]		10.9% (53)	21.0% (13)	12.7% (7)	25.0% (4)	**12.4%(77)**
Dominant hand[a]		7.2% (35)	3.2% (2)	3.6% (2)	6.3% (1)	**6.4%(40)**
Female gender[a]		2.3% (11)	0% (0)	1.8% (1)	6.3% (1)	**2.1%(13)**
Low education level		1.6% (8)	1.6% (1)	3.6% (2)	12.5% (2)	**2.1%(13)**
Biological Barriers						
Pain	High pain intensity	39.5% (193)	24.2% (15)	27.3% (15)	37.5% (6)	**36.9%(229)**
	Chronicity of condition/pain	17.8% (87)	12.9% (8)	1.8% (1)	12.5% (2)	**15.8%(98)**
	Poor pain management	3.1% (15)	3.2% (2)	1.8% (1)	12.5% (2)	**3.2%(20)**
Worker's lack of understanding of condition/treatment/injury trajectory		25.0% (122)	24.2% (15)	29.1% (16)	18.8% (3)	**25.1%(156)**
Inconclusive diagnosis/diagnostic criteria		19.1% (93)	9.7% (6)	16.4% (9)	12.5% (2)	**17.7%(110)**
Diagnostic Related Factors	Surgery in the absence of diagnostic tests[a]	8.6% (42)	4.8% (3)	5.5% (3)	0.0% (0)	**7.7%(48)**
	Diagnosis/cumulative trauma[a]	1.8% (9)	0.0% (0)	3.6% (2)	0.0% (0)	**1.8%(11)**
Multiple HCPs involved		1.8% (9)	3.2% (2)	5.5% (3)	0.0% (0)	**2.3%(14)**
Psychological Barriers						
Stress	Work relationship stress/ors	83.6% (408)	77.4% (48)	90.9% (50)	75.0% (12)	**83.4%(518)**
	Personal relationship stress/ors	65.0% (317)	64.5% (40)	76.4% (42)	18.8% (3)	**64.7%(402)**
	General stress	1.2% (6)	3.2% (2)	0% (0)	13% (2)	**1.6%(10)**
Poor recovery expectations		42.6% (208)	30.6% (19)	54.5% (30)	19% (3)	**41.9%(260)**
Mood Disorders	Anxiety	25.8% (126)	12.9% (8)	14.5% (8)	13% (2)	**23.2%(144)**
	Depression	2.9% (14)	0.0% (0)	1.8% (1)	6% (1)	**2.6%(16)**
Psychological Issues		17.2% (84)	25.8% (16)	12.7% (7)	31% (5)	**18.0%(112)**
Worker's concerns about RTW	Anxious about returning to work	15.2% (74)	6.5% (4)	16.4% (9)	0% (0)	**14.0%(87)**
	Poor motivation to RTW	5.5% (27)	1.6% (1)	5.5% (3)	0% (0)	**5.0%(31)**
	Negative belief regarding work	1.0% (5)	1.6% (1)	0.0% (0)	6% (1)	**1.1%(7)**

	modification					
Abnormal Illness Behaviour	Abnormal pain perception	10.4% (51)	17.7% (11)	30.9% (17)	6% (1)	**12.9%(80)**
	Fear of chronicity	6.1% (30)	3.2% (2)	5.5% (3)	0% (0)	**5.6%(35)**
	Other abnormal illness behaviors e.g., adjustment to injury, sick role behaviours	0.4% (2)	0.0% (0)	1.8% (1)	0% (0)	**0.5%(3)**
Low job satisfaction		7.4% (36)	3.2% (2)	7% (4)	6% (1)	**6.9%(43)**
Poor RTW self-efficacy		2.0% (10)	4.8% (3)	1.8% (1)	0% (0)	**2.3%(14)**
Social Barriers						
Seeking legal advice		49.6% (242)	45.2% (28)	65.4% (36)	0.0% (0)	**49.2%(306)**
Physical demands of work		42.8% (209)	30.6% (19)	25.5% (14)	37.5% (6)	**40.5%(248)**
Lack of RTW planning		16.4% (80)	32.3% (20)	16.4% (9)	62.5% (10)	**19.1%(119)**
Workers' compensation status		14.5% (71)	17.7% (11)	12.7% (7)	18.8% (3)	**14.8%(92)**
Duration of work absence		5.7% (28)	4.8% (3)	16.4% (9)	6.3% (1)	**6.6%(41)**
Union involvement		13.5% (66)	24.2% (15)	0.91% (17)	6.3% (1)	**15.9%(99)**
Low degree of job control		3.7% (18)	4.8% (3)	9.1% (5)	0.0% (0)	**4.2%(26)**
Poor communication between stakeholders		1.2% (6)	0.0% (0)	0.0% (0)	6.3% (1)	**1.1%(7)**
Status of job e.g., full time/part-time		0.6% (3)	0.0% (0)	0.0% (0)	0.0% (0)	**0.5%(3)**
Biological Strategies						
Pain management		49.6% (202)	8.1% (3)	20.0% (7)	20.0% (1)	**44.0%(213)**
Patient education		26.3% (107)	2.7% (1)	11.4% (4)	0.0% (0)	**23.1%(112)**
Clinical reassessment		13.3% (54)	10.8% (4)	2.9% (1)	0.0% (0)	**12.2%(59)**
Functional capacity evaluation		2.5% (10)	2.7% (1)	0.0% (0)	0.0% (0)	**2.3%(11)**
Psychological Strategies						
Psychological Intervention		45.0% (183)	21.6% (8)	14.3% (5)	40% (2)	**40.9%(198)**
Counseling	Workplace relationship counseling	16.0% (65)	37.8% (14)	40.0% (14)	20.0% (1)	**19.4%(94)**
	Improve self confidence	12.8% (52)	10.8% (4)	5.7% (2)	0.0% (0)	**12.0%(58)**
	Personal relationship counseling	10.8% (44)	21.6% (8)	14.3% (5)	0.0% (0)	**11.8%(57)**
	Goal setting regarding long-term vocational rehabilitation / long-term motives	12.5% (51)	8.1% (3)	5.7% (2)	0.0% (0)	**11.6%(56)**

	Adjustment to injury counseling	5.9% (24)	8.1% (3)	48.6% (17)	0.0% (0)	**9.1%(44)**
Social Strategies						
RTW planning / suitable duties program		41.5% (169)	40.5% (15)	42.9% (15)	80.0% (4)	**41.9%(203)**
Improve stakeholder communication		35.6% (145)	35.1% (13)	37.1% (13)	20.0% (1)	**35.5%(172)**
Worksite visit		15.0% (61)	10.8% (4)	11.4% (4)	0.0% (0)	**14.3%(69)**
Workplace education re. policies and procedures		4.4% (18)	10.8% (4)	14.3% (5)	20.0% (1)	**5.8%(28)**
Compensation claim intervention	Education regarding compensation system/processes	3.4% (14)	5.4% (2)	2.9% (1)	0.0% (0)	**3.5%(17)**
	Resolve compensation claim	1.0% (4)	0.0% (0)	0.0% (0)	0.0% (0)	**0.8%(4)**

[a] non-modifiable barriers

[b] % of stakeholders in that group who nominated that barrier/strategy; n=number of stakeholders who nominated that barrier/strategy in that stakeholder group

[c] % of stakeholders (all groups combined) who nominated that barrier/strategy; n=number of stakeholders (all groups combined) who nominated that barrier/strategy

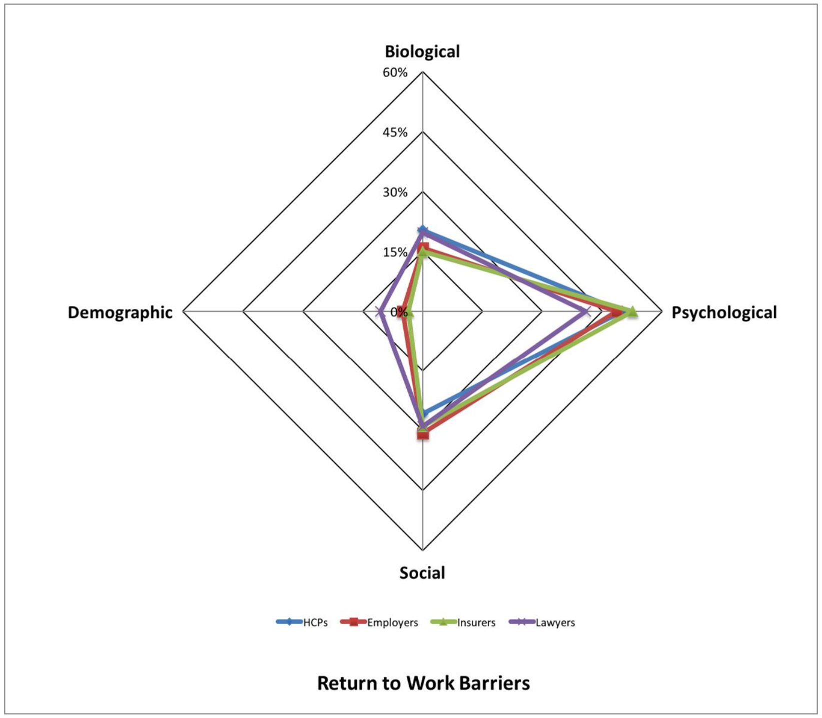
Table 7.3: Percentage of barriers and strategies nominated by each of the stakeholder groups

	HCPs		Employers		Insurers		Lawyers		All Groups	
	Barriers	**Strategies**	**Barriers**	**Strategies**	**Barriers**	**Strategies**	**Barriers**	**Strategies**	**Barriers**	**Strategies**
Number of participants who responded	488	407	62	37	55	35	16	5	621	407
Total number of barriers/strategies nominated	2798	1203	323	87	335	95	76	10	3532	1395
Demographic %(n)	3.8%(107)	na	4.9%(16)	na	3.6%(12)	na	10.5(8)	na	4.0%(143)	na
Biological %(n)	20.3%(570)	31.0%(373)	15.8%(51)	10.3%(9)	14.9%(50)	12.6%(12)	19.7%(15)	10.0%(1)	19.4%(686)	28.3%(395)
Psychological %(n)	50.0%(1398)	34.8%(419)	48.6%(157)	46.0%(40)	52.5%(176)	47.3%(45)	40.8%(31)	30.0%(3)	49.9%(1762)	36.3%(507)
Social	25.8%(723)	34.2%(411)	30.7%(99)	43.7%(38)	29.0%(97)	40%(38)	28.9%(22)	60.0%(6)	26.6%(941)	35.3%(493)

Key: %=percentage of responses; n=number of responses nominated in that domain; na=not applicable

NB: It is important to note when interpreting this table that the % relate to the number of responses, not the number of participants. This is because participants could nominate multiple demographic, biological, psychological or social barriers/strategies.

Figure 7.1: Radar Graphs



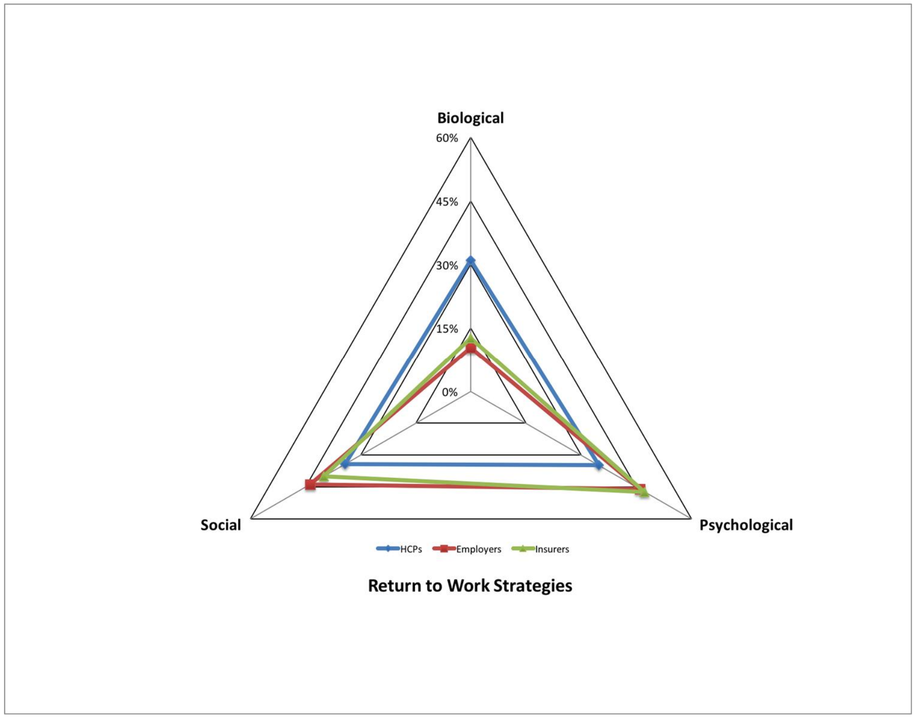
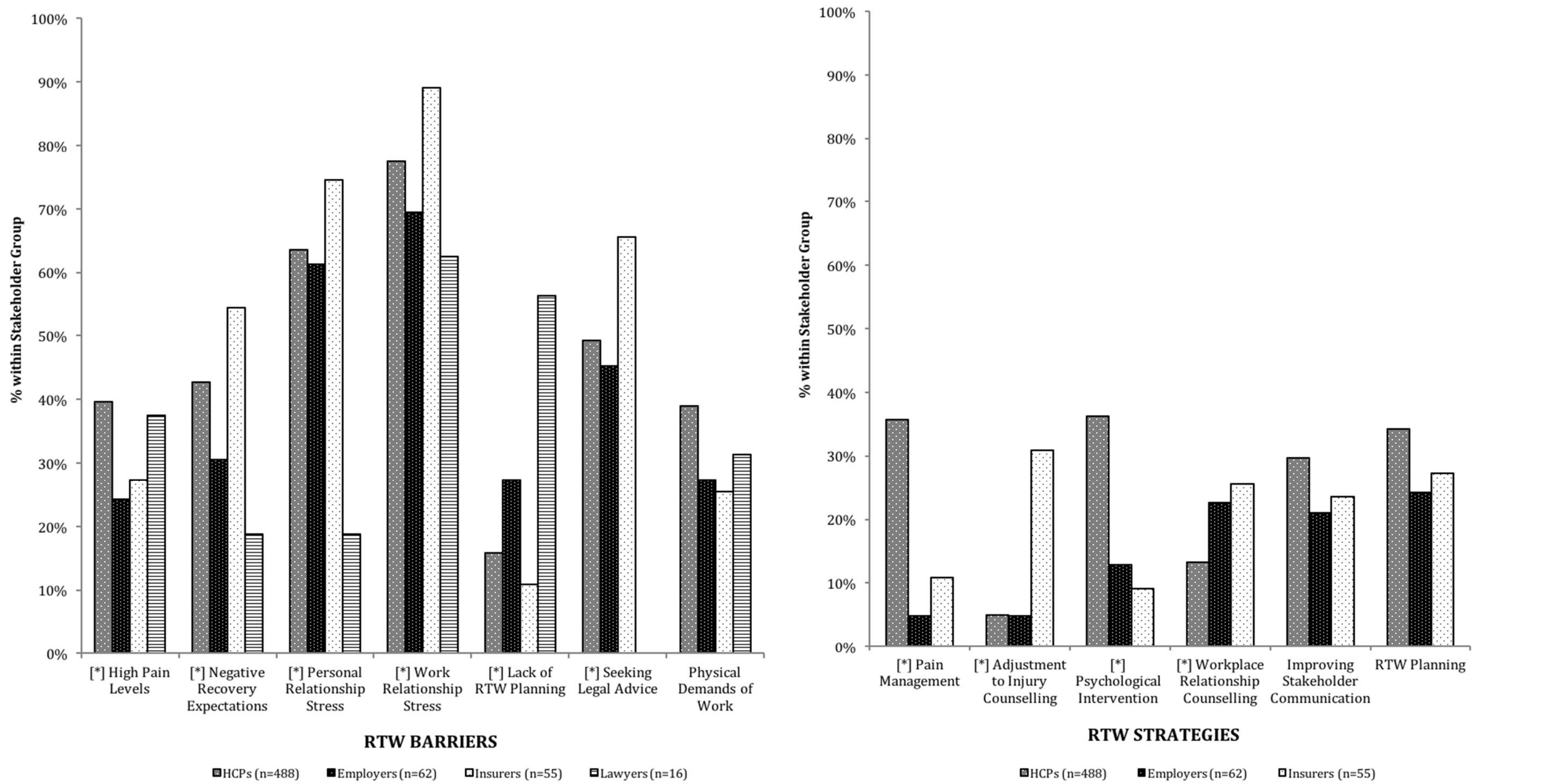


Figure 7.2. Histograms depicting differences between stakeholder groups for the main nominated barriers and strategies



7.7 Discussion

This study examined stakeholders' perspectives of RTW barriers and intervention strategies using a vignette of a worker with a non-traumatic UE condition. Our hypothesis that HCPs will focus on biological and psychological barriers and strategies, whilst insurers, employers and lawyers will emphasize social (including work related) barriers and strategies was only partially supported. Overall, HCPs, employers, insurers and lawyers perceived similar barriers to RTW in the vignette. However, the reported RTW strategies were quite diverse thus supporting our hypothesis.

The identification of similar RTW barriers across stakeholder groups is encouraging. This suggests that when various stakeholders are given the same case, there is a degree of consistency across stakeholders in identifying the potential barriers to RTW. However, this differs to a study by Schweigert et al which found that HCPs see workplace issues as the main barrier to RTW, whereas employers perceived clinical factors,(284) such as the lack of physician input in RTW planning, as a main barrier. The discrepancy between this study and ours may be due to stakeholders in our study operating under similar workers' compensation schemes, and the broad approach of these insurers supporting the adoption of a biopsychosocial approach. Research suggests that when stakeholders have a shared understanding of a worker's situation it leads to improved communication and collaboration.(9, 226, 235)

Although stakeholders generally identified similar barriers, our study also found that HCPs tended to focus on biological interventions, such as 'pain management', compared to the other stakeholder groups. This suggests that HCPs may still operate under a biomedical model in their knowledge of strategies and resulting behaviours. However we know that operating in a traditional biomedical paradigm does not adequately fit the dynamic and complex process of RTW. Consistent evidence exists to support adoption of a biopsychosocial approach to managing work-related UE injuries.(62) Biological, psychological and social factors are interlinked and hence should be managed simultaneously to improve outcomes. This is an important consideration as they are often addressed hierarchically, i.e., first biological, then psychological and social factors. Our finding is consistent with previous research in the work disability literature that has found that HCPs tend to focus on biomedical aspects of rehabilitation when dealing with injured workers.(65, 285, 286) It is also possible that HCPs participating in this study may operate mainly in a clinical capacity advocating clinical interventions and may not be routinely involved in RTW interventions. This supports the need for more education and information regarding evidence based RTW strategies for stakeholders.

Stakeholder's different focus of RTW strategies is not an unexpected finding. Each stakeholder has unique professional qualifications, knowledge, skill sets and roles in the RTW process. For example, one would expect a HCP to be more proficient at identifying and reporting biological-related strategies such as a 'pain management'; and employers be more proficient at identifying social or workplace strategies as was the case in our study. It has been suggested that agreement of each stakeholder's professional roles and responsibilities is required to improve cooperation between employers and HCPs.(60, 226) Establishing clear parameters for the roles of stakeholders in the RTW process will define which stakeholders are responsible for certain RTW interventions.(60, 226, 287) Lack of role clarity in the RTW process has been shown to severely impact RTW outcomes.(226) Given the diversity of stakeholders with respect to their professional backgrounds, unclear boundaries and roles will inevitably cause difficulties and miscommunication between stakeholders resulting in a lack of consistent RTW strategies within and between stakeholder groups.(226, 235) Franche et al. suggested that employers are hesitant to take responsibility for coordinating their worker's RTW because this might interfere with medical treatment, harm their worker's health or possibly even have legal consequences.(226, 277) However in Australia, some stakeholders working in roles such as case-managers and RTW coordinators may have very different professional backgrounds and training, as these roles are competency-based. In this setting, interventions should focus on equipping the stakeholders to not only identify barriers to RTW, but also to develop appropriate RTW strategies and for these to be discussed concurrently within stakeholder groups.

The overall percentage of nominated strategies was considerably lower among stakeholders in comparison to the nominated barriers (**Fig. 7.2**). Twenty percent of respondents did not report any RTW strategies, with the percentage of non-responders being highest in lawyers. This may be because legal professionals don't see themselves as interventionists and rely on other stakeholders, such as HCPs to provide opinions regarding treatments to improve work capacity and facilitate RTW.

Another interesting finding was the considerably smaller proportion of nominated strategies compared to the number of identified barriers. The vignette deliberately included mostly modifiable RTW barriers of which most stakeholders identified. Yet fewer strategies were listed to address them. For example, a high proportion of HCPs, employers, insurers and lawyers reported 'work relationship stress' as a barrier to RTW but only a small proportion indicated 'work relationship counselling' as an intervention (**Fig. 7.2**). This might suggest that stakeholders may not be able to identify appropriate strategies for important modifiable RTW barriers or believe this is not within their role despite being able to identify them.

It is also important to highlight that although stakeholders identified few workplace-specific strategies, they did consistently identify 'RTW planning' and 'improving stakeholder communication' as key strategies. This is a good starting point to open dialogue between stakeholders to establish RTW plans. These RTW strategies have also been identified as contributors to successful and timely RTW outcomes.(60, 226)

Methodological considerations

A limitation of this study was an unequal distribution of participants within stakeholder groups. This is likely due to a higher number of HCPs dealing with workers with UE conditions in Australia, than insurer, employer and legal representatives. There was also more difficulty in recruiting participants from these smaller stakeholder groups due to institutional limitations imposed by some of the gatekeeper organizations. It is important to note that this study was conducted within the context of the Australian worker's compensation system. This may limit generalizability of the findings to countries with different worker's compensation systems due to the involvement of different stakeholders. Due to the snowball sampling method used and the unknown population size from which the respondents were derived for each stakeholder group, a sample size calculation could not be performed. However the population was sampled for a period of one-month, until no new responses were received. Thus, for the purpose of this study, saturation was achieved using this *a priori* time based cut-off.

7.8 Conclusions

In conclusion, stakeholders perceived similar barriers to RTW but identified different strategies according to their area of professional expertise. Employers and insurers were more consistent in the barriers identified. The HCPs tended to report more biological-related strategies than the other stakeholder groups. Future research should focus on tools to assist stakeholders in identifying both barriers to RTW and concomitant interventions to facilitate RTW. This will continue to advance the field of RTW research and improve RTW outcomes for all involved.

7.9 Acknowledgements

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SECTION E: Tools used by healthcare providers to evaluate barriers to return-to-work for workers with upper extremity conditions

CHAPTER 8: Tools used by Australian healthcare providers in clinical practice to identify barriers to return-to-work for workers with upper extremity conditions

8.1 Chapter Introduction

This chapter details the assessment tools that Australian health care providers (HCPs) use in their clinical practice for assessing barriers to return-to-work (RTW) for workers with upper extremity (UE) conditions/injuries (**Aim 4**). The data from this study was collected in the survey of Australian stakeholders detailed in **Chapters 4, 5 and 7.**

Ethical approval: School Health and Rehabilitation Sciences, The University of Queensland (2012SHRS_OT007).

8.2 Publication

This chapter has been submitted as a short report to the journal Hand Therapy (SAGE):
***Peters SE**, Johnston V. Tools used by Australian healthcare professionals in clinical practice to identify barriers to return-to-work for workers with upper extremity conditions.*

8.3 Abstract

Introduction: HCPs are frequently called upon to identify barriers to RTW in people with UE injuries. However, the tools used by these professionals are unknown. Assessment tools can be used to direct appropriate interventions for those workers who may be at risk of a delayed RTW.

Methods: The purpose of this study was to identify the assessment tools and methods favoured by HCPs to assess barriers to RTW for workers with UE conditions. 596 Australian HCPs responded to an open-ended question regarding the tools and methods they use to identify barriers to RTW. All responses were coded and analysed descriptively. Differences between tools nominated by professional disciplines were recorded.

Results: HCPs nominated 59 types of assessment tools/methods that they currently use to identify barriers to RTW for workers with UE conditions in clinical practice. The most favoured method was clinical interviewing. Other commonly used tools were clinical measures e.g., strength, and a RTW risk-factor screening tool validated on musculoskeletal diagnoses, the Orebro Musculoskeletal Screening Questionnaire (OMPQ).

Discussion: HCPs use a variety of tools and methods to identify barriers to RTW when managing workers with UE conditions. In general, they favoured subjective methods. They also frequently nominated strength testing and the OMPQ. However, neither of these has been found to predict poorer work outcomes for workers with UE conditions. Future research is needed to develop or validate assessment tools for identifying barriers to RTW specifically for workers with UE conditions.

Keywords: assessment; work disability; occupational health; workers' compensation; risk factors

8.4 Introduction

The majority of serious workers' compensation claims in Australia involve the UE.(3) In the Australian workers' compensation setting (similar to insurance agencies internationally), HCPs, such as hand therapists and hand surgeons, are expected to identify barriers to RTW and recommend strategies to overcome these barriers.(136, 137) The emerging paradigm for work-related injuries is to identify early risk factors associated with a delayed RTW using the biopsychosocial model.(55) When modifiable risk factors are recognized early in the injury trajectory, appropriate interventions can theoretically be implemented to facilitate a successful earlier RTW. Recently, researchers have developed various screening tools, based on the biopsychosocial model, that have the potential to identify barriers to RTW and thereby facilitate recovery for workers with back pain and general musculoskeletal disorders.(58, 122) The flags method has also been popularized as a method for identifying psychosocial barriers to RTW in the literature.(106, 125, 134, 135) Although not validated specifically on workers with UE, it has been implemented in workers' compensation jurisdictions, including some in Australia.(131)

It is unknown which methods and/or specific tools are currently being utilized by HCPs to identify RTW barriers for workers with UE conditions (e.g., carpal tunnel syndrome, lateral epicondylalgia and rotator cuff pathology) and injuries (e.g., fractures, tendon repairs and mutilating traumas). Thus, the purpose of this study was to explore the types of assessment tools and methods most frequently used by Australian HCPs to identify barriers to RTW for workers with UE conditions.

8.5 Methods

A cross-sectional survey was administered to Australian HCPs whom manage patients with UE conditions. The surveys were completed between August 2013 and January 2014. Completion of the survey was voluntary. A complete description of the methods is contained in **Chapter 5**.

Distribution of the questionnaire was through HCP gatekeeper organizations (refer to *Acknowledgements*), using an online survey platform and hard copy surveys at key stakeholder events. In addition, the survey was disseminated by the 'RTW Matters' online newsletter (www.RTWmatters.org). This newsletter is distributed nationally to healthcare professionals, employer representatives, and insurer claims advisors and case-managers. Using a snowball dissemination strategy, respondents were able to forward the electronic survey on to other HCPs that manage patients with UE conditions who may not be affiliated with a gatekeeper association. Hardcopy responses were later entered into SurveyMonkey by a person external to the study. This chapter summarises the data from an open-ended question that was included in the survey: *"What assessment tools or methods do you use in your practice to identify barriers to RTW?"* Respondents were able to list one or more assessment tools or methods that they use in the clinical practice. Examples of common conditions provided were carpal tunnel syndrome, lateral epicondalgia, wrist tendinopathies and rotator cuff pathology.

Descriptive statistics were used to detail the demographic data of the participants (**Table 8.1**). To analyse the data from the open-ended question, we first coded the responses into categories of assessment tools. Due to the number of tools and methods, we grouped similar tools into logical categories determined by the researchers. For example, different variations of functional capacity evaluations (FCEs) were combined into one category. Then using an iterative process, categories were refined to create a final list. We collapsed different types of similar overall assessment methods into one category that best described the tools (refer to **Table 8.2**). Any ambiguous or unfamiliar tools were discussed between the authors to gain consensus on the tool's categorization or whether it should be removed from the list of tools. When particular protocols for functional or psychological evaluations were not specifically described, it was assumed that these methods were not objective or validated instruments due to lack of explicit description regarding the methods. Hence, these responses were recorded as methods under 'semi-structured clinical interviews'. For example, when healthcare professionals stated, "assess function" or "functional assessment" these were described as 'functional assessments – not specified'; and "assess psychological state" or "general psychological evaluation", was coded as 'psychological evaluation – not specified'. Also on occasion, participants nominated strategies instead of assessment tools and, hence, these responses were not coded. Frequencies for each of the categorized tools/methods were calculated for the overall HCP group and for each discipline.

8.6 Results

In total, 752 HCPs completed the questionnaire, of which 596 respondents provided valid responses that could be coded for analysis. These included hand therapists (i.e., occupational therapists or physiotherapists practicing in hand therapy) (26.8%), physiotherapists (21%), occupational therapists (18.1%), surgeons (i.e., hand surgeons, orthopaedic surgeons, plastic surgeons, neurosurgeons) (12.2%), occupational physicians/general practitioners (7.5%), exercise physiologists (7.2%), psychologists/counsellors (4%), nurses (2.3%), and other HCPs (including social workers and speech pathologists working in occupational rehabilitation) (0.7%). The characteristics of the HCPs are described in **Table 8.1**.

A total of 59 assessment tools and/or methods were reported by the HCPs. Each HCP nominated a mean of 2.7 assessment tools or methods (Range: 0-12). The frequency of each of the categorized assessment tools nominated by each discipline can be viewed in **Table 8.2**.

Overall, a mix of assessment methods was nominated, including clinician's overall impression and clinical opinion (e.g., interviews, discussions, clinical reasoning), semi-structured interviewing (e.g., insurer specific checklists), objective measurement (e.g., functional capacity evaluations), worksite evaluations, patient-rated questionnaires (e.g., DASH). **Table 8.3** lists the ten highest responses from each HCP discipline. The majority of the stakeholders indicated that they use subjective methods i.e., their own overall impression and clinical opinion to inform their clinical judgments. The most favoured method by all stakeholders combined was clinical interviewing and history taking directly from the worker (40.4%). This was the favoured method by surgeons, occupational physicians, occupational therapists, and psychologists (64.4% 54.8%, 47.2%, and 41.7% respectively). However, physiotherapists and exercises physiologists favoured the Orebro Musculoskeletal Pain Questionnaire (OMPQ) (46.4% and 48.8% respectively), and hand therapists favoured strength assessments (e.g., grip strength) (57.5%).

Table 8.1: Demographic characteristics of the HCPs

		HT	PT	OT	SURG	OP	EP	PSYCH	NURSE	OTHER	TOTAL
%(n)		26.8(160)	21.0(125)	18.1(108)	12.2(73)	7.5(45)	7.2(43)	4.0(24)	2.3(14)	0.7(4)	596
Number of Assessment tools nominated	Mean	3.1	2.8	3.3	1.7	2.2	2.7	2.8	1.9	3.3	2.7
	SD	1.7	1.7	1.9	1.3	1.1	1.4	2.3	1.7	2.9	1.7
	Range	0-8	0-12	0-10	0-6	1-5	0-6	1-10	0-6	1-7	0-12
% Workers managed that are workers' compensation (% of HCP groups)	0-25%	25.6	41.6	21.2	19.2	15.6	14.0	16.7	42.9	50.0	155
	26-50%	30.0	25.6	19.4	37.0	6.7	18.6	8.3	21.4	0.0	144
	51-75%	25.6	15.2	23.1	23.3	8.9	9.3	8.3	14.3	0.0	114
	>75%	18.8	17.6	36.1	20.5	68.9	58.1	66.7	21.4	50.0	183
Gender (%of HCP group)	Female	90.6	63.2	89.8	6.8	15.6	55.8	87.5	92.9	100.0	395
	Male	9.4	36.8	10.2	93.2	84.4	44.2	12.5	7.1	0.0	201
Age (% of HCP group)	21-29	13.8	29.6	20.4	0.0	0.0	55.8	4.2	7.1	0.0	107
	30-39	41.3	28.0	29.6	23.3	11.1	25.6	29.2	0.0	25.0	174
	40-49	26.3	23.2	34.3	31.5	13.3	11.6	25.0	14.3	25.0	151
	50-59	15.6	12.8	13.0	31.5	31.1	7.0	25.0	14.3	25.0	106
	60 or older	3.1	4.8	2.8	13.7	51.1	0.0	16.7	42.9	25.0	58
State (% of HCP group)	ACT	1.8	1.6	4.6	2.7	6.6	0.0	4.2	14.3	25.0	19
	NSW	27.5	70.4	26.9	21.9	11.1	81.4	10.0	28.6	75.0	225
	NT	0.6	0.0	2.7	0.0	0.0	2.3	8.3	0.0	0.0	7
	QLD	28.1	18.4	37.0	40.8	22.2	9.3	20.8	7.1	0.0	164
	SA	7.0	2.4	10.2	9.6	13.3	0.0	20.8	0.0	0.0	39
	TAS	4.4	1.6	0.0	2.7	2.2	2.3	0.0	0.0	0.0	8
	VIC	22.5	4.0	15.7	12.3	24.4	0.0	4.2	50.0	0.0	86
	WA	9.4	1.6	11.1	5.5	48.9	4.6	0.0	0.0	0.0	39
	Other	-	-	-	-	-	-	-	-	-	9

Key:

ACT: Australian Capital Territory; HCP: healthcare professional; NSW: New South Wales; NT: Northern Territory; QLD: Queensland; SA: South Australia; TAS: Tasmania; VIC: Victoria; WA: Western Australia

Table 8.2: Number of assessment tools/methods nominated by HCPs

ASSESSMENT TOOL		OT n	PT n	HT n	SURG n	OP n	EP n	PSYCH n	NURSE n	OTHER n	TOTAL N
None		4	1	2	9	0	1	0	0	0	17
Clinician's overall impression and clinical opinion	Interview/Patient history taking	51	37	50	40	29	19	10	3	2	241
	Meeting/discussion with stakeholders	27	12	12	8	15	9	7	5	1	96
	Subjective (Not Specified)	10	6	12	6	0	1	2	0	0	37
	Documentation from Stakeholders	3	1	1	9	6	1	1	2	0	24
	Clinical reasoning[4]	4	2	7	4	2	2	0	1	0	22
Semi-structured clinical interviews	Physical clinical examination	6	21	17	22	11	5	1	0	0	83
	Functional assessment (not-specified)[5]	15	21	24	1	0	6	1	0	0	68
	Psychological Evaluation (not-specified)	1	4	5	1	2	2	5	0	1	21
	FACTORWEB(288)	2	2	2	0	0	6	3	1	0	16
	Vocational Assessment	6	1	2	1	1	0	4	0	0	15
	Insurer specific checklists for barriers to return-to-work	1	2	2	0	0	0	2	0	0	7
	ADL assessment	0	1	3	0	1	0	0	0	0	5
Objective measurement	Strength	34	22	92	9	1	2	0	0	0	160
	Range of movement/Goniometry	32	25	63	7	0	3	0	0	0	130
	Functional Capacity Evaluation	29	21	28	3	1	6	2	1	0	91
	Hand sensibility tests	12	0	27	1	0	1	0	0	0	41

[4] Clinical reasoning is defined as the thinking and decision-making processes associated with professional practice. *Higgs, J. & Jones, M. Clinical reasoning in the health professions. In: Higgs J, Jones M, eds. Clinical reasoning in the health professions. Oxford: Butterworth-Heinemann.2000. p. 3–14.*

[5] When particular protocols for functional or psychological evaluations were not specifically described, it was assumed that these were not objective or validated instruments.

	Radiology and pathology results	0	1	1	7	1	0	0	0	0	10
	Fine motor/dexterity tests	3	1	4	0	0	1	0	0	0	9
	Manual Muscle Testing	3	0	2	0	0	0	0	0	0	5
	Sollermon's Hand Function Test(289)	2	0	0	0	0	0	0	0	0	2
	Humantech(290)	0	0	0	0	0	0	0	1	0	1
Worksite evaluations	Worksite Assessment	23	9	0	6	6	5	2	4	1	56
Patient Questionnaires – Barriers to RTW	Orebro Musculoskeletal Pain Questionnaire(291)	21	58	27	0	5	21	8	2	1	143
	Flags Model(131)	5	6	9	1	6	3	3	1	0	34
	Abilita self-report questionnaire(292)	1	1	0	0	0	0	0	0	0	2
Patient-rated Questionnaires	DASH/Quick DASH(110)	19	9	37	3	1	1	0	0	1	71
	Pain severity scales	19	14	27	3	0	2	3	0	0	68
	Questionnaires (not- specified)	5	13	4	0	1	8	1	0	0	32
	Depression Anxiety Stress Scale(293)	4	8	0	0	5	5	6	1	3	32
	PRW(H)E(112)	4	0	16	0	0	0	0	0	0	20
	UEFI(294)	1	4	5	0	0	0	0	1	0	11
	Patient Specific Functional Scale(295)	1	4	4	0	0	0	0	0	0	9
	Oswestry Disability Index(296)	1	4	0	0	1	2	0	0	0	8
	Fear Avoidance Beliefs Questionnaire(297)	2	6	0	0	0	0	0	0	0	8
	UL Functional Index(111)	2	1	5	0	0	0	0	0	0	8
	Kessler Psychological Distress (K10) Scale(298)	3	0	0	0	1	3	0	0	1	8
	Pain Self-efficacy Scale(299)	0	4	1	0	0	1	0	0	1	7
	SPADI(300)	4	3	0	0	0	0	0	0	0	7
	Neck Disability Index(301)	0	6	0	0	0	0	0	0	0	6
	TAMPA Scale of Kinesiophobia(302)	0	5	0	0	0	0	0	0	0	5
	Roland Morris Disability Questionnaire(303)	0	3	0	0	0	1	0	0	0	4
	Beck Depression Questionnaire(304)	0	0	0	0	2	0	1	0	0	3

Quebec Back Pain Disability Scale(305)	0	1	0	0	0	1	0	0	0	2
Pain Catastrophising Scale(306)	0	2	0	0	0	0	0	0	0	2
Patient Evaluation Measure(307)	1	1	0	0	0	0	0	0	0	2
Constant Score(308)	0	2	0	0	0	0	0	0	0	2
Hospital Anxiety and Depression Scale(309)	0	1	0	0	0	0	1	0	0	2
Post-traumatic Stress Checklist(310)	0	0	0	0	0	0	1	0	1	2
Western Ontario Rotator Cuff Index(311)	0	1	0	0	0	0	0	0	0	1
Michigan Hand Questionnaire(312)	1	0	0	0	0	0	0	0	0	1
Profile of Mood States(313)	0	0	0	0	0	0	1	0	0	1
Centre for Epidemiological Studies Depression Scale (CES-D)(314)	0	0	0	0	0	0	1	0	0	1
Rosenberg Self-Esteem Scale(315)	0	0	0	0	0	0	1	0	0	1
Mini Mental State Examination(316)	0	0	0	0	1	0	0	0	0	1
EuroQOL(317)	0	0	0	1	0	0	0	0	0	1
Perceived injustice questionnaire(318)	0	1	0	0	0	0	0	0	0	1
International Classification of Functioning, Disability and Health (ICF) Model(63)	1	0	0	0	0	0	0	0	0	1
Canadian Occupational Performance Model(319)	1	0	0	0	0	0	0	0	0	1
Distress and Risk Assessment Method(320)	0	0	0	0	0	1	0	0	0	1

Table 8.3: Most common assessment tools identified by HCP discipline

Ranking	Occupational Therapists	Physio-therapists	Hand Therapists	Surgeons	Occupational Physicians/GPs	Exercise Physiologists	Psychologists	All groups
1	Interviewing/ history taking (47.2%)	OMPQ (46.4%)	Strength testing (57.5%)	Interviewing/ history taking (54.8%)	Interviewing/ history taking (64.4%)	OMPQ (48.8%)	Interviewing/ history taking (41.7%)	Interviewing/ history taking (40.4%)
2	Strength testing (31.4%)	Interviewing/ history taking (29.6%)	Range of movement/ goniometry (39.4%)	Physical clinical examination (30.1%)	Meeting/ discussion with stakeholders (33.3%)	Interviewing/ history taking (44.2%)	OMPQ (33.3%)	Strength testing (26.8%)
3	ROM/ goniometry (29.6%)	ROM/ goniometry (20%)	Interviewing/ history taking (31.3%)	Meeting /discussion with stakeholders (12.5%)	Physical clinical examination (24.4%)	Meeting /discussion with stakeholders (20.9%)	Meeting/ discussion with stakeholders (29.2%)	OMPQ (24%)
4	FCE (26.9%)	Strength testing (17.6%)	DASH/ QuickDASH (23.1%)	Strength testing (12.5%)	Documentation from stakeholders (13.3%)	Questionnaires-not specified (18.6%)	DASS (25%)	ROM /goniometry (21.8%)
5	Meeting/ discussion with stakeholders (25%)	Manual muscle testing (17.6%)	FCE (17.5%)	None (12.5%)	Worksite assessment (13.3%)	Functional assessment not specified (14.0%)	Psychological evaluation (20.8%)	Meeting/ discussion with stakeholders (16.1%)
6	Worksite assessment (21.2%)	Physical clinical examination (16.8%)	Worksite assessment (16.9%)	Meeting/ discussion with stakeholders (10.9%)	Flags model (13.3%)	FCE (14.0%)	Clinical reasoning/ experience (16.7%)	FCE (15.3%)
7	OMPQ (19.4%)	FCE (16.8%)	Pain severity scale (16.9%)	Radiology and test results (9.6%)	OMPQ (11.1%)	FACTORWEB (14.0%)	Flags model (12.5%)	Physical clinical examination (13.9%)
8	Pain Severity Scale (17.6%)	Functional assessment not specified (16.8%)	Sensibility tests (16.9%)	Range of movement/ goniometry (9.6%)	DASS (11.1%)	Physical clinical examination (11.6%)	Pain severity scale (12.5%)	DASH / Quick DASH (11.9%)
9	DASH/ QuickDASH (17.6%)	Pain severity scale (11.2%)	Functional assessment not specified (15.0%)	Worksite assessment (8.2%)		DASS (11.6%)	FACTORWEB (12.5%)	Functional assessment not specified (11.7%)
10	Functional assessment not specified (13.9%)	Questionnaires not specified (10.4%)	Physical clinical examination (10.6%)	Subjective examination not specified (8.2%)		Worksite assessment (11.6%)		Pain severity scale (11.4%)

8.7 Discussion

Overall, HCPs favoured subjective methods (such as clinical interviewing and semi structured interviews) to inform their own impressions of barriers for RTW. The most common method was the use of clinical interviewing (40.4%), which was favoured for occupational therapists, surgeons, occupational physicians and psychologists. This was the second most favoured method for physiotherapists and exercise physiologists. Subjective assessments were most likely nominated as they are able to capture factors that are not purely biological in nature (e.g., the context of the injury, such as timing of injuries, previous interventions). Hence, they allow psychosocial factors (such as, observed and reported psychological state and exploration of workplace issues) to be explored by probing and discussing issues and concerns with the worker. Clinical interviewing is an essential component of clinical reasoning used by HCPs in diagnosis, so it is not surprising that this was the favoured method used to identify barriers to RTW. Furthermore, clinical reasoning is a higher level function that often combines information obtained from multiple sources, such as interviewing and objective measures, to make decisions and recommendations. Therefore, it is also possible that HCPs did not nominate clinical reasoning as frequently as the other methods, as they nominated a variety of tools, which they use to inform their practice.

Hand Therapists favoured use of strength testing and goniometry to assess barriers to RTW. These tools are important objective outcome measures to monitor progress for recovery, but focus on the biological impairment itself with equivocal evidence for their relationship with RTW. For example, grip strength and range of motion testing have not been found to be strong prognostic variables for work-related outcomes following carpal tunnel release.(250) Interestingly, using a clinician's overall impression or clinical opinion to guide identification of RTW barriers, such as, clinical interviewing, was nominated by only 30% of this group. However, clinical interviewing is a key part of the hand therapy session. It might be possible that hand therapists focused on the objective biological impairment measures, as these are validated and standardised instruments used in their practice, but still engage in clinical interviewing. Also, standardised and valid measures are favoured by insurance agencies in Australia, as documented in the Clinical Framework for Delivery of Health Services in Australian compensable settings.(136, 137) In addition, there was an absence of specific questionnaires to assist in identifying barriers to RTW nominated by the hand therapists. However, this is likely reflective of the lack of tools developed or validated on this population of people, resulting in hand therapists nominating the tools they are most familiar with.

Physiotherapists and exercise physiologists preferred the use of the OMPQ to identify barriers. Interestingly, the OMPQ was designed as a screening tool to identify psychosocial barriers in patients with low back pain, not UE diagnoses.(291) Their selection of this tool as a favoured method may reflect their experience that this tool can be generalized across various musculoskeletal condition. Its utility is advocated by various insurance agencies (including workers' compensation insurers).(321-324)

Fewer HCPs nominated work-related assessment tools such as worksite assessments and FCEs to identify barriers to RTW, despite these being key services provided by RTW intervention providers (such as, occupational therapists).(325) Although FCEs and worksite assessments are commonly used to facilitate RTW, Gross et al found that functional performance was a weak predictor for workers' compensation claim closure and recovery for workers with UE conditions.(57) Perhaps, through focusing on functional capacity and workplace issues, clinicians may ignore the personal and psychological factors that may pose as barriers in the RTW process. Further research needs to be conducted to specifically establish the benefit of worksite assessments and FCEs for workers with UE conditions.

It is not surprising that the various self-report patient questionnaires were not commonly used. The tools that were nominated were often directed at assessing discrete barriers to RTW, such as pain catastrophising or fear avoidance beliefs While it is feasible that these psychological factors are barriers to RTW, there is limited evidence for workers with UE conditions. Therefore, they are probably used in a battery of assessments to examine psychosocial functioning, or perhaps only when isolated issues are raised through clinical interviewing. Recommendations have also been made that a staged process to assess psychosocial barriers to recovery and RTW should be conducted when a worker does not RTW at two weeks or later.(55, 135) These tools may be suitable to use for this purpose.

Surprisingly, the DASH and its short version were nominated by 11.9% of respondents. This questionnaire was developed as an outcome measure for function and symptoms, not specifically as a tool to identify barriers to RTW.(109) A number of other UE specific tools that were identified (e.g., Constant score, Patient Rated Wrist (and Hand) Evaluation (PRWHE), UE Function Index (UEFI), Shoulder Pain and Disability Index (SPADI) are also outcome measures rather than screening tools.

There are several plausible explanations for the variation in tools and methods nominated by the HCPs. First, there are no known validated tools to specifically identify barriers to RTW workers with UE conditions. Therefore, it is possible that HCPs default to using tools that they have the greatest familiarity, in the hope of gaining some insight regarding the potential barriers for RTW. Second, HCPs may expect that by identifying barriers to recovery, such as biological or psychosocial factors, barriers to RTW will also be revealed. Third, perhaps HCPs don't understand what constitutes a barrier for RTW and are therefore unsure how to assess them. Finally, the HCPs in this study may feel it is not part of their role to assess RTW barriers.

Limitations of this study

One limitation of this study was that we were unable to obtain an equal number of participants from each HCP discipline for our sample. However, this is most probably a reflection of the relative proportion of these HCPs who actually work with UE patients. Also, although we investigated the type of assessment tools and methods that the different HCPs from various disciplines used, we did not directly question the rationale behind the utility of each specific tool. The survey method did not lend itself to adequate exploration of this. A future qualitative study (either through interviews or focus groups) in which HCPs are required to discuss the processes they use to identify barriers to RTW and explain the reasoning behind the selection of particular assessment tools, would be a preferred method to yield this information. This would also allow clarification behind some of the nominated methods such as 'functional assessment – not specified' or 'psychological evaluation – not specified', and further exploration of complex methods, such as clinical reasoning.

8.8 Conclusions

Australian HCPs use a variety of tools and methods to identify barriers to RTW when managing workers with UE conditions and injuries. They favoured subjective methods, such as clinical interviewing. They also frequently nominated strength testing and the OMPQ. However, neither of these has been found predictive of poorer work outcomes for workers with UE. Future research is needed to develop or validate assessment tools for identifying barriers to RTW specifically for workers with UE conditions and injuries. Such tools would assist HCPs greatly to direct appropriate interventions for those workers who may be at risk of a delayed or poorer work outcome.

8.9 Acknowledgements

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SECTION F: Defining delayed return-to-work in the context of upper extremity conditions

CHAPTER 9: Experts' perspective on a definition for delayed RTW following surgery for non-traumatic upper extremity disorders: Recommendations and implications

9.1 Introduction

This paper was generated from data collected in Round 1 of the Delphi Study detailed in **Chapter 6**. The significance of this paper is grounded in the importance of defining time-points for measurement in research. Hence, this study aimed to clarify a definition for a delayed return-to-work (RTW) following surgery for non-traumatic upper extremity (UE) conditions and determine whether a time-point to differentiate the transition from early to delayed RTW (as an outcome measure) is appropriate (**Aim 5**).

9.2 Publication

This chapter has been submitted for publication as it stands:
***Peters SE**, Coppieters MW, Ross M, Johnston V. Experts' perspective on a definition for delayed RTW following surgery for non-traumatic upper extremity disorders: Recommendations and implications. Submitted to Journal of Hand Therapy*.

9.3 Abstract

Introduction: A delayed RTW is often associated with poorer outcomes after a workplace injury but is ill defined.
Purpose of the study: To define 'delayed RTW' following surgery for non-traumatic UE conditions.
Methods: Experts were consulted to define 'delayed RTW' and whether a universal time-point can determine the transition from early to delayed RTW.
Results: Forty-two experts were divided between delayed RTW being defined as a worker 'not returning to pre-injury (or similar) work within the expected timeframe' (45%) and 'not returning to any type of work' (36%). Two thirds of experts believed universal time-points to delineate delayed RTW should be avoided.

Discussion: Multiple factors complicate a uniform definition of delayed RTW.
Conclusion: Defining delayed RTW should be individualised with due consideration to the type of work. Time-based cut-offs for outcome measurement may not be appropriate with continuous measures more appropriate in research.

Ethical Approval: School of Health and Rehabilitation Sciences, The University of Queensland (*#2011SHRS-OT008).*

Keywords: return-to-work; work disability; carpal tunnel syndrome; rotator cuff tendinopathy; lateral epicondylalgia; outcome measurement

9.4 Introduction

Following an UE injury, RTW is frequently used as an outcome to measure progress or as an indicator of functional ability. It is an often-used metric by third party or workers' compensation insurers to monitor the effectiveness of insurance schemes, clinical management and RTW interventions.(326, 327)

'Promoting early RTW' and consequently 'avoiding delayed RTW' are phrases commonly used by clinicians, researchers, insurers and policy-makers. These phrases originate from both experience and evidence that the longer an injured worker remains off work, the more unlikely it is that the worker will RTW.(11) Early RTW suggests treatment success and is purported to have benefits to all stakeholders involved: the worker returns to work, which has health, quality of life and financial benefits, the employer maintains productivity and the insurer has lower wage replacement and often lower treatment costs. Conversely, a delayed RTW denotes a poor outcome with adverse consequences. The evidence espouses that delayed RTW should be avoided and RTW should be the focus for recovery from injury.(277, 328-330) Similarly, studies of RTW prognosis often examine variables associated with delayed RTW.

Time-based cut-offs are typically used to demarcate a transition from an acute to a chronic (work) disability state.(331) Similarly, the developers of certain screening tools for determining risk factors for work disability advocate for the tools to be administered at specific time frames, usually in the sub-acute phase before a delayed RTW occurs.(9, 69,

249) A recent systematic review of workplace interventions operationalized the definition for a timely (or non-delayed) RTW as less than four weeks.(141) This suggests that RTW is delayed if a worker has not returned to work within a month for a musculoskeletal condition. These time-points are founded on evidence that up to 70% of workers return to their work within one month and approximately 90% return within three months.(332) Researchers have previously advocated that a differentiation between early and delayed RTW is needed,(141) yet there is still a paucity of research exploring this topic.

The purpose of this study was to define delayed RTW for workers who have had surgery for non-traumatic disorders of the UE, using a panel of experts who have published on the topic of RTW. This definition could be used in future research to determine time-points for outcome measurement in studies of prognosis and treatment effectiveness. The study was also designed to explore qualitatively how experts perceived the use of particular definitions and time-points.

9.5 Materials and Methods

Experts were surveyed on their views regarding delayed RTW via an electronic questionnaire. The experts consented to participate and ethical approval was obtained. Data were collected between May and August 2014.

Selection of Experts

International experts (n=102) with a track record of published research on work disability for workers with UE disorders, prognosis for delayed RTW or defining RTW were invited to participate. Experts were identified through a literature search of peer-reviewed papers or doctoral theses published in the last 20 years. Both first and senior/corresponding authors of these publications were contacted. Six additional experts who met these criteria were not selected as they were known to either have retired or were deceased. The compiled list provided a global representation of experts including both researchers and clinicians from various disciplines (epidemiology, hand surgery, occupational health, occupational therapy and physical therapy).

Questionnaire Development

A questionnaire was developed for the purpose of this study. Questions were agreed upon by all members of the research team. The questionnaire was pilot-tested using three HCPs who were experienced in managing injured workers (hand surgeon; occupational/hand therapist; occupational physician).

The first question investigated how the experts believed delayed RTW should be defined. Three definitions based on the literature were provided as potential answers(10, 30, 51, 52, 146, 220): a) a worker does not return to his/her pre-injury work within the expected time frame; b) a worker does not return to any type of work within the expected time frame; c) a worker recovers slower from his/her injury than expected. Experts could also formulate their own definition for delayed RTW if their view was not reflected in the provided definitions.

The second question inquired whether experts believed a universal time period could be defined to determine the transition to a delayed RTW for workers following surgery for a non-traumatic UE disorder, irrespective of the diagnosis (binary response: yes/no). If the experts responded affirmatively, they were asked to indicate at what time period they would consider RTW to be delayed. Response options were: after 2 weeks or more; after 4 weeks or more; after 6 weeks or more; after 8 weeks or more; after 10 weeks or more; after 12 weeks or more; after 16 weeks or more; after 6 months or more; after 12 months or more and after 24 months or more. The time periods were based on the literature.(30, 146, 220) The responses to this question were later collapsed into wider time intervals due to the heterogeneity in responses. Experts were encouraged to explain or motivate their answers qualitatively for both questions.

Data Collection and Analysis

Questionnaires were sent electronically to the experts (SurveyMonkey.com). Data were analysed descriptively. Open-ended comments were summarised thematically in an iterative process between the authors.

9.6 Results

Participants

Of the 102 experts invited to participate, 22 declined to participate and 38 did not respond despite reminders being sent at two, four and six weeks after the initial invitation. Forty-two experts completed the questionnaire. Demographic information of the experts is detailed in **Table 9.1**. The largest group of experts (33.3%) worked in academia, research and clinical practice. The experts who worked clinically had on average (mean (SD)) 17.2 (10.5) years of clinical experience. The mean (SD) research experience was 15.9 (7.5) years. The majority of experts were male (59.5%). Geographical representation included: North America: 19; Europe: 18; Australia: 3; Africa: 1; and Asia: 1. It is important to note that these countries have different compensation schemes for injured workers.

Definition for delayed RTW

With respect to the listed definitions, 19 experts (45.2%) defined delayed RTW as ‘not returning to pre-injury work within the expected timeframe’; 15 experts (35.7%) defined it as ‘not returning to *any* type of work within the expected time frame’; 5 experts (11.9%) defined it as ‘a worker recovering slower than expected’. The remaining three experts (7.1%) suggested additions or modifications to the provided definitions. One expert emphasised return to original *or similar* work. Another expert emphasised that the time-frame to *sustainable* work should be considered. Another expert emphasised that resumption of part-time or full-time work should be considered in the definition (taking into account pre-injury work hours).

Timeline to define delayed RTW

Two thirds of experts (66.7%), stated that they did not believe a specific time period to define delayed RTW should be used. For the remaining one third who did believe a set duration could be used, there was no consensus and the period before RTW could be considered delayed varied from 2 to 4 weeks to 6 months (**Table 2**).

Table 9.1: Demographic information of the experts

		N (%)
Sex	Male	25 (59.5)
	Female	17 (40.5)
Age	20-29 years	1 (2.4)
	30-39 years	5 (11.9)
	40-49 years	11 (26.2)
	50-59 years	19 (45)
	60 years or older	6 (14.3)
Country	Canada	11 (26.2)
	The Netherlands	8 (19)
	USA	8 (19)
	Australia	3 (7.1)
	United Kingdom	3 (7.1)
	France	3 (7.1)
	Denmark	1 (2.4)
	Finland	1 (2.4)
	Slovenia	1 (2.4)
	Sweden	1 (2.4)
	South Africa	1 (2.4)
	Israel	1 (2.4)
	China	1 (2.4)
Primary profession	Physical Therapist	10 (23.8)
	Orthopaedic Surgeon	7 (16.7)
	Academic or Professor in occupational health	5 (11.9)
	Occupational Physician	5 (11.9)
	Occupational Therapist	4 (9.5)
	Research Scientist	4 (9.5)
	Biostatistician	2 (4.8)
	Human Movement Scientist	2 (4.8)
	Plastic Surgeon	2 (4.8)
	Neurologist	1 (2.4)
Primary occupational roles	Research/Academia/Clinical	14 (33.3)
	Academia and research	11 (26.2)
	Research	10 (23.8)
	Clinical	2 (4.8)
	Academia (teaching)	2 (4.8)
	Clinical / Research	2 (4.8)

Key: Number (n) or percentage (%) of experts.

Table 9.2: Views regarding time periods to define delayed RTW

	n	%
No universal time period to define delayed RTW	28	67.0
Universal time period to define delayed RTW	14	33.0
2 to 4 weeks	2	4.8
6 to 10 weeks	3	7.0
After 12 weeks	5	11.9
After 16 weeks	3	7.1
After 6 months	1	2.4
After 12 months	0	0

Key: Number (n) or percentage (%) of experts.

Explanation and motivation regarding timeline to define delayed RTW

Twenty-four experts provided further explanatory comments. Three themes emerged from the data.

1) RTW and delayed RTW are multifactorial

The majority of experts commented that RTW is multifactorial. Experts stressed that these factors might influence RTW and need to be remediated before a delayed RTW is assigned. If these factors have not been remediated appropriately, it is difficult to establish a clear time point after which RTW can be considered delayed. Experts detailed factors that may contribute to a definition of a delayed RTW in the following domains:

i) *Biological, psychological and social factors related to the worker* (including his/her injury);

ii) *Biological, psychological and social factors related to management of the injury*, such as surgery, rehabilitation and involvement of HCPs. One expert also stated that surgery for non-traumatic conditions shifts RTW timelines due to iatrogenic effects of the surgery itself;

iii) *Physical demands, psychological and social factors related to the workplace.* Experts commented that the following contextual elements may have an impact on time to RTW: type of work, availability of job modification and suitable duties, employer’s decision regarding availability of duties and fear of re-injury whilst recovering at work, supervisor and co-worker support and being able to fit in rehabilitation after returning to work.

iv) *Factors related to the insurance setting.* Different countries may have different insurance frameworks. The fact that injured workers have access to compensation, income replacement and rehabilitation may play an important role in how RTW could be defined.

2) A definition of delayed RTW should be worker-centric

Experts stated that a definition for delayed RTW needs to be worker-centric and consider the individuality of each worker's situation. Experts indicated that a 'one size fits all' approach should be avoided and that RTW should be focused on the individual characteristics of the worker, the injury and recovery.

3) Misuse of time-based thresholds for defining delayed RTW

Experts stated that there is a risk of using time-based cut-offs when a worker transitions from an acceptable RTW timeframe to a delayed RTW. The implementation of time-based cut-offs pragmatically may not take into consideration the myriad of factors mentioned above. Experts cautioned against the use of time-base cut-offs and warned against their potential misuse for purposes that they were not intended for. For example, one expert warned that cut-offs used for research could be applied to classify 'malingerers' in a compensation setting.

9.7 Discussion

This study set out to establish a definition for delayed RTW and explore whether a time based cut-off to differentiate transition to a delayed RTW state could be determined using an expert panel. The experts' responses revealed differing views regarding what constitutes a delayed RTW outcome, and did not agree on the use of a specific time-based cut-off. These findings constitute an important starting point in opening a dialogue regarding definitions for RTW outcomes and their measurement in future research studies. These findings are discussed and recommendations made based on these findings with reference to the current literature.

Difficulty in defining 'work' in delayed RTW

Experts were mainly divided between delayed RTW being defined as a worker not returning to pre-injury (or similar) work within the expected timeframe (45.2%) and as not returning to any type of work (35.7%). Interestingly, 11.2% of experts preferred delayed RTW being defined as a worker recovering slower than expected', i.e., a definition without the type of work being specified. Difficulty in defining RTW is not a new dilemma.(10, 51, 52, 327) A systematic review on RTW following carpal tunnel surgery revealed not only a wide variety of RTW outcomes (e.g., time from injury to RTW (continuous variable), whether the worker had returned at a specific time point (dichotomous), number of sickness absences following the injury, as well as consideration of type of work on return), but also little explanation of what constituted RTW.(30)

Our survey highlights that more efforts are needed to further refine the type of work a worker returns to in defining delayed RTW. Our findings indicate that type of work (any or pre-injury (or similar) work), part-time or full-time capacity and sustainability of work all need to be considered; as well as how instances of voluntary exit from the workforce are reported. Previous research supports this recommendation.(10, 51, 52)

Difficulty in defining 'delayed' in delayed RTW

According to the majority of experts, specific time-based cut-offs to delineate transition to a delayed RTW should not be used. This is an important and potentially problematic finding, as early and delayed RTW both intuitively imply a timeline. However, even amongst experts who believe a universal time period can be defined, the duration of this period varied largely. The median duration for RTW to be considered delayed was three months, but similar numbers of experts suggested substantially shorter or longer periods. The experts, supported by the existing literature,(51, 141) highlighted the difficulties of using time-based cut-offs to define delayed RTW.

Many factors influence RTW. The literature indicates that factors influencing RTW are not only related to the worker or his/her condition and circumstances, but are also under control of other stakeholders, such as HCPs, employers and insurers.(60, 226) For example, surgeons are more likely to certify a worker off work for longer if a worker appears anxious or experiences pain at the six week review, whereas workers with fewer psychosocial problems were likely to be certified fit for work.(220) Moreover, fear-avoidance beliefs of clinicians also directly influence RTW.(333, 334)

Potential negative consequences of defining delayed' in delayed RTW

Several experts expressed concerns regarding using time-based cut-offs to define delayed RTW. Firstly, they could be used for unintended purpose by other stakeholders not understanding the specifics of the worker's condition and RTW. Therefore, application of strict time-based criteria may lead to workers being unfairly classified as having delayed RTW. Secondly, time-based criteria may also act as 'self-fulfilling prophecies'. If workers are advised that RTW is expected at, for example, four weeks, workers may be prompted to remain off work until this time point. There may also be added stress for the worker returning to work using a pre-determined timeline when recovery may be slower than expected, or psychological or workplace issues have not been remediated prior to the worker's return.

Recommendations for future research and clinical practice

In prognostic studies, the time-points used for data collection are an important consideration. However, our findings indicate that it is difficult to determine whether RTW at a certain cut-off would be considered a delayed RTW outcome. This creates uncertainty around such use of terms in the workers' compensation arena. Using dichotomous RTW outcomes is common in the literature; likely due to the straightforward data analysis it affords.(141) However this requires the researcher to assign a time-point for data collection; thereby implying that a person who has not returned by a specific time-point has had a delayed (or less favourable) RTW outcome. Based on our findings and supported by the literature,(141) we recommend using continuous RTW outcomes for UE conditions. These include cumulative time off work from injury and/or surgery, time until first RTW and time to a lasting RTW (a period of absence until previous or equal work has been resumed and maintained for a period of time established by the researchers). The outcome should also account for the type of work returned to as detailed above, whether it be return to existing or similar work duties in the same capacity, modified work duties (such as, lighter work or reduced hours (e.g., full time to part-time)), return to an alternate occupation or voluntary exit from the workforce (e.g., maternity leave or retirement by choice). If these recommendations were adhered to it would also allow for comparison of similar outcomes across study and meta-analysis of homogeneous studies.

The findings also suggest that clinicians should provide increased clarity before suggesting a worker has had a delay in their return back to work in their reporting to stakeholders, especially in a workers' compensation context. Instead, focus should be on the work context, setting, job situation, roles, hours and decisions behind any job or role change. Dialogue between stakeholders needs to address whether various risk factors have first been remediated. This avoids the negative consequences of using the term delayed RTW without further explanation of the multitude of factors that may be influencing RTW.

This study provides important findings and recommendations for future research and clinical practice. Further exploration using other methods, such as a working group, may be an important next step to establish guidelines for consistent definitions that can be used in research and also applied pragmatically. A limitation of this study is that only 40% of potential experts completed the questionnaire. However, this is common in electronic survey research and is considered acceptable.(335) A systematic review reported that electronic surveys have a high percentage of non-responses due to distribution errors (e.g., respondent no longer uses the email address), as well as respondent specific issues (e.g., time constraints) or lack of incentives.(336) The majority of respondents were from claim-based insurance systems (i.e., North America, Australia). Therefore, there may be response biased regarding the experiences of the experts having conducted research or working in jurisdictions with workers' compensation insurance. However, the study did yield a wide representation of experts across settings and from both clinical and academic fields.

Our study revealed that experts have rather different perspectives on what constitutes delayed RTW and on a specific time-point to determine transition for a delayed RTW. Multiple intrinsic and extrinsic factors complicate a uniform definition of delayed RTW. Defining delayed RTW should be individualised and worker-centric. In the absence of a standard approach to defining delayed RTW outcomes, researchers need to provide adequate detail in their description of work-related outcomes to allow for both research and clinical utility.

SECTION G: Injured workers’ return-to-work experiences – An exploration of the factors and processes influencing return-to-work

CHAPTER 10: “Walk a mile in my shoes”: Worker’s experiences of stakeholder interactions during the RTW process following a severe upper extremity injury

10.1 Chapter Introduction

Adversarial and anti-therapeutic effects of insurance systems and return-to-work (RTW) processes are experienced largely by workers with serious and prolonged claims.(7, 222) We interviewed workers with severe traumatic upper extremity (UE) injuries, as these workers would be more likely to have rich experiences suitable for qualitative methods. The aim of this qualitative paper was to explore workers’ encounters with stakeholders in the RTW process and the factors influencing work outcomes (**Aim 6**).

10.2 Publications

No publications have yet been submitted from this chapter.

10.3 Abstract

Purpose: The aim of this qualitative study was to explore workers’ experiences of dealing with stakeholders in the RTW process after a severe UE injury.

Methods: Semi-structured interviews were conducted with 34 Australian workers who were between six months and ten years following a severe UE trauma. All workers had either considered or attempted to RTW. An iterative approach was used to develop central themes, which were coded, by using NVivo. Thematic analysis was conducted on how workers viewed their process of RTW and recovery, in relation to their encounters with RTW stakeholders.

Results: From the standpoint of the worker, the priorities of stakeholders differed from the workers own needs. The interviews revealed interactions with insurers, employers and health care providers (HCPs) that were both positive and negative. These were often

embedded within the structural context of the workers' compensation system. This system influenced stakeholders to interact in a certain way during the RTW process. Workers reported experiences influenced by: stakeholders' responses to organizational mandates; the narrow scope of stakeholders roles in the RTW process; and stakeholders' responses to a system designed to 'fit' the average worker. Workers experiences were complicated by the severity of their injury and the often complex (and/or costly) RTW interventions needed to return the workers to meaningful occupation.

Conclusion: From the workers standpoint, RTW is a complex navigation of a decentralized system of multiple stakeholders. The RTW processes are often complicated by poor stakeholder communication, collaboration and cooperation that generally appeared to be oriented to the needs of insurers, employers and other actors, more so than the worker with the injury. This limits the workers' decision-making and control over the RTW process. RTW processes would be enhanced by insurers, employers and HCPs using a worker-focused approach to establish recovery and RTW priorities, and in making decisions. Understanding how workers experience and view their interactions with stakeholders, can lead to interventions for positive stakeholder interactions.

Ethical Approval: Behavioural and Social Sciences Ethical Review Committee, The University of Queensland (2014001393).

10.4 Introduction

Trauma to the UE accounts for nearly 40% of all work-related admissions to Australian Emergency Departments.(36) These injuries can include amputations, burns, electrocutions, severe lacerations, degloving, mutilating or crush injuries. They result in devastating physical damage with surgery often required to repair the damaged structures. The post-operative recovery may take months to years. Returning to work following such an injury is an important facet of functional recovery, self-identity and self-worth.(60, 119) However, a recent study found that 33% of workers with severe to major hand injuries remained off work at one year following their injury.(44)

Current strategies to facilitate early RTW include a complex and dynamic interaction of various processes (e.g., health care, insurance, government and legal) with many stakeholders involved. Stakeholders in the RTW process have been defined as ‘any person, organization or agency that stands to gain or lose based on the results of the RTW process’.(p.544, 60) Broadly, they have been classified to include: the injured worker, HCPs, employer representatives (e.g,. supervisors, co-workers and RTW coordinators), insurers or payers (e.g., case managers or insurance administrative staff) and society. Society encompasses the broader context including legal, economic, health care systems.(60) Stakeholder interactions in the RTW process are an important contributor to successful work and disability outcomes.(70, 226)

Evidence indicates that RTW practices, processes and the compensation setting can influence the success of RTW interventions,(337, 338) and therefore work-related outcomes.(70) Ideally, several stakeholders work together to: firstly, provide support to ensure the worker is ready to RTW; second, to facilitate a successful and safe RTW; and third, to enable the worker to remain at work beyond the first return. The evidence, however, suggests otherwise. Stakeholders often have their own motivations and goals based on their standpoint in the RTW process,(60, 222, 339) and because of this may not always work together collaboratively or with the injured worker’s needs as the upmost priority. An additional challenge to creating an ideal system is the professional background of the stakeholder, which may mean they adopt different frameworks to conceptualize the injury and RTW. Employers are financially motivated by productivity loss, insurance premium increases or wage replacement. Insurers are concerned about minimizing claim costs. HCPs are motivated to focus on their patient’s health and recovery. Whilst in compensation-based systems such as Australia, lawyers are focused on the client’s rights, and damages to compensate a worker for their loss. Furthermore, the way a stakeholder behaves and communicates may influence a workers self-efficacy to RTW, their decision-making process, and ultimately RTW outcomes in either negative or positive ways based on these interactions.(119, 340) Differing opinions regarding the cause of a worker’s injury, and suitability of interventions can strain the collegiality between stakeholders and potentially jeopardize work outcomes.(341) This supports an argument that these differences in priorities need to be understood because they have implications for worker cooperation with early RTW, as well as the appropriateness of RTW plans matching workers physical and psychological impairments throughout the recovery trajectory.

The body of quantitative research on work outcomes generally focus on days to RTW, productivity losses or gains, and cost to the insurer.(51) However, employment sustainability, job satisfaction, work-home balance, and psychological functioning have been found to be important work-related outcomes that are often not addressed through quantitative methods,(342) all of which may be influenced by the involvement of RTW stakeholders. Similarly, some barriers to RTW, such as system-related factors, and the subtle interaction of some variables may be difficult to study quantitatively. For example, qualitative studies have identified factors, such as coping with pain, uncertainty with respect to work ability and job modification, act as perceived barriers to RTW from a workers standpoint.(343)

Little is known about the experiences of workers with hand and UE injuries, which may pose particular functional and occupational challenges. The focus of this study was to inquire how workers view the pragmatic implementation of RTW processes by examining the positive and negative aspects of stakeholder interactions. We explored the interactions of stakeholders in the RTW process from the 'standpoint'(243) of the injured workers with severe hand and UE injuries.

10.5 Methods

This qualitative study is part of a larger mixed method study exploring the RTW experiences of workers following severe UE trauma. A phenomenological approach was used to help researchers understand the complexities of the lived experience from the perspective of those being studied.(344) This approach is suitable due to the scarcity of research and our limited understanding of the process of RTW for workers following severe UE trauma as a phenomena.

The Australian context

The experience of workers is set against Australia's health and insurance system which is comprised of the following key components: a universal health care scheme supplemented by private health insurance; sick leave entitlements under national labour laws; social security benefits including both temporary sickness allowances and longer-term disability pensions; mandatory state statutory no-fault compensation schemes work-related injury; a fault-based motor vehicle insurance scheme and the potential to claim for common law damages claims for pain, suffering and economic loss.

Workers' compensation is provided to eligible workers who are employed at the time of the injury for injuries considered to be work-related by both the medical practitioner and the insurer. Workers are entitled to income replacement during the recovery period, medical and rehabilitation coverage, RTW plans, death benefits, and lump sum compensation for permanent impairment. Workers' compensation is regulated within each State (or Territory) of Australia. Large employers can self-insure. Overall, there are small differences state-to-state, such as the level of coverage, duration of compensation, amount of compensation paid to workers, types of injuries that are considered work-related.

A worker entitled to compensation benefits is generally only remunerated at a percentage of their original wage.(326) This is thought to incentivize workers to RTW as soon as medically possible.(227) Workers have obligations once a claim is approved to participate and cooperate with their rehabilitation and RTW, including attending any examination deemed necessary by the insurer.(326)

Sample

The sample is detailed in **Table 10.1**. A purposive sampling approach was used to generate information-rich cases together with variability in geographic location (rural versus metropolitan; Australian state), occupation, gender, age, injury severity, time since the injury and phase in the RTW process[6] using the Readiness to RTW Scale(69) (**Table 10.2**). Participants were included if they: had experienced a severe UE trauma; were at least three months from the date of injury; had either returned to work, attempted a RTW or were attempting/planning to RTW; and were aged over 18 years of age. All participants had a Modified Hand Injury Severity Score over 51, validating that they had a 'severe' injury. Participants were excluded if they: had associated or pre-existing comorbidities or injuries that impaired cognition, communication or ability to ever RTW; or were not planning to RTW at the time of the injury e.g., planned retirement, or permanent disability

[6] Pre-contemplation: Workers are not yet thinking about initiating behaviours to support a RTW. Contemplation: Workers begin to consider returning to work in the future, however they are not making concrete plans to facilitate RTW. Prepared for action: Workers are actively seeking information regarding RTW, testing their functional capacity and making concrete plans. Action: Workers are putting a RTW plan into action and going back to work in some capacity. Maintenance: Workers use skills and supports to enable them to remain at work.

pension recipient. This information was collected directly from the participants using a questionnaire.

Workers were recruited through a variety of gatekeeper organizations including the Australian Hand Therapy Association, Australian Hand Surgery Society and the Shoulder and Elbow Surgery Association of Australia. Association members advised potential participants of the research study. Injured workers interested in participating, provided written consent for the researchers to initiate contact. None declined participation. Many workers expressed gratitude that they were eligible to participate.

Thirty-four workers (30 male; 4 female) and two female family members participated in the interviews. Severe UE traumas are more prevalent in males (91%) and between the ages of 20-44 years in Australia.(36) Our sample represented this. Work status and demographic information is contained in **Table 10.1**. The time between injury and the interview for the sample varied from four months to 11 years. The majority of participants were employed in trades, transport and machine operating occupations. Thirty-one workers were claiming workers' compensation, and three were self-employed receiving wage replacement through a private insurer. Only the data from the participants receiving workers' compensation are used to illustrate the quotes. However, the findings of those receiving private income indemnity insurance were considered to validate the differences with those in the workers' compensation system with respect to stakeholders' encounters. There were 26 in-person interviews; five telephone interviews and three Skype interviews (Range: 34 minutes-to-2.5 hours) conducted between November 2014 and February 2015. In person interviews were generally conducted in a private room in a clinic setting or in the participant's home.

Ethical Considerations

This study received ethical approval from The University of Queensland. All participants were assured of their confidentiality and anonymity in dissemination of the results. Informed consent was obtained from all participants.

Data Gathering and Management

Issues raised in the scientific literature generated the initial interview questions. An inductive process, where data collection and analysis occurred simultaneously, contributed to a developing interview schedule as new areas of interest emerged. The questions addressed roles of various stakeholders in the RTW process; challenges or barriers with respect to people, processes or personal factors; what facilitated RTW and coping with the injury; navigating the various systems (e.g., workers' compensation, other insurance systems, health care systems); impact on employment roles; psychological aspects related to the injury and/or navigating the system; and future vocational concerns. Questions were also asked addressing life roles outside of work (e.g., domestic and community). Using an iterative approach data collection continued until the composition of the sample, and data provided adequate context, depth and meaning to answer the questions. The first author conducted semi-structured one-on-one interviews.

Data analysis

Interviews were audio-recorded and transcribed using a strict verbatim process by a professional transcriptionist. All transcripts were cross-checked with the audio-files to ensure accuracy, and that no meaning was lost during the transcription process.(346) Initial themes were developed from the transcripts (**Table 10.3**). Themes were reviewed in relation to their coded extracts from the original transcripts.

Thematic analysis was performed as described by Braun and Clark.(346) First we identified key topics after each of the interviews was conducted. This was also used to determine when data saturation for each of the questions had been reached. One of the researchers (SP) immersed herself in the transcripts and became familiar through a process of listening to the taped audio-files, reading the field notes (to determine mood, context and tone of the recorded interviews) and (re-)reading the transcripts to identify initial thematic patterns in the data. In an iterative process, these concepts were discussed with the senior authors (VJ, EM), as well as coding notes prepared by the first author (SP), to define the codes used in the analysis. The coding was aided by Computer-Aided Qualitative Data Analysis Software (NVivo for Mac, Version 10.2.0). Themes were reviewed in relation to their coded meaning units and also the entire data set.

Table 10.1: Participant demographic information

No.	Sex	Location injury occurred	Occupation al category	Current work status*	Age range at Injury	Time Since Injury (months)
1	F	Rural	Healthcare	Changed occupation /Different Employer	20-29	138
2	M	Remote	Mining	Changed occupation/Same employer	30-39	60
3	M	Urban	Factory	Host Employer[7]	20-29	36
4	M	Urban	Labourer	Modified Duties/Same Employer	<20 years	12
5	M	Rural	Labourer	Not working	30-39	12
6	M	Urban	Education	Returned to pre-injury role /hours	60-69	29
7	M	Urban	Machine Operator	Returned to pre-injury role in modified capacity	20-29	26
8	M	Urban	Machine Operator	Changed Occupation/ Different Employer	30-39	34
9	M	Urban	Machine Operator	Same Occupation/ Same Employer	40-49	80
10	M	Urban	Labourer	Host Employer	30-39	6
11	F	Urban	Education	Returned to pre-injury role in modified capacity	50-59	23
12	M	Urban	Healthcare	Not working	30-39	29
13 + wife	M	Urban	Technical	Not working	50-59	24
14	M	Urban	Machine Operator	Changed Occupation/ Same Employer	<20 years	36
15	M	Urban	Mechanic	Not working	50-59	70

[7] Host employers are used in the Australian workers' compensation setting for workers who are unable to return to their pre-injury employer. Host employers are companies that engage in RTW rehabilitation programs to facilitate re-engagement in the workforce when the pre-injury employer cannot offer appropriate workplace accommodations or for workers in contract or labour-hire positions. *Workcover QLD. Recover at Work program: Queensland Government; 2015. Available from: https://www.worksafe.qld.gov.au/recoveratwork/home.*
These employers are not the workers pre-injury employers, but rather employers who offer these programs to facilitate a workers recovery. The programs on average last three to six weeks, but can be extended for longer for workers with more severe or complex injuries. The insurer continues to pay the worker's salary during this period, but host employers often receive incentives for participating in the host employment scheme. *Safe Work Australia. The cost of work-related injury and illness for Australian employers, workers and the community, 2012-2013 Canberra: Safe Work Australia; 2015. Available from: http://www.safeworkaustralia.gov.au/sites/SWA/about/Publications/Documents/940/cost-of-work-related-injury-and-disease-2012-13.docx.pdf.*

16	M	Urban	Technical trade	Returned to pre-injury role/ hours	50-59	18
17	F	Urban	Hospitality	Not working	50-59	32
18+ wife	M	Rural	Farmer	Same Occupation/ Different Employer	40-49	131
19	M	Urban	Truck Driver	Not working	60-69	37
20	M	Urban	Crewman	Not working	50-59	15
21	F	Regional	Machine Operator	Different occupation/ Different employer	30-39	15
22	M	Urban	Factory	Not working	20-29	21
23	M	Urban	Factory	Host Employer	20-29	13
24	M	Urban	Truck Driver	Alternative duties/ Same employer	40-49	7
25	M	Urban	Plant Operator	Alternative duties/ Same Employer	40-49	4
26	M	Urban	Technical Trade	Returned to pre-injury role in modified capacity	<20 years	8
27	M	Urban	Machine Operator	Returned to pre-injury role in modified capacity	60-69	4
28	M	Urban	Machine Operator	Not working	40-49	8
29	M	Urban	Machine Operator	Different role/ Same employer	30-39	10
30	M	Rural	Farming	Forced resignation/ retirement	60-69	37
31	M	Rural	Farming	Changed Occupation/ Different Employer	40-49	87
32	M	Rural	Farming	Not working	50-59	33
33	M	Urban	Mining	Not working	50-59	24
34+ wife	M	Rural	Factory	Returned to pre-injury role in modified capacity	30-39	7

* Work status at time of interview

Table 10.2: Readiness to RTW scores

No	Precont-emplation	Contemp-lation	Prepared for Action: Self-evaluative	Prepared for Action: Behavioural	Uncertain Maint-enance	Proactive Maint-enance
1					6	18
2					9	18
3	8	11	12	11		
4					12	17
5	3	3	11	10		
6					5	20
7					23	20
8					7	16
9					5	20
10					16	16
11					10	19
12	7	8	9	8		
13	4	12	13	10		
14					16	20
15					23	14
16					5	18
17	13	9	11	13		
18					5	20
19	15	3	8	7		
20	7	14	12	12		
21					13	18
22	6	11	16	12		
23	6	12	11	14		
24					9	18
25					11	16
26					17	15
27					12	16
28	5	6	12	12		
29					14	16
30	9	9	12	9		
31					5	20
32	14	8	6	7		
33	7	13	16	13		
34					5	20

Table 10.3: Coding algorithm

Code	Description of meaning units included in this code
The Stakeholder Team	• Stakeholders – who are they? • Perceived roles from the perspective of the worker. Are they perceived as being helpful or adversary? • Role of HCPs in RTW decisions • Who is performing the case management?
Stakeholder Team - Positive Aspects	• “Being on the same team” · WC first engagement with worker · Cohesive stakeholder team · Using language that can be understood · Recovery expectations of the HCP · Honesty · Does not include family and friends (see ‘Support’)
Support	· External resources / advocacy · Advocacy – someone advocating on workers behalf o Legal o Unions o Support groups o Internet · At work – physical support / kindness · Friendships · Emotional · Lack of support after claim closes • Spirituality / religion
Stakeholder Team – Native Aspects	· Knee jerk reactions · Fragmented siloed team · Incongruent expectations · Communication and collaboration (see ‘Communication and Collaboration’) · Denial of treatment · Decision making seen as negative
Communication / Collaboration	· How it happens? Why it happens? In which cases does it work well or not so well? · Timing · Methods /RTW Certification · Clear avenues of communication, goal setting and treatment progression · RTW discussion –who’s involved; was it a good / bad experience; readiness for RTW; who initiates contact with employer? · Honesty (or dishonesty) · Content & quality e.g., clarity, understanding of RTW processes and treatments
Returning to work	· Who initiates RTW sets the tone for the RTW experience? · Perceived motivations to RTW · Perceived stakeholder goals to RTW · Control over RTW process e.g., who has control? How do they exert control?
Legitimacy of injury	· Hero status – telling people what you have accomplished · Stigma · Legitimacy of injury and work-relatedness
Blame	· For the injury · Management of the injury e.g., treatment decisions · Self-blame

10.6 Results

This study focused on the experiences of workers receiving workers' compensation insurance and their interactions with stakeholders. Workers reported positive interactions that made the RTW process easier and less complicated, but also negative interactions, which, in some cases, complicated and impeded the RTW process. These encounters frame issues related to stakeholder interactions within the Australian workers' compensation system. It is important to note that workers did have several positive encounters with stakeholders. However, the stance of this paper was to identify those areas, which were most commonly reported and could be the focus of interventions. When considering the findings it is important to note that the stakeholders play certain roles and responsibilities, which are dictated by the Australian workers' compensation system.(254)

Workers' experience of stakeholders in the insurance agency

The responsibilities of the insurance authorities in Australia are administrative and procedural to facilitate RTW processes related to workers' compensation,(254) and in some insurance agencies, case management. The insurer reimburses the worker's salary, and has a gatekeeping role in approving (or declining) treatments including rehabilitation and RTW interventions. The insurers also ensure that stakeholders, such as employers and HCPs, follow the correct procedures within the state and national legislations. The interface between the worker and the insurance agency is generally through an insurer's case manager or claims advisor. This is an example of the documented responsibilities of the insurer in one jurisdiction, Queensland:

> *"An insurer must take the steps it considers practicable to secure the rehabilitation and* ***early*** *return to suitable duties of workers who have an entitlement to compensation. An insurer must refer a worker who has lodged a notice of claim to an accredited RTW program of the insurer, unless the insurer is satisfied that, as a result of the injury, the worker will not be able to participate in the program. An insurer must take the steps it considers practicable to coordinate the development and maintenance of a rehabilitation and RTW plan in consultation with the injured worker, the worker's employer and treating registered persons. An accredited RTW program, of an insurer, means a RTW program managed by the insurer that is accredited by the Workers' Compensation Regulator.(p.138)"(254)*

Workers remarked that the decisions made by the insurers were centred around the administration of their claim, such as, determining eligibility for a workers' compensation claim, calculating the amount of wage reimbursement, approving treatments and RTW interventions, and pursuing reports from HCPs to ascertain eligibility or readiness for RTW. This could result in workers feeling 'lost' and de-humanized in a system that mostly did not centre on their own needs or priorities. From the standpoint of the worker, the insurer appeared to be the gatekeeper to accessing salary reimbursement and rehabilitation (and in some cases domestic assistance). Hence, workers pointed out that interactions were often impersonal and business-like:

> *" I don't think they are too concerned about the injury. It's not about the injury for them. It's about payments and not wanting to pay me, which I guess that's what insurance companies do. It's not personal. It's just that I'm a number."* [21]

In many cases workers wanted the insurer to be empathetic to their situation and be prepared to spend time listening and acknowledging their concerns and to provide advice about appropriate avenues for assistance with any issues related to the claim or injury. One worker explained that he lived rurally, but due to his injury required a long-term stay in a metropolitan hospital. He described how problematic managing the mundane day-to-day household functions were when also dealing with his workers' compensation obligations:

> *"Not only that, they [the insurer] are not thinking about that side of it. You're worrying about what's got to be done back at home because everything's just been turned upside down…. And then they forget you have a family, have a home outside of the claim - ours was three hours away from. We had animals, other commitments. We had a long distance relationship for three months. You worry about this…" [18]*

The timing of contact after the injury was also highlighted as an important issue. Visits from case managers in hospital or in the first weeks after the injury often felt like an intrusion on the worker's privacy. These visits focused on providing the injured worker with information about their rights and obligations with respect to the claim and RTW processes. However, workers stated that they were seldom in the "right headspace" (e.g., due to psychological issues, medication-related disorientation or sedation) to understand or retain the information provided. Furthermore, dealing physically, psychologically and emotionally with the graveness of the injury was considered a very personal matter, usually reserved for family and close friends; rather than discussions with an insurer regarding obligations to participate in rehabilitation or RTW. This young worker described his experience of an insurer representative visiting him in hospital:

> *"At the beginning they were kind of pushy. It was a week into hospital and they're like, "we want to meet and discuss what's going on," and my mum's like, "no". I was*

still under drugs and dealing with stuff. I was just out to it, and [mum] was like, "you're not coming up. No, if you come up we're going to get security. We don't want you up here right now."[4]

The bureaucratic administrative processes and the often complex calculations for determining wage reimbursement, sometimes resulted in workers having delays in receiving wages, or incorrect wages being paid in which workers were instructed to pay back to the insurer. This worker described the impact of being on workers compensation and receiving only a percentage of his pre-injury salary, not being able to work overtime, or receive penalty rates that were commonplace in his industry:

"It's funny how it works. Even once I did go back on full time I couldn't do full duties doing overtime... And, I'm earning three to four hundred dollars less. Sometimes five, six hundred dollars less when I did really big hours [on overtime]. It's very difficult to keep up the same kind of lifestyle and everything is very difficult to keep paying."[7]

Workers experiencing severe UE injuries often needed to be off work or worked in a limited capacity for months and in some cases, years. They reported going 'backwards' financially with difficulty repaying loans and mortgages, paying school fees and providing basic needs for themselves and their families. This worker described how he started to look for other options to make ends meet:

"Well, like anyone has plan what you'll be doing in the next ten years and what your goals would be. And when that's taken away… You're just like, "No, I already had this planned. I was already going to be there [financially] and I was already heading in that direction." A roadblock is put in front of you. You can't go around - you can't go over - you've got to go through it. You've just got to start looking at other options."[12]

For some workers payments were delayed due to administrative errors, the insurer questioning compliance with the rehabilitation program, or wait-times to determine claim eligibility. Workers expressed attempts to discuss their financial concerns with insurance case managers, hoping that this may expedite the claims process. However, workers explained that this often caused more friction.

For some workers, RTW discussions were often initiated by the insurer, and less frequently by employer stakeholders or HCPs. For some workers, this seemed out of place, as they believed that themselves and/or their treating HCPs (e.g., surgeon, or hand therapist) were better placed to make decisions regarding work readiness. Although HCPs are generally mandated in most states to provide regular reports regarding work capabilities, the worker with little knowledge of these reports or any previous discussions, was unsure how the insurer was making these decisions. Thus, as the worker was often not included in these discussions, it appeared to them that the insurer was the key stakeholder focusing on returning them to work as early as possible. Workers also stated that when they first returned to work, this raised questions from the insurer about their ongoing rehabilitation needs (especially after receiving certification for full-duty capacity), prompting them to want to remain on lighter-duty. Some workers also perceived that this was the insurer pushing them one step closer toward claim closure, as discussions regarding claim finalization often occurred concurrently with a return to full work capacity. This worker described how he was pushed to return to full capacity before he felt ready physically or psychologically:

> *"The case manager just wanted me to do what they said, even if it's good or bad. Then they want to finish things quickly before the doctor says, "Oh he's done". Then they are pushing me harder and making things harder. There's some kind of work I can't do and they say that I just have to do it."[3]*

Limited choices also existed for those workers who did not want to return to their original workplace. Workers cited reasons such as not seeing a future in their previous role due to the extent of their injuries and resulting impairments, irreparable breakdowns in the working relationship between the worker and key persons in the workplace, or workers believing it was just better for their recovery, health or general wellbeing. This worker [21] who was working in a remote rural community described how she opted not to return to her pre-injury employer to be closer to her rehabilitation providers. However, her insurer wanted her to return to suitable duties on reduced hours with the previous employer. This meant she was unable to access therapy as often as the treating medical professionals recommended. Hence, the worker found an employer locally who was willing to provide suitable duties with reduced hours that matched her work capacity. When this worker informed the insurer, her payments for salary top-up (to her pre-injury salary) were discontinued. The worker reported frustration that the initiative she displayed, and her own rehabilitation needs and choices, were not considered or even able to be negotiated:

> *"Workers' comp cut my payments, because they said that because I didn't return to the light duties at my old employer, I had withdrawn myself from the RTW program. They are still paying my therapy and everything but just didn't pay the wage top up."[21]*

Another problem identified by the workers, were the modes of communication that seemed to delay claim entitlements and decision-making, and further complicated the RTW process. Standard communication methods initiated by insurance agencies were by email, text message, or formal letter. However, these types of communication were perceived as being impersonal. Workers felt that insurance case managers and claims advisors were more likely to screen requests for clinical treatments, domestic assistance (e.g., equipment to perform every day activities) and RTW interventions (e.g., job modifications), especially those that might require costly solutions. However, for the few workers who did have regular phone contact with their insurer, the lack of face-to-face contact was still identified as an issue:

> *" And you know, you can't put a face to whoever you're speaking to. They won't listen to you. They just tell you what's going to happen."[28]*

Many workers reported that even if they were assigned a permanent case manager, these often changed or were not available at the time of phoning. This resulted in the worker having to explain their case time and again to different case managers. This was particularly difficult for workers who had traumatic injuries or psychological manifestations. Another difficulty identified by workers was the use of medical or legal jargon used in formal communication, frequently above their literacy levels. Workers reported that they generally did not ask for further clarification as they assumed that this would be perceived as being "stupid" or even "not compliant". Difficulty understanding the workers' compensation processes often initiated workers to seek advice from other sources, such as the internet, work colleagues who have had claims, legal counsel or union representatives.

As the insurer frequently acts as the intermediary between stakeholders (i.e., HCP, workplace and worker), this was sometimes perceived to be a conflict of interest from the workers perspective. Although this relationship manifests from the insurers role in paying for services and wages and facilitating RTW, workers felt that this also enabled the insurer to 'hold all the cards'. An example of this occurred when insurers questioned medical treatment decisions. Insurance claims advisors would request seeking second opinions from doctors perceived, from the workers standpoint, to be 'working for the insurer'. The perceived power imbalance of the insurer being in the drivers seat for claim decision making, prompted workers to behave in a certain way when dealing with the insurer. For some, it was easier to just 'go with the flow' and let the insurer remain in the driver's seat:

> *"But, it was like, "Okay, there's a system here that's bigger than all of us and it's going to have to play out" and I've just got to go with the flow these people. Hopefully this system is here to help and if I play the game…It was just, "Righto, well, this is what you're faced with, this is what we want you to do." "Righto, I'll do it."[9]*

While others responded by expressing frustration and anger towards the insurance agency representative, for example, as documented by this worker:

> *"And each [case manager] gets progressively aggressive- more aggressive and they start telling you, "You're going to do this and you're going to do that". And of course all your conversations are recorded. And I used to fight with them every time I went on the phone. Because they used to lose things. I've spoken to other people that are on Work Cover, it's all the same. You know, government departments are yeah! It leaves a lot to be desired I think. They're not very compassionate put it that way."[19]*

Workers emphasized that they wanted to be provided with some power to contribute to decisions regarding readiness to RTW. Some workers reported decisions to RTW early before they felt physical or mentally ready. While other workers who were not able to return to their original employer, vocational options were often not discussed or were avoided by the insurance case managers and claims advisors. For these workers, their experiences were complicated by the severity of their injury and the often complex (and/or costly) RTW interventions needed to return the workers to meaningful occupation. Some workers described how they had to argue with their insurers for (seemingly costly) job accommodations to be put in place to enable a return to a modified position at the pre-injury workplace. This worker described how he wanted to RTW in some capacity but felt due to the severity of his injury, that RTW options at his pre-injury workplace were being avoided by the case manager at the insurance agency, (and to a lesser extent, his employer):

> *"It's made me realise that it's a great place to work and I think it's a good thing that if I can convince other people that your job is really important no matter what. We all have good days and bad days and shit happens but in the end, it's about getting back into the workforce for me in some capacity. I would like to get back to work and everything and there are things that I can do, but it's just a matter of when and what can be put in place for me because I am a little bit-- It's just more than me just coming back to work, isn't it? There's a lot more going on. So, I am looking to hold on and if I took my time... Do you know what would be really good? If they discussed with me what they think they can do for me, what jobs-- You know give me the options and maybe say, "Okay, we've got a couple of ideas" and discuss things with me one-on-one."[13]*

Workers also stated that retraining or career counselling were often not routinely offered. In some cases workers' stated their lawyers discouraged this as it might jeopardize damages amounts in their common law claims.

Workers described that they entered the insurance system believing that it was designed to, and would, support them. However, when insurers appeared to focus more on the administrative, procedural and financial aspects of managing a claim, workers described losing trust in the system, and questioning whether it was the good for the wellbeing and/or helping them recover:

> *"It's not that you need more support from the system, or that things could have been done differently, it's that you think they [the insurer] are doing the best thing, the right thing…You think they are trying to help you… You believe everyone is trying to help you. But you realise in the end they're not. It's not about how confident you are asking for things. It's that you assume that you are already getting everything that you are entitled to. You shouldn't have to ask."[18]*

Host Employment – An insurer initiated return-to-work program

For some workers who were assessed as having work capabilities but were unable to return to their pre-injury duties, alternative work with their employer, or if this was not possible, a host employer was commonly organised.

Some workers in this study were provided with a host employer when they were unable to return to their pre-injury employer due to lack of suitable duties at their pre-injury employer or anxiety problems related to returning to their pre-injury workplace. Their experiences with the host employer varied. They reported a number of factors that they perceived influenced the success of the host employment program, such as, the size of the host employer; whether a good co-worker relationship could be established; whether the work was something the worker saw as being meaningful; and whether the worker understood the role of the host employer. For some workers, interactions with the host employer were based around the hosts' obligations to the insurer. One worker also described how he was led to believe that the host employment would result in long-term employment with the host up until the end of the program, when the host explained that this was not the case.

Workers' experience of stakeholders in the workplace

Employers of injured workers have a responsibility to provide a safe working environment for their staff, prior to an injury and on their return.(254) Following a work-related injury in

Australia, they are also responsible for reporting the injury to the insurer, providing suitable duties and supporting early RTW. Employers can be financially incentivized to accommodate early RTW in various ways,(3) such as maintenance of insurance premium amounts.

In this study, the employment settings varied. Larger organizations were more likely to have specialized dedicated staff to facilitate RTW (e.g., RTW Coordinators[8] or Human Resource specialists). From the standpoint of the worker, supervisors were more likely to act as the middle-person, balancing the needs of the worker, insurer, co-workers with the often competing needs of the employer's management team (e.g., adhering to production deadlines and managing staff wage budgets). For smaller organizations, the owner of the company or a co-worker was frequently the point-of-contact for developing RTW plans.

From the perspectives of the workers, encounters with stakeholders in the workplace appeared to be grounded primarily in managing the needs of the workplace, with respect to staffing and productivity quotas; and managing costs associated with productivity loss or increased wages to pay additional staff until the injured worker is back to full capacity. However, employers also have a number of other obligations dictated by the insurer and legally, such as to provide duties (if possible) to match the work capacity nominated by HCPs.(254)

The first contact between the employer and the worker was critical in setting the tone for future interactions. With employer encounters, as with insurer encounters, workers did not feel in the right state-of-mind to be discussing RTW or their injury. Workers reported concerns that they might make statements that affected the eligibility of their claim. One worker detailed his first interaction with his employer who requested he give a statement explaining how the injury occurred, immediately after was discharged from hospital:

> *" I shouldn't have been made to feel, a week after a severe accident, being forced to give a statement [to my employer] while not really thinking clearly, with not being told anything about it. The fear of it… Receiving compensation shouldn't hinge on you*

[8] A Return-to-work Coordinator is required in many jurisdictions for workplace above a certain size to facilitate injured workers to remain at or RTW as soon as safely possible, and to assist the employer to meet their legislative RTW obligations. They are usually employed by the workplace, or contracted to the workplace. The responsibilities often include: facilitating the RTW process, liaising with RTW stakeholders to assist in making decisions to progress RTW, monitor the worker's progress, and help resolve issues or disputes. *Bohatko-Naismith J, James C, Guest M, Rivett DA. The Role of the Australian Workplace Return to Work Coordinator: Essential Qualities and Attributes. Journal of Occupational Rehabilitation. 2015;25(1):65-73.*

giving a statement [about your injury]…. The initial part can't be so confronting. You can't just come out and whack you with a sledgehammer straight out. They've got to ease you into it…"[8]

For other workers, experiences were perceived positively if the contact was centred on care for the injured workers wellbeing, and a sense that the worker would be involved in determining both readiness to RTW and possible work duties. This worker described that her workplace encouraged the co-workers to have regular contact. Although she described the recovery and RTW processes as an endless battle, she explained that when her employer did call her, the focus was not on when she was coming back to work, but centred on concern for her injury and general conversation about the day-to-day happenings in the workplace:

> *"I kept in contact with them all the time, to tell them where I'm at now and what battle I'm fighting at the moment. Every couple of weeks, on my way to the hand [clinic] I used to call into the [workplace] and just say a quick "Hello" to the [co-workers], and they used to come to the hospital once a week to visit me…. So, even though I wasn't physically at work I still had at least once a week contact with the staff - so that contact never went away."[11]*

Another worker also described being contacted by a senior work representative who offered support to the family and for assistance at home:

> *"The CEO phoned me when I was still in hospital to see personally if I was okay and being treated okay and if I had any issues to advise him straight away. That was a bit of a surprise. I didn't expect that they would go out of their way for someone down the food chain. But at the same time it felt good."[11]*

Workers reported that they were often present at discussions between the employer, a RTW HCP, and sometimes the case manager regarding suitable work duties to match their physical capacity. Workers reported that concurrent psychological injuries or the capacity to perform basic functions were rarely discussed. Due to the severity of the worker's UE injuries, limited hand function posed problems in every aspect from travelling to work, work itself and being able to perform activities of daily living at work, such as, toileting or preparing one's lunch. However workers reported that these issues were either not raised or the worker did not feel comfortable mentioning these concerns that may be relayed to co-workers and supervisors, due to their personal nature. This worker described his situation on developing a RTW plan:

> *"I had people come in and do a RTW plan; which they did twice, once when I first started and once before I just left. And I had to go through it all. And again that's a really emotional thing to be able to have to stand in there and talk about all that shit in front of everyone and what-not and what I can and can't do and all that sort of shit.*

> *So, it's stuff that you don't want to have to do in front of all those people that you have to work in front of all the time."[12]*

When job accommodation and suitable duties were discussed, workers reported that their opinions were often not sought. Workers reported that the HCP developing the RTW plan focused on physical capacity whilst the employer representative (such as, the supervisor or RTW coordinator) offered suggestions for suitable work duties. One worker described himself as the "invisible man in the room" when detailing his experience of developing a RTW plan:

> *"It was like well, "His capacity is this. What duties do you have for him to do?", and then they [workplace, insurer and RTW HCP] would work all that out and that would be signed off [by the treating medical doctor], "Righto you can go back to whatever [duties], for how many weeks, until the next step [in the RTW plan]". So, that's how it worked. And I wasn't really involved. I wasn't asked as such, "What do you think you can do?" It was like, well the employer has got these list of duties that I was capable of doing and it was like, "All right, you've got to go". Not that I wasn't willing. I was always willing to go back. It's just to what degree and capabilities, and capacity you have to [return to work with]. So, it was like "What's the program?" "Oh, yes so you can go back and do this, this and this" and I said, "Righto I'll do that".[9]*

In some cases, the only duties that were available were perceived as not being meaningful to the worker. This was further complicated for workers who were on casual or contract employment. One casual worker described how his employer gave him duties that were tedious and then continued to upgrade him beyond his work capacity. He was later released from his job because he was not able to perform his pre-injury job:

> *"I was off for four months and then I went back to work for two months and they just had me out counting light bulbs, and they just push, push, push. They were just trying to get me to work and I said, "I can't, you know". I still had to have more surgery. Those people, I've worked for them in the past. They were just grubs and I knew it from the start when they went "Yeah, yeah, we'll look after you, we'll do this, we'll do that" and I knew what was going to happen and it happened… They know it's a serious injury and they still treat you like rubbish. Because even the people I was working with at the start they treated me like shit. They couldn't wait to get rid of me and when they did. Boom, I didn't have a leg to stand on because I was only casual."[33]*

Workers also reported confronting situations when employers stated that they were not happy for the worker to return due to lack of suitable work, or due to the cost of paying a salary when the worker was not at full capacity. Workers also reported tensions when employers questioned their liability for an aggravation of any injury, or of the worker sustained another injury if they returned before being fully recovered. This often left the worker not feeling valued in the workplace, and questioning whether they would continue working for that employer.

Due to the nature of both workers' compensation and workplace's early RTW policies, injured workers are frequently back at work before they are fully recovered from their injury. Employers are often incentivised to support early RTW, as premiums increase the longer a worker stays off work. When early RTW occurs, injured workers are accommodated either by their pre-injury workplace in a modified capacity or even in an alternative role. For workers returning to work while they were still recovering from the injury, considerable effort and energy was often required to perform their early RTW programs. This resulted in workers having little energy or increased pain levels after they finished work. Workers described that the physical exhaustion also depleted their emotional and psychological resources. This could be further complicated by the side-effects of medications that workers were often taking to manage their pain or psychological sequelae. This worker described a situation in which he did not have the physical capabilities to return to his pre-injury role, even in a lighter capacity. Hence he was provided with office duties in a different section of the organization. He explained how this impacted on his rehabilitation and contributed to his concerns regarding how his early RTW may have affected his recovery:

> *"Then a fortnight after the injury I'm going back to work… Trying to deal with learning, how to work a computer, learning what they wanted me to do with the computer and so forth. It was very hard. It was very overwhelming. I didn't have time to think about anything or process anything. I have mixed feelings because it was very difficult for me. I felt that then, and I still kind of feel the same way now. They were too eager. They were too pushy. They didn't let me have time to myself to work it out, you know to process everything… I didn't have time to feel sorry for myself. I was forced to keep going and not stop … I was forced into being back at work... It did take a long time to process everything. But at the same time I was forced to keep on going and to try and make an effort of working, what they wanted me to do. Then to race off to physio after work and do what they wanted me to do. It was just full-on. I was very tired. I was very fatigued. It was extremely hard. Another person who's not as strong as me, they would have gone under... But I survived. I coped."[24]*

Workers often felt like they were being interrogated by being *"hauled over the coals"* with respect to legitimizing their claim, when many were already experiencing distress. Issues arose when employers questioned, or in some cases tried to prove that the injuries were not work-related, especially those which were not clear-cut. In some jurisdictions, claims can be made for travelling to and from work, and working in another location outside of the main workplace.(326) In these cases, employers could question whether the workers were travelling directly to- and from- work, or whether they made a detour to attend a private appointment during the trip.

Problems were also raised when employers questioned a worker's mental health state at the time of the injury. Injuries that occurred as a result of intoxication or self-harm are generally not covered by workers' compensation.(254) A few workers reported that because of the traumatic nature of the accidents, they were asked a series of questions suggesting the injury was a result of attempted self-harm. Workers reported feeling trapped because they often had psychological reparations as a result of the injury. One worker reported that their employer routinely questioned co-workers about the mental health state of injured workers to ascertain whether the injury could be associated with the workers' pre-injury mental health state:

> *"My maintenance supervisor, he was a real dick about everything. He secretly tried to undermine my case when it happened. They pulled another guy that I work with into the office and they had their private detective-- They got him in there as well and they were asking if I was stressed that day, like stressed from outside sources the day that I hurt myself. The fact that they would do that kind of thing-- Seeing that happen. It made me wonder what they're going do to me. You feel, "Are they really trying to help you or are they just trying to save their own arse?"[7]*

Workers' reported that this created ongoing stigma in the workplace, which over time *'wore them down'*, causing more psychological issues.

Once the workers had returned to work, some reported instances of constantly being scrutinised with respect to their work effort or levels of symptom reporting. Workers stated that if they were back at work supervisors and co-workers appeared to consider them as relatively symptom free, which was usually not the case. These notions were fostered by supervisors and co-workers often not knowing the full extent of the workers limitations due to privacy policies and legislation. Invisible symptoms, such as pain and anxiety, were often experienced long after the injury. Workers stated that they often experienced side effects from their pain medications, such as fatigue and "brain fogginess". This frequently affected their work performance, ability to perform certain work duties (e.g., driving a forklift or high level cognitive tasks) and drive to and from work.

Workers were often pleasantly surprised at the unexpected roles some stakeholders, such as co-workers, played in their RTW. For example, some co-workers provided support not only within the workplace on RTW, but also in the early recovery period through acts of goodwill. One worker detailed his experience:

> *"My workmates, even though I never saw them, they came down to the house... They took up a collection at work... And [at the workplace], like some guy, a random person who I'd never met, decided to have a [charity event] for me. And I was allowed home on the weekend and I decided that rather than go home I'd just go straight to the [charity event]… It was pretty amazing… I was pretty overwhelmed by that. They had a little bit to say at the end. They made a speech. And they raised a couple of thousand dollars just from that… Yeah, I couldn't believe the amount of money they raised...."[13]*

Another common way that co-workers provided support was by helping out with physical aspects of their job, or by the gesture of simply offering a helping hand or an open-ear. However, workers reported that co-workers rarely were involved in RTW discussions, yet were still instrumental in accommodating job modifications, such as lighter duties, frequent rest breaks and shorter shifts. Whilst positive interactions did exist, these were mainly dependant on the directives of the employer (with respect to cost and productivity), the amount of extra workload placed on the co-worker, or whether the pre-injury working relationship was collegial. In cases, where any barriers to achieving the employer's mandates occurred (e.g., slowed production, increased workloads, or pre-injury workplace conflict with co-workers), co-workers and workers were put under pressure. For example, one worker described how his co-workers were concerned regarding both productivity being slowed and health and safety risks on their return:

> *"They would say, "What's he going to do with one hand? You know it's a two handed job… We don't know if it's really a good idea. I don't think he should be here or doing anything like that."*[2]

Workers stated that they were unlikely to ask for help under the perception that this would cause further workplace tensions.

> *"Well, when you're walking into an office room with 15, 20 employees, and I knew a couple of them [co-workers] from doing [my previous job], so I knew them on a professional level… But when you're going in only two to three days a week you're going to get people that are looking at it as in, you know, "You're pushing the limits of your WorkCover. You're only doing this to get back into work". So, I've got to fight my own demons with that. Walking in plus them doing it, and then it becomes a really stressful environment and if people are saying those sorts of things, it really does affect you... I thought I was really tough and nothing bothered me before the accident, but now I've got to really cut myself off because I get really emotional about it. It's just hard when you try to do everything you can and it's still not enough in other people's eyes."[12]*

Supervisors and RTW Coordinators were frequently identified as acting as having a liaison role in the workplace. Workers frequently commented on the often-difficult role that supervisors had in *"trying to keep everyone happy"*. In most cases, workers reported that they appreciated the extent to which supervisors facilitated RTW and responded to various stakeholders needs, even though this may not appear to be a key part of the supervisors work role. One worker described his supervisor:

> *"He [my supervisor] just let me be and whatever I got done, I got done. It was kind of up to me what I did or didn't do. The only thing was for you know the people higher up than him, I had to be at work. So he had to come and pick me up and take me home at the end of the day, that type of thing. What I did in the middle he wasn't really too fussed about - as long as everyone else was happy."[24]*

Many Australian jurisdictions require employers of a certain size to employ a workplace-based RTW coordinator.(254) The role of the RTW coordinator involves identifying suitable duties, developing and assisting with the implementation of RTW plans (thereby having a responsibility of managing the RTW process), resolving issues and monitoring the injured worker's progress. In most jurisdictions, some level of prior RTW coordinator training is required to qualify for the position. Workers pointed out that their role was made more difficult by having, what workers described as, a mediating role to keep management, co-workers, and the worker happy, as well as having a responsibility to respond to the requirements of the insurer and HCPs recommendations regarding work capacity and rehabilitation requirements. Similar to that of the supervisor, workers reported that RTW coordinators needed to juggle the employer's needs with their own concerns, as well as the HCPs requests for work accommodation. However, the difference between the encounters was related to the RTW coordinator's role in the RTW process. Workers explained that the RTW coordinator focused on early RTW, and that there was a clear progression of the work duties over time, as this was their role and responsibility to the employer and insurer. This differed to the workers encounters with their supervisors who tended to moderate stakeholders needs outside of their role, but did not pushing worker's to progress their duties, if this was not in the workers interests or compromised co-worker relationships. One worker illustrated the conflicting issues that the RTW coordinator dealt with due to his obligation to the employer:

> "*It took a long time for him [the RTW Coordinator] and I to see eye to eye just purely and simply because I didn't trust him. This is the first time I've ever worked for such a big company and I didn't really know what was going on. I got pushed by him [the RTW coordinator] into going back to work when I would have probably rather have been left to stay at home for a little while longer… I didn't trust him and I kept him as far away as I could at arm's length. But I feel sorry for him because he has to deal*

with all these people getting hurt and then they're angry because they got hurt, and they're angry at the company. You know he has to deal with an awful lot... And then he has to deal with what the bosses want too."[24]

Workers' experience of Health Care Providers

A number of HCPs were involved in managing the injuries and/or providing RTW services for the workers with severe UE injuries. Many workers were reviewed regularly by their treating surgeon, as well as their general practitioner. They all received rehabilitation for the UE injury with an occupational therapist, physiotherapist or hand therapist, or a combination of these. Many were receiving psychological counselling. If RTW services were provided, they were often conducted by either their treating therapist or more commonly an external provider selected by the insurer (who was not previously known to the injured worker). For many workers, a number of other HCPs were involved to manage piecemeal parts of their rehabilitation, e.g., pain management specialists, exercise physiologists to organize gym programs.

Regardless of the role the HCP has in the RTW process, the insurer usually pays directly for the services they provide.(254) Treatments frequently require pre-approval and are determined by a fee schedule.(348, 349) Medical practitioners provide primary medical treatment for the injury, but are also responsible for certifying a worker's RTW capacity, referral to other health services and monitoring the effectiveness of treatments provided and facilitating RTW (including liaison with the employer, other HCPs and the insurer).(349)

In this study, HCPs providing clinical interventions were viewed as treatment providers focusing on physical and psychological recovery, rather than having an obvious role in facilitating RTW. Workers' reported feeling supported and empowered by their treating doctors and therapists in promoting their own physical and psychological recovery; however, these HCPs, especially the treating doctors, infrequently discussed returning to work as a routine part of their appointments. In some cases, although the doctor was signing the medical certificates indicating work capacity, workers described situations in which the treating therapists decided on work capacity and/or suitable duties:

"I do hate it a bit how [the surgeon] just kind of wings it. I can't really plan ahead which is what you need on a big injury… You need to be able to set your goals and always be moving forward not stepping back and that's where he made it a bit hard… He didn't play a role in my RTW… He just did the surgery and made sure it was

coming along all right and just checked in every so often. When it came to going back to work and everything it was [my hand therapists] and the workplace RTW [coordinator]."[8]

In many instances, workers described their treating doctors sidestepping RTW concerns and discussions of barriers to RTW. Hence, the workers assumed that this was either not a key part of the doctor's role or that their injury was too severe to warrant discussing RTW options. Workers also described some treating therapists that either did not discuss, or promote early RTW. Workers reflected that this may have been the case as it was not part of their role, and due to the extent of their injuries therapists were more focused on increasing independence in other areas. Even though the severity of their injuries may have been a key factor to explain the lack of discussion regarding RTW, workers reflected that they did want to have these discussions – to set goals early in the recovery trajectory regarding further vocational options.

"It was me that raised the question [to my doctor], "When can I go back to work?" I pushed for that to happen. My [insurer and employer] opened up a little bit of a window to give me a work trial but I felt like I had to prove to them that I was ready. I don't know if you should have to prove that you're ready or not. I felt like I had to. But it was frustrating and they're saying, "We don't want you to come as far as you've got and go backwards." And I said, "Well, how am I ever going to know if you don't all let me jump?"[1]

When dealing with the HCPs providing their clinical care, mutual goal setting was perceived by the workers to be important in facilitating their recovery. This worker explained the therapeutic relationship between her and her hand therapist:

"We've developed a pretty good relationship over time where she does her professional input and I do my patient input by saying, "I think maybe this might help with my hand." And she'll either straight out say, "No, that's not going to work" or "Yeah, that's a good idea. Let's try that." So, we do a lot of work in cooperation."[11]

Similarly, the same worker described the in-person collaboration between treating HCPs as assisting the RTW process and facilitating open lines of communication to promote recovery:

"So each time with the surgeon… [My hand therapist] she always came to the appointment with me so she can give [the surgeon] a medical background on where I'm at and then he will give her guidance on what he wants to proceed and how long before another surgery and what outcome we might get. So he talks to me, but he is also talking to [the hand therapist]... So there was a three-way communication happening… We're all on the same page at the same time."[11]

Workers also highlighted the importance of medical information being provided to them in a format that they could understand:

> *"They explained things in… Like they sort of gave the terms, medical terms, and then they broke it down into everyday English… It helped me to understand the situation quicker and easier."[24]*

Workers noted that HCPs who provided reinforcement or explanation of a workers progress and voicing their recovery and RTW expectations helped them to develop their own recovery and RTW expectations. This was considered especially important due to the often incremental gains that were seen over long time-frames. This worker stated:

> *"So doing all the [range of movement] measurements and stuff and knowing that there was improvements even though I couldn't feel it or see it… That really helped."[2]*

Workers also expressed the importance of HCPs humanizing them when providing clinical treatments:

> *"They treated me like I didn't have an injury… There was no bullshit about them. They just did what they did and they treated me like you would treat anyone that you knew… The closeness of it. They treated me like family. And I did appreciate that."[19]*

The HCPs providing RTW services in Australia frequently have to work and liaise across levels of organizational systems (e.g., worker, employer and insurer levels), which may have different vested interests, to manage the workers needs and reach mutually acceptable outcomes.(325) Interestingly, workers often perceived that the HCPs providing RTW interventions were working for the insurer, and as a result often distrusted them and felt that they were providing biased recommendations towards the insurers preference for an early RTW, and the employers preference for cost-containment. Workers explained this perception was also founded on the insurer (and occasionally the employer) acting as 'gatekeepers' by organizing, approving and paying for the RTW interventions. They also directed the workers' attendance at any meetings, such as worksite assessments or functional capacity evaluations. Workers often felt that they had no other option but to attend the meetings.[9] Workers also reported that the information regarding their injury and resultant impairments provided by the insurer to these HCPs developing the RTW plans

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[9] In most states and territories in Australia, legislation exists through the various state-based Workplace Health and Safety and Rehabilitation Acts, which workers are obligated to participate and cooperate in RTW and injury management plans, while they receive workers' compensation. (Table 5.3, p.132-135).
254. *Safe Work Australia. Comparison of workers' compensation arrangements in Australia and New Zealand, 2013-2014. Canberra, Australia: Safe Work Australia, 2015.*

often seemed insufficient. Workers described instances in which the HCPs developing the RTW plans were unaware of the extent of their injuries, open wounds that need to be kept protected, their daily rehabilitation schedule, orthosis use or in some cases, physical impairments e.g., grip or hand dexterity. This resulted in the workers feeling less confident that the HCPs developing the RTW plan would identify duties that were safe or practical. Workers felt that these HCPs appeared to be more concerned with meeting the employers or insurers needs and tended not to include the worker in discussions. In some cases, workers reported that these HCPs would perform a functional capacity evaluation. However, workers stated that they felt they could have advised the HCPs of their own capacity without performing, as one worker described it, a *"lifting test"*.

From the standpoint of the workers, stakeholders, in general, appeared to be working towards a common goal to facilitate recovery and (in some cases) RTW. However, workers described situations in which stakeholders' approaches to meet their own responsibilities and obligations within the overarching legislation and systems resulted in them working in a siloed approach. Workers reported situations in which they were 'stuck in the middle' with no power or knowledge on how to facilitate the stakeholders involved in their own RTW to work collaboratively. They described stakeholders either not communicating their own needs and priorities to others at all or not acknowledging other stakeholders' needs and priorities. Problem solving towards a mutually beneficial solution either did not occur, or resulted in conflict and increased tension in which the workers reported stakeholders arguing around them, in a struggle of power. One worker described a dispute that occurred between the occupational therapist and supervisor at work regarding a recommendation for modified equipment to accommodate an early RTW:

> *"And [the occupational therapist] did the ergonomics for the chair and a desk and what-not, and that's when there was like the butting of heads between her and the boss basically because she's like, "You know you need this and this and this" and he's like, "Well, I don't have it. We can't get him to do that. The only thing we can get him to do is to sit down and do the computer work," "There's nothing in between". So, it's the butting heads between those guys. Again it makes it really uncomfortable for me when I walk back in the next day and she's not there and the rest of them are still there, so I've got to deal with it, no-one else"[12]*

Another worker described the views of his psychologist pitted against the Occupational Therapist who was involved in developing the RTW plan:

> *"And he [the psychologist] said to me, "Well, of course you've got an issue... You shouldn't have been doing what you're doing." He said, "These people [the Occupational Therapist] that sent you back to work and gave you a program." He*

> *said, "Look at you, you're a supervisor going back and sweeping floors." He said, "You shouldn't have done that."[15]*

This resulted in injured workers questioning whether the RTW recommendations were the best for them at their point in their recovery; and for some, even questioning whether they should RTW at all.

10.7 Discussion

An evolving problem

This study found that for many workers, returning to work was a complex system of stakeholders and processes. Complexities arose due to the systems in place and the stakeholder's priorities and self-interests. This study reaffirms previous research findings regarding workers' RTW experiences when dealing with stakeholders from differing organizational standpoints.(222, 339) In our study, experiences were dependent on how the insurers, employers and HCPs responded to their organizational and professional mandates in their encounters with the injured workers. Workers described how there was an absence of understanding from the stakeholders they dealt with, that each worker's recovery was unique. The lack of stakeholder communication and collaboration and inclusion of the injured worker in decision-making, meant that the workers felt that the stakeholders were out of sync, or were not listening to the injured workers concerns or needs. As has been found previously, if certain 'toxic' conditions exist, (222) an environment is created that motivates stakeholders, including the injured workers, to react and behave in a certain way. Previous studies have found that RTW problems perpetuated when there are: conflicting mandates;(5, 222, 339) poor communication and collaboration between stakeholders involved in the RTW process;(70, 350) limited choice and decision-making capacity by the injured worker;(340) issues with legitimization of the injury; and, stigma.(150, 222, 350) Although these issues are not new, this Australian study found they are still prevalent for workers with serious UE injuries and acted as barriers in the RTW process. These issues fundamentally cause unnecessary stressors, which have been associated with poorer health outcomes and prolonged work disability.(5, 351)

Worker's narratives revealed how stakeholders' actions appeared to be in response to a system designed to 'fit' the average worker. Promoting early RTW is a mandate for all stakeholders in Australia.(254) The treating doctor has a responsibility to certify work fitness, and other HCPs, such as hand therapists and physiotherapists, are required to make determinations of work capacity to allow early RTW as soon as soon as possible.(352) If a worker has capacity to work, the worker has an obligation (in cooperation with their employer or the insurer) to make reasonable efforts to RTW. Employers have an obligation to provide safe and suitable duties[1] to accommodate early RTW policies. However, early RTW policies are designed for the average worker. In some cases, principles such as early RTW and attempting to return them to their pre-injury employment, appeared impossible to the workers. Due to the severity of the workers' UE injuries, returning to work before being fully recovered was often complicated by managing symptoms and fatigue, psychological sequelae, juggling rehabilitation needs, as well as the often-lengthened time and difficulty to complete tasks. Some of these workers questioned the motivations of the employer and insurer for advocating early RTW, which was sometimes opposed by a member of the HCP treatment team.

Workers also reported that stakeholders generally did not acknowledge that the injury affects the whole person – physically, emotionally, and psychologically. Workers detailed situations in which they felt that insurers, employers or HCPs focused on either RTW or recovery and evaded discussing personal problems. For these workers, this felt like the stakeholders were dismissing the importance of any personal issues. Stakeholders' self-interests were perceived as taking precedence over the workers' diverse needs and concerns. Similar findings have been found in a study of workers with chronic pain, which revealed that when pain was not recognized or adequately acknowledged by others, there were significant psychosocial consequences which accumulated causing distress, loneliness, lost identity and poor quality of life.(353)

Workers also stressed the dynamic nature of RTW and recovery throughout the recovery trajectory. They felt stakeholders often perceived RTW as being a static process, that is, that recovery and therefore RTW should occur in a linear fashion – the worker gets better, capacity to work improves, and hence work duties also steadily progress. However, for workers in this study, psychological state, pain and physical recovery were phasic and often cyclical. Moreover, this was complicated by injuries that required multiple surgeries over months, and, in some cases, years.

From the standpoint of the worker, the priorities of stakeholders frequently differed from that of the workers. Overall from the workers standpoint, RTW and workers' compensation processes appeared to be focused on the mandates and self-interests of other stakeholders. Insurers and employers were motivated to focus on RTW; whereas, the HCPs were inclined to concentrate on promoting physical recovery, which is not always congruent with early RTW policy.

In Australia if the claim is compensable and being funded by an insurer, HCPs are required to communicate with other stakeholders in the RTW process and to meet mandatory reporting requirements to the insurer.(7) Many HCPs see themselves as their patient's advocate and, hence, may avoid promoting early RTW if they perceive it may interfere with recovery.(100, 286) Previous research conducted in Australia has also identified that medical practitioners have the predicament of having conflicting 'dual' roles of both: i) gatekeeper to accessing workers' compensation insurance and facilitating RTW, and; ii) treatment provider.(354-356) Studies have also suggested HCPs have difficulty managing psychosocial issues related to RTW due to time constraints, high workloads, lack of financial remuneration and difficulty understanding their role in the system.(66, 251) This may explain some of the encounters with HCPs observed in this study, and how the characteristics of the system influence HCPs' decision-making and communication regarding recovery and RTW.

From the standpoint of the workers, it also appeared that workers' compensation system was geared towards supporting both the insurer and employer, with the worker's role being to 'toe the line' by following the policies, procedures and unwritten rules of each organization.(7) Because of the role the employer and insurance stakeholders play in the RTW process, workers often perceived that stakeholders had a lack of empathy towards their individual personal issues and unexpected delays in their recovery (such as pain exacerbations or surgery), because they were focused on other aspects of their mandated role. Often incongruences in self-interests existed. This had the potential to create tension between the worker and other RTW stakeholders, especially when their competing interests forced them to focus elsewhere - on priorities not considered important to the worker at that point in time. In our study, worker's reported that these issues were amplified in times of heightened stress, such as in the acute phase following the injury or subsequent surgery or at significant time-points in the RTW trajectory, (i.e., when key

RTW decisions were being made). Roberts-Yates has previously highlighted the issue of ‘social power networks’ in the Australian workers’ compensation system.(361) The legislative requirements and the stakeholders’ compliance towards these, result in a system that orients processes towards compensation or monetary reward, which further shapes expectations, behaviours and ‘social cooperation’. In addition, stakeholders in the system also have their own professional cultures, social status, and vested interests, which may also influence the ‘social power’ balance.(361)

One of the possible reasons for a power imbalance in our study may possibly be due to the direction of remuneration in the Australian workers’ compensation system (i.e., who is paying who), which has flow on effects. Workers perceived the direction of power flowing towards the stakeholder who holds the purse strings. That is, the insurers who are the payers in the Australian workers’ compensation system. They pay the worker’s salary whilst on compensation. They also pay the HCPs for provision of services and, therefore, are also the gatekeepers to accessing treatment. An Australian study also identified the issue of RTW providers being remunerated directly by insurers and nominating the ‘provider’ who will provide the RTW services.(325) Similarly, workers felt that HCPs providing RTW services did not make impartial RTW recommendations and were biased towards meeting the insurers and employers needs to return the injured worker back to work, regardless of whether this was seen as being the best option from the perspective of the injured worker.(325) Furthermore, insurers also can incentivize employers to support early RTW indirectly through premium increases.(7) While, employers to a lesser extent hold some power due to their control over maintaining the workers’ future employment security.(7, 362) Many workers in our study reported concerns regarding future job loss if they were unable to perform as per their pre-injury capacity on cessation of their claim, or if they chose to change occupations and/or employers.

In Australia, the treating medical doctor is the gatekeeper both into the workers’ compensation system, but also for certifying a worker fitness to RTW. However, our study found that workers perceived the insurer to be primarily in the driver’s seat and having the final say regarding RTW. Worker’s reported that the dialogue surrounding RTW decisions, such as, identifying readiness to RTW, work capacity and the RTW plan frequently centred on the needs of both the insurer and employer. Furthermore, when returning to the pre-injury occupation was not realistic, workers reported encounters in which the insurers and

HCPs focused on achieving maximum functional recovery and shirked discussions regarding future vocations. This was highlighted particularly in state jurisdictions, such as Queensland, which have short-tail schemes.[10] For workers who are not able to RTW due to a permanent disability above a certain level, a payout based on their impairments may be offered when the worker is deemed stable and stationary by their treating doctor. Due to the severe nature of the workers UE injuries and the extent of their impairments and physical disability, workers felt that they were placed in the "too hard basket", and discussions regarding future vocation were avoided. Some of these workers reported that they felt that stakeholders (by default of avoiding the discussion) judged their injuries as being too serious, or unsuitable, for rehabilitation, especially if the interventions were costly. However, workers pointed out that they believed they could still contribute to the workforce in some capacity, but felt helpless and alienated by not knowing what to do or who they could turn to for advice. A previous study of Canadian workers and service providers found that limited choice and ability to make decisions that affected worker's health and vocational prospects are influenced by systems rules and cost-containment.(340) Baril et al found that workers were more willing to participate when their opinions and experiences were sought and were valued by their employers.(235) Thus, it is logical that how a worker is treated influences their cooperation with their RTW plans and might break down barriers to recovery and RTW. Workers are a valuable member of the RTW team, yet it seems we are forgetting the valuable contribution they can make. Workers lack a voice in these workers' compensation systems – without a voice we do not know which workers 'want to get back on the horse quickly' or other that need time to assimilate the impact of their injury.

The workers' narratives identified that RTW stakeholders tended to operate in a decentralised, siloed approach when facilitating the worker's recovery and/or RTW. Similarly, in a previous study conducted in Sweden suggests that stakeholders don't tend to cross boundaries with respect to their roles, responsibilities and self-interests, which means they are not obligated to consider other stakeholders interests.(339) This also appeared to be the case in an Australian setting. For example, a case manager's primary aim is to return an injured worker ultimately back to their pre-injury job with the same

[10] Short-tail schemes place an arbitrary cap on compensation payments that can be made, whereas long-tail schemes can provide for ongoing payment to injured workers until they are able to RTW or in some cases, until retirement age. *Purse K. Workers' compensation and the impact of institutional barriers on RTW outcomes. Australian and New Zealand Journal of Health, Safety and Environment 2013; 29(4): 1-10.*

employer if possible with the lowest cost to the claim;(101) an employer-based RTW coordinator's primary role is to facilitate a safe transition back to work following an injury with the goals and financial motivations of the employer being considered;(357) and a supervisor is concerned about managing productivity, budgets of his department, and the safety and wellbeing of all staff.(242, 358-360). To move away from a siloed approach is dependent on the stakeholders' acknowledging and potentially working towards priorities outside of their own self-interests, which, as workers in our study stated, mostly did not occur. Because of this, no-one appeared to take the responsibility to steer or co-ordinate the decision making process with respect to treatment choices or RTW in a collaborative manner. Although the workers identified that stakeholders presented options and recommendations, the worker (whose life, well-being and health is being directly affected) should, but does not, make the final decisions. This can have anti-therapeutic effects,(5, 222) resulting in barriers that undermine the RTW process.(7) Dismantling these barriers are an essential path forward, that require changes on individual (worker), organization and systems levels.(7, 222, 361)

Certain research suggests that stakeholders are cognizant of the divergent perspectives of other stakeholders and are able to problem solve solutions to facilitate multidisciplinary collaboration.(363) Yet, pragmatically this often still does not occur.(235, 341, 361) Studies have revealed that this is because collaboration can be compromised in situations of social power imbalance, organizational rigidity and fixed expectations, and lacking communication processes.(361) Collaboration is a dynamic process that consists of mutual decision making by key stakeholders, in which, solutions emerge by dealing constructively with differences; there is joint ownership of decisions; and the stakeholders assume collective responsibility for the outcome.(364) Positive experiences of collaboration between stakeholders support the injured worker along the RTW process,(365, 366) which promote trust and respect and vice versa.(60, 235) Including all stakeholders, in addition to the worker, in the RTW process may seem an obvious way of facilitating collaboration. However, for many workers included in this study, this was not their experience. Similar findings have also been found in a Canadian study that examined a bipartite stakeholder policy aimed to facilitate cooperation.(341) Collaboration was hampered by power struggles, long-term problems due to stakeholders focusing primarily on short-term benefits, and policies not designed to accommodate the complexities of severe injuries and/or serious claims.(341) In our study, a key element of collaboration was missing in nearly all of the negative stakeholder encounters; that is, the workers were not mutually involved in decision-making regarding RTW or choice of treatments or vocational options. A number of other problems were also found which limited collaboration between the worker and the other stakeholders including: inappropriate timing or methods or communication; formal communication that was not easy for workers to understand; practical issues of pay; and issues with stigma and legitimization of their injury.

Engaging the worker in the RTW process in key decisions regarding treatments and RTW is a good first step for eliciting and maintaining worker cooperation. Previous studies have indicated that stakeholders perceived the injured worker to be the key figure in the RTW process.(235, 367) Indeed, Loisel et al's case-management "Arena" model centres the worker in the middle of the RTW process.(9) This model focuses on incorporating all stakeholders in the rehabilitation process for a successful RTW. Despite this, few studies have focused on workers' experiences of being in the centre of the arena of stakeholders. A recent study by Ahlstrom et al, revealed that workers often felt trapped in the rehabilitation arena, by not being able to navigate their way out of the problem due to lack of awareness with respect to RTW processes and the perception that stakeholders were not listening to their concerns.(367) In our study, workers also reported feeling like they were in the centre with all stakeholders in the arena present. However, they too were often not included in the decision-making process for their own recovery or RTW. Workers described stakeholders making decisions above and around them, situating them at the bottom of the arena, where their concerns and needs were not central in the RTW process. Many workers highlighted the need for stakeholders to look at the RTW process from their level, from their standpoint, *"to walk a mile in their shoes".*

Another issue limiting worker cooperation is that of legitimization of the injury and stigma. A Canadian study revealed three issues that explain poorer outcomes of injured workers including: stigma, imbalance of power and lack of social supports.(5) Australian and Canadian studies have shown that injured workers feel stigmatized by having a workers' compensation claim, are often blamed for being injured, and can be shunned by HCPs for their workers' compensation status.(222, 350, 368, 369) Every stakeholder in the RTW process has the potential to create stigma, whether intentional or not, however those mentioned most often in our study, were employer- or insurer-related or HCPs providing

RTW interventions. Evidence shows that high levels of stigma can lead to feelings of helplessness and more severe health consequences.(150) Certainly in our study, a few workers reported stigma contributing to depressed thoughts regarding their self-worth as a person and/or value as a worker. However it is important to note that stigma is not necessarily caused by the system itself, as beliefs about workers' compensation claimants can also be more widely held by the community.(5)

Workers reported concerns with the lack of planning for their future vocation when a return to their pre-injury occupation was not possible. The insurers often placed workers in host employment with the premise that workers are recovering whilst at work and are contributing meaningfully.(345) Anecdotally, this has been found to be beneficial for workers who are unable to return to their pre-injury occupation.(345) However, workers in this study stated they had little choice as to the nature of their host employment. For workers unlikely to ever return to their pre-injury occupation, concerns with lack of attention towards their future vocation and retraining, were raised. Similar sentiments were reported by workers who were placed in alternate roles (e.g., a manual worker placed in an office role) when this was either not meaningful to the worker or had no long-term prospects. In this sense, workers described rehabilitation in a similar way to temporary agency work reported in the vocational literature. Although this type of intervention has been found to have social benefits for workers, the effectiveness leading to permanent employment has been questioned.(370) That is, workers felt that these measures were only temporary and retraining and vocational rehabilitation might have been more beneficial. This suggests that for some workers resources would be better invested in exploring options for future vocation and retraining, instead of a 'recover at work' program.

For workers, the cumulative effect of negative experiences, such as, lack of focus on the workers' needs and interests, stigmatization and questioning of legitimacy by other stakeholders, led to loss of trust in the systems that were designed to support them. Once the worker has lost trust in the system, it is difficult for the worker to believe that the stakeholders have their best interests in mind. Workers, who experienced negative encounters with stakeholders over time, described how this could also manifest into psychological and emotional corollaries.

Our study revealed that because of the roles that stakeholders play and their own vested interests, there was not a clear mechanism for facilitating smooth RTW and recovery processes that were consistent, or, for the injured worker, meaningful. The lack of a worker-centric approach was endemic through many of the worker's narratives. Yet, the recommendation of implementing such an approach as a solution to workers' compensation stakeholder issues in Australia, is not new.(7, 361) One of the reasons why this problem still exists may be because including the worker centrally in all key decision-making regarding their treatment and determining their own RTW timeframes is perceived to conflicts with the vested interests of other stakeholders, and in particular, concerns regarding cost-containment.(7) However, there may be larger ramifications if the issues revealed in our study occur over time, which may be equally as costly to the worker, employer, insurer and society. Workers described deleterious stakeholder encounters that resulted in distrust towards both the stakeholders and the workers' compensation system. If not resolved, these issues acted as barriers in the RTW process, impacting on the (cost) effectiveness of RTW interventions and outcomes. Previous research indicates that goodwill and trust between workers and the stakeholders in the RTW process is crucial to a successful work-related outcome.(70, 235) A key element of trust in this setting is that workers need to be able to expect that insurers, employers and HCPs will treat them with respect. An injured worker is vulnerable in the system because of the power imbalance, because the injury has the potential to affect the 'whole' person, whom may change over time; and their concerns should be taken seriously irrespective of whether the stakeholders agree. Another key element of trust is cooperation, which, as discussed, requires clear communication (of priorities, interests and concerns) and collaboration. Trust is thought to moderate the relationship between cooperative motives and cooperative behaviours.(371) Thereby, to promote cooperative behaviours in an injured worker, a relationship based on trust needs to be formed. Conflicts are inevitably going to arise when stakeholders have different vested interests and motivations. However, these should be seen as a positive sign that stakeholders are voicing their self-interests and their motivations for a particular decision - to create an open dialogue toward a shared resolution.(372)

Methodological considerations

This qualitative study using interviews of injured workers was exploratory and open-ended. The phenomenological methods allowed us to explore a wide range of experiences from the time of injury, during the claim process, first RTW and longer-term vocational implications. This approach allowed complex concepts to be examined from the perspective of the injured worker. The purposeful heterogeneous sampling across Australian jurisdictions, age range, time since injury, gender representation and geographical region allowed a diverse range of experiences to be included. This enhances the generalizability of our study's results to other clinical populations.(373)

It is important to note that the lead author of this study was a HCP. However the senior author is an experienced sociologist with vast research experience in the field of work disability, and the other members of the research team are from diverse clinical, academic and professional backgrounds. The data was analyzed using an iterative approach between the members of the research team and the findings are grounded in the workers' narratives as illustrated by the quotes.

A strength was the variety of methods used to collect the data, in person, telephone and Skype. This allowed a number of participants to be involved from remote areas and across states of a relatively large country. Skype (a form of video conferencing) was a novel inclusion at the suggestion of some of the workers who preferred to have face-to-face interaction rather than using traditional methods, such as the telephone. With advances in technology and continually increased speed in Internet, this allowed a virtual meeting place. Body language and facial expressions could be interpreted, whereas teleconferencing options often meant this information is lost in translation.

This study was also conducted in an Australian setting, and the majority of workers were claiming workers' compensation insurance. These findings may be limited in their generalizability to other settings that have different social insurance or welfare schemes. However, stakeholders are involved regardless of the setting and hence, some of the findings such as congruency in expectations with respect to recovery and RTW, stigmatization in the workplace and legitimization of invisible symptoms, such as pain and fatigue, could possibly apply regardless of the setting. Also, some of the injuries and hence the workers' compensation claims occurred greater than two years ago. Hence changes in the workers' compensation system legislation and processes may not be reflected in these worker's experiences. However we did find common threads throughout the workers narratives regardless of the time since injury or claim closure.

10.8 Conclusions

There is little understanding how systems- and process- based influences can act as barriers in the RTW process without exploring these qualitatively. Thus, this study explored stakeholder encounters from the perspective of the injured worker with a severe UE injury. From the workers' standpoint, the implementation of RTW processes generally appeared to be oriented to the needs of insurers and employers, rather than the injured workers. For workers, RTW is a complex navigation of a decentralized system of multiple stakeholders that can be complicated by conflicting mandates, poor collaboration, limited decision-making and choice and stigma. The RTW processes may be enhanced by including a 'worker-focused' approach to establishing recovery and RTW priorities; and in making decisions on an equal footing with the other RTW stakeholders. Understanding how workers experience and view stakeholder encounters, can lead to interventions for positive stakeholder interactions and overcome barriers to RTW.

10.9 Acknowledgements

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CHAPTER 11: Workers' experiences of loss following severe upper extremity injuries in the occupational health setting.

11.1 Introduction

This study was derived from a larger qualitative data analysis, as described in **Chapter 10**. When interviewing the injured workers, loss emerged as a key but unanticipated theme. This chapter will detail the experiences of loss(es) described by the study participants as a framework to identify barriers to return-to-work (RTW) processes (**Aim 6**). Prior to presenting the narrative findings from this study, a background on the theory of loss will be presented to give the key findings context. Due to the nature of the evolving interview schedule, we were able to probe and discuss the issues of loss with the workers.

11.2 Publication

Parts of this chapter are being prepared for publication and are formatted according to the journal, *Disability and Rehabilitation*:

***Peters SE**, Johnston V, Ross M, MacEachen E. Workers' experiences of loss following severe upper limb injuries.*

11.3 Abstract

Purpose: To apply a theory of loss to the experiences of workers following severe upper limb (UL) trauma.

Methods: We conducted semi-structured interviews with 34 Australian workers between 4 months and 10 years, following a severe UL trauma that had considered or attempted to return-to-work (RTW). Using an iterative approach, central themes were developed and coded using NVivo. Thematic analysis identified dimensions of loss as barriers to recovery/RTW.

Results: Primary loss occurs when workers sustained their injury. Secondary losses precipitated (e.g., loss of work, domestic and community roles) and often snowballed

causing further issues. Losses were intensified by workers' compensation systems problems influencing how workers' responded to their losses. These acted as barriers to RTW and perpetuated long-term work disability. Loss of control over recovery and RTW was a key issue exacerbating the workers' loss experiences resulting in loss of trust in the systems and stakeholders designed to support them.

Conclusions: Workers' loss experiences were due to the complex nature of systems and the diversity of stakeholders involved in the RTW process. Systems issues influenced how workers experienced loss, responded and coped. Therefore, attention should be paid to workers' loss experiences to facilitate the success of interventions for recovery and RTW.

Ethical Approval: Behavioural and Social Sciences Ethical Review Committee, The University of Queensland (2014001393).

11.4 Introduction

Trauma to the UL is common and accounts for up to 40% of all work-related admissions to Emergency Departments.(36) When the injury is severe, such as mutilating or amputation injuries, it can result in persistent pain and symptoms, devastating permanent physical and psychological impairments, and long-term disability. In addition, further surgeries are generally required and the recovery may be long, frequently extending beyond twelve months.(38, 44) This type of trauma can be life-changing to the individual, as the UL is integral to a person's occupational and social functioning. The hand, more than any other body part provides a person with independence, and autonomy; and imparts a means of productivity, communication and interaction with others and the environment. One way of understanding how these types of injuries impact on a person and those around them is to use a theory of loss as a framework. Loss has been highlighted as an important area of study following traumatic life events.(374-376)

During our lives, we all encounter loss. Although theories of loss have historically focused on death, natural disasters or trauma as a result of violence, recently there has been increasing recognition that loss can impact on individuals following any type of negative life event or experience, that results in a physical or psychological consequence.(376) Therefore, losses can also be subtle (for example, job loss or loss of physical function), but just as overwhelming for the individual. Due to the intangible nature of these losses, they frequently lack recognition by those interacting with the person experiencing the loss.(376, 378) Research has confirmed that these losses are just as important, and require validation and attention.(375, 376, 379, 380) This is thought to help those who experience loss to work through the changes associated with the grief, to cope, regain control and move on from their losses.

Loss as a potential cause of complex or prolonged return-to-work processes

Work plays an important role in a person's life. An interruption to work, caused by severe UL injuries, can have a significant effect on many aspects of the workers lives and those around them. A recent Australian study found that the experiences of young people following major traumatic injury were a complex process of adaptation and coping.(403) They experienced feelings of vulnerability due to the loss of control over the changes associated with their injuries, such as their physical abilities, environment and future, which contributed to feelings of lost self-identity and self-worth.(403)

Coping with the grief associated with loss is a complex and dynamic process requiring both internal resources and external support.(404) However, what has not been explored is how workers cope with primary losses as a result of a severe UL injury, and the resulting secondary losses within a workers' compensation system in which employers, and insurers also hold a large stake. Previous research has found that injured workers with workers' compensation claims have additional system-related barriers to navigate, that can have potentially damaging effects on the worker, including delays in returning to work, and contributions to long-term work disability.(222, 350) This may also perpetuate further losses incurred by the injured worker, and other stakeholders, such as families, employers and peers, whom have a vested interest.

Remarkably, loss has received very little attention in the occupational health literature with respect to the diverse and complex array of losses incurred following severe UL injuries. Although not an unfamiliar term, loss is usually used in industrial countries in a legal sense; to receive monetary compensation for losses incurred due to an injury. The concept of 'retribution' for losses incurred due to injury most often takes the form of compensation and litigation.(253) However as discussed earlier, loss can be applied in a much broader sense and, hence, warrants further exploration.

Researchers and clinicians could benefit from an in-depth understanding of the barriers and facilitators to RTW for those workers with a severe UL injury, using the theory of loss as a framework. This understanding would help facilitate the transition to work, trouble-shoot potential barriers and prepare the individual, their family and the workplace for the returning worker. Moreover, it could help guide assessment, and both clinical and RTW interventions, for workers with severe UL injuries.

The aim of this paper was to identify the ways that workers can experience loss following severe UL trauma. We suggest that stakeholders may overlook the impact of these losses on the RTW process, and, thus, on RTW outcomes. This may mean that stakeholders are not recognizing or appreciating workers' experiences of loss following traumatic musculoskeletal injuries. Appropriate management of a workers' loss may assist injured workers with adapting and dealing appropriately, which in turn may overcome RTW barriers and improve work-related outcomes. Achieving positive work outcomes for these workers requires an appreciation of the workers' lived experiences.

Theories of Loss

Loss is produced by an event, which is perceived to be negative by the individual involved, and results in long-term changes to one's social situation, relationships or cognitions.(p.12, 377)

The experience of loss is thought to be necessary for individuals to grow and adapt as part of normal life.(376) Loss has been viewed from various theoretical perspectives including psychodynamic, attachment, social learning, cognitive/behavioural and constructivist.(381) It is thought that the different perspectives contribute to understanding the complex, yet normal, processes of loss and grief. Theories have viewed loss as an event, an experience and/or a process.(374, 377) Losses can be tangible (e.g., loss of a body part, job loss) or intangible (e.g., loss of self-identity or status due to job loss, loss of control over recovery or RTW).(374) Losses can snowball, further magnifying their impact.(379) A summary of the key tenets from the theories of loss discussed is detailed in **Table 11.1**.

Table 11.1: Key tenets from the theories of loss

Key elements of a Theory of Loss
1. Loss is a universal, and a normal reaction to a traumatic event.
2. Loss experiences are unique and individual.
3. The loss experience and responses to loss are dynamic (temporal nature).
4. Losses will have different “meaning” to different individuals, based on our sense of self, others and the world.
5. The dimensions of loss can be either tangible or intangible.
6. Losses are cumulative. Primary losses are usually accompanied by secondary, consequent losses.
7. Responses to loss can be emotional, behavioural, psychological and somatic. Hence, they can result in subsequent losses.
8. People are ‘transformed’ by loss, they don’t ‘recover’ from loss.
9. Loss is influenced by wider systems.

The role of attachment in the loss experience has been examined. In one of the first theories of loss, Bowlby suggested that that our experiences of early-life attachment guide us to form ‘working models’ of ourselves and the world.(382) These models are based on the construct of secure attachment representations of the world that meet our worldly needs, and provide us with a sense of safety and security. The ideal that the world is safe, helps us to build trust in people, societal systems and the surrounding environment.(383) Bowlby’s theory suggests that loss can threaten these models, leading us to question, change and adapt in response to the loss.(382)

Building on this, Parkes introduced the concept of the ‘*assumptive world’*, that is, that individuals form assumptions on how the world works based on their life experiences, as well as their attachments. *“The world is the only world we know and it includes everything we know or think we know. It includes our interpretation of the past and or expectations of the future, our plans and prejudices. Any or all of these may need to change as a result of [loss] in the life space”.(p.102, 386)* This theory of loss of the assumptive world has been studied in the context of traumatic experiences,(384-386) including amputation of a body part, and perhaps is one of the models of loss that can be easily applied to the workers experiencing UL injury in the occupational health field.(386) The theory of ‘loss of the assumptive world’ is thought to result in disruption of one’s beliefs about the meaningfulness and goodness of the world, fairness and trust in others and systems, and self-worth.(384, 385) Thus, loss is often viewed from the individual’s perspective of limited control over certain exposures or experiences, such as trauma, which can ‘shatter’ an individual’s assumptions about how the world should work.(379, 385) Harvey stated that this can result in a significant emotional investment of a person's resources which subsequently can have successive ramifications.(374)

In a similar vein to the assumptive loss theories, other theorists have used schemas or 'meaning representations' to explain loss. These schemas depict our interpretation of our own experiences, or of worldly events.(387) The interpretation of our schemas explains how we assimilate or accommodate loss based on our assumptions of how the world does or should work. Landsman described a "crisis of meaning", when traumatic events don't fit one's perception of their schemas.(387) Further, Neimeyer and colleagues proposed that individuals respond to trauma by trying to make meaning of the situation and, then, its consequences.(388) The 'meaning reconstruction' organises individuals' narratives in an attempt to recreate order and regain a sense of control over their experiences. Thus, the trauma causes a person to question and re-order their preconceived 'meaning representations' or schemas to interpret their losses and regain control.
Others have also emphasized that loss occurs within a social environment. The social environment affects how people experience loss, grieve, cope and respond to loss. The social systems are thought to influence the course of recovery, and therefore reinforce the multi-dimensional nature of the loss experience.(389-391) This could also be applied to the social context of health care and insurance agency systems, familial and societal influences on workers who sustain work-related injuries. Furthermore, some have hypothesised that the magnitude of the loss can vary depending on the standpoint of the individual identifying the loss. That is, the perception of the impact of the loss, and the appropriate ways to cope with the losses, from the perspective of either the individual experiencing the loss (the insider) versus those external to the person experiencing the loss (the outsider).(392) The key tenant of this theory is that different stakeholders have different perspectives based on their own experiences and beliefs; and hence, they may also view the severity of the loss, the impact of the loss on the person and the perception of how the person should respond to the loss, in different ways. This has important consequences when considering loss as a part of recovery or rehabilitation, as many stakeholders (e.g., HCPs, employers, co-workers insurers and family members) have a vested interest in the outcome (**Chapter 10**), which may frame their beliefs and ideals about loss. Similarly, others have postulated that loss represents a *process* rather than an experience or event and therefore, loss changes over time. (380, 393) The loss process is moderated by a number of internal and external factors such as coping, support and

adaptation which is influenced by a person's relationships and environmental factors.(380, 393)

In summary, losses are complex, dynamic, and multidimensional(394). Building on these theories of loss, Harvey recently described five principles to summarise loss, that can be applied to traumatic life events: 1) major losses are relative to our perception of the magnitude of the loss; 2) major losses may have cumulative impacts; 3) major losses often contribute to facets of identity change; 4) major losses involve adaptation to loss of a sense of control; and, 5) important coping strategies for dealing with loss involve working on the meanings of the losses and learning how to give back to others based on their own lessons of loss.(395)

Theories of responding to loss

Loss and grief are universal experiences. However, the personal responses and appraisals of these experiences are uniquely individual.(376) Grief has been defined as *"the emotional response to loss; the complex amalgam of painful affects including sadness, anger, helplessness, guilt and despair".(*p.33, 396) To overcome loss and grief, individuals establish coping mechanisms in a process of constantly changing their cognitive and behavioural efforts to manage specific external and/or internal demands, such as the demands experienced by loss.(378) Kauffman stated that when traumatic loss occurs, the persons belief in goodness and goodwill of others, and the world, is shattered,(378) which can impact on engagement in counselling or rehabilitation. A person can become acopic when the demands either consume or exceed the resources of the person.(378) Therefore, sometimes the process of coping with the grief and stress, expends so much energy and resources, that the act of coping becomes a loss too (such as, depletion of resources and energy, reduced morale, feelings of lost control and identity).(374)

Earlier theorists adapted phases of grief, such as Kübler-Ross' well know stages of grief following death of a loved one.(397) However, other models have avoided labelling the responses to loss as a series of predictable events. Worden postulated that coping with grief is as an individual experience that involves a series of four tasks that can occur in any order, at any time (or not at all). These include: 1) acceptance; 2) working through the pain of the grief; 3) adaptation and 4) re-investing or 'moving on'.(398) Authors further postulated that a person has a need to reconstruct new meaning of the changes to be able to overcome their losses.(388, 399) A number of factors have been associated with how individuals respond to, or make meaning from their losses including: coping; optimism; perceived control over life events; perceived sense of self; pre-existing vulnerabilities; and the characteristics of the traumatic event itself.(400) Authors have advocated that if a loss is not integrated into one's existing sense of self, it may negatively impact on a person's self-worth and sense of self in the world.(386, 401) The Dual Process Model of coping with loss (402) proposes that people experiencing loss oscillate between two approaches to coping: i) a loss-oriented approach,(i.e., focus of the loss itself), and ii) restoration-oriented approach (i.e., focus on secondary stressors that are consequences of the primary loss). This constant reappraisal is thought to be an integral part of the coping process. This helps individuals experiencing loss to realign their assumptions and make sense of the world and their loss experience.

Phenomena of study and study purpose

The purpose of this study was to: i) identify the dimensions of loss following severe UL injuries; and, ii) to describe how workers respond to these loss(es). This paper focuses on why the concept of loss is relevant to recovery and work resumption for injured workers.

11.5 Methodology and analytic focus

The study used a qualitative phenomenological approach. Phenomenology guides researchers to understand the complexities of the lived experience from the perspective of those being studied.(344)

Sample

Purposive sampling was used to generate variability in geographic location, occupation, gender, age, time since injury, and phase in the RTW process (using the Readiness to RTW scale). Participants were included based on the eligibility criteria: those with a severe traumatic injury to UL (Modified Hand Injury Severity Score); were at least 3 months from the date of injury; had either returned to work, attempted a RTW or were attempting/planning to RTW; and were aged over 18-years of age at the time of interview. Participants were excluded if: they had associated/pre-existing comorbidities or injuries that impaired cognition, communication or ability to ever RTW; or, were not planning to RTW at the time of the injury e.g., planned retirement, or disability pension recipient.

Workers were recruited through a variety of gatekeeper organizations including the Australian Hand Therapy Association, Australian Hand Surgery Society and the Shoulder and Elbow Surgery Association of Australia. Association members advised potential participants of the research study. If there was interest in participating, consent was provided to allow researchers to contact the participants.

Thirty-four workers (30 male; 4 female) and two female family members participated in the interviews. Severe traumatic injuries to the UL are more prevalent in males (91%) and between the ages of 20-44 years in Australia,(36) as represented by our sample. Work status and demographic information is contained in **Table 11.2**. The time between injury and the interview ranged from 4 months to 11 years. The majority of participants were employed in trades, transport and machine operating occupations. This study was conducted in Australia. A description of the Australian setting and its workers' compensation insurance systems is described in earlier chapter of this thesis. Of the 34 workers interviewed, 31 were claiming workers compensation, and three were self-employed and receiving either wage replacement through private income protection insurers and/or private health insurance. The experiences of workers that were not claiming compensation were used to help frame the systems issues experienced by those who were claiming compensation.

Ethical Considerations

This study received ethical approval from The University of Queensland. All participants were assured of their confidentiality and anonymity in dissemination of the results. Informed consent was obtained from all participants.

Data Gathering, Management and Analysis

Semi-structured one-on-one interviews were conducted by the first author (SP). We used an inductive process, whereby data collection and analysis occurred simultaneously. Interviews were audio-recorded and transcribed professionally using strict verbatim. Transcripts were cross-checked with the audio-files to ensure accuracy, and that no meaning was lost during the transcription.(346) Analysis was performed in phases.(346)

First, key topics were identified after each of the interviews was conducted. This was also used to determine when data saturation had been reached. The first author immersed herself in the transcripts and became familiar with the data by actively reading and re-reading the transcripts identifying initial patterns in the data. A process of listening to the taped audio-files, reading the field notes and the transcripts was used, to determine any additional themes. In an iterative process, these concepts were discussed with the senior authors (VJ, EM) to define the codes used in this study. Coding was aided by Computer-Aided Qualitative Data Analysis Software (NVivo for Mac, Version 10.2. Themes were developed and reviewed in relation to their coded extracts from the original transcripts. As this analysis was part of a larger study, this analysis focused on those extracts coded as “loss or gains”.

The results are illustrated by selected quotes and experiences. Any alterations to the exact quotes have been made for practical reasons and do not change the meaning of the quotes in any way. In the *Results* section, participants are referred to by participant number to maintain anonymity as detailed in **Table 11.2**.

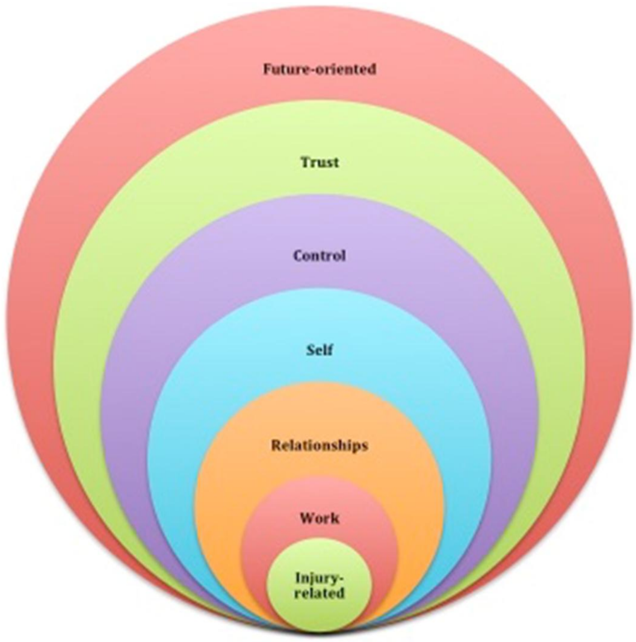
11.6 Results

Loss was a concept that permeated all aspects of the workers lives. Workers reported loss experiences as actual barriers along the recovery and RTW trajectory. The primary losses experienced were physical losses related to their injury, such as loss of a body part. However, workers also described secondary losses, which often had more significant impacts on their recovery and RTW. In this paper we describe the ‘dimensions of loss’; and ‘responses to loss’ experienced by injured workers with severe UL injuries.

Dimensions of Loss

The dimensions of loss that were most eminent in the workers’ (with severe UL trauma) narratives were: injury-related losses; work-related losses; relationship-related losses; losses related to self-identity; loss of control; loss of trust; and, future oriented losses (**Fig, 11.1**). These will be discussed in the results section narratively (but not necessarily in the order mentioned above). The dimensions of loss were influenced by the workers’ compensation systems in the various Australian jurisdictions. As perceived from the standpoint of the injured worker, these systems intensified the worker's losses, and will also be detailed.

Figure 11.1: Dimensions of loss



Workers described dimensions of loss that changed over time – from the acute stage immediately following the injury, to the later stages when physical recovery stabilised. Some of the dimensions of loss were tangible (e.g., loss of body part, loss of employment) and were described as being easily recognized by other people involved in the RTW process. Although these dimensions were often barriers to recovery, and hence RTW, workers reported that the obvious nature of these loss experiences usually helped others to comprehend the enormity and consequences of their injury. This allowed these individuals to provide support and comfort to the injured workers. However, workers stated that there were many dimensions of loss that were less obvious from another's standpoint (e.g., loss of identity, loss of control, loss of trust), and as a result appeared, from the workers' perspective, more difficult for others to understand. Thus, workers felt these losses lacked recognition, validation and attention from insurers, employers, HCPs, their families and peers.

The snowball effect of loss was seen in all of loss narratives. Primary losses (e.g., loss of body part, loss of movement or ability to grasp) perpetuated secondary losses (e.g., loss of independence) that in turn created more losses (e.g., loss of self-identity, loss of self-worth), causing a cycle of losses. This was often compounded by the nature of the severe UL injuries that often required subsequent surgeries. These often led to periods of time in which the worker felt they were taking a step back whilst they were recovering from the surgery:

> *"Again it's a lot of things… It's the two surgeries I had to go through. It's the returning to work. My mental self and dealing with only being able to do those few days plus everything else, and then the stuff with other people at work. And everything builds up. I ended up having to go see a counsellor up the road from here for a couple of months because I just needed to. I'd never seen anyone like that before and thought it was a really pussy thing to do. But when I started to see her I realized that I needed to see her."*[12]

At the time of interview, workers were at different stages in the RTW process (refer to **Table 10.2**). Some had returned to work in various capacities and had finalised their workers' compensation claims, some were receiving workers' compensation and were either working in some capacity or were on total incapacity; some had not returned to work (despite wanting or attempting to RTW) and were on disability income support benefits; whilst others had been forced into early retirement. In the early stages, workers reported their initial feelings of responding to their injury and/or the loss of a body part and physical abilities. There were realizations that life was never going to be the same again, and the grief associated with this could be overwhelming. As one worker described:

> *"I mean it's only over the last two months that I'm starting to realise it's not going to be the way it was before I injured it. There's going to be things that I can't do. There's going to be fingers that aren't going to bend all the way or… And I was telling myself it'd be fine. And I'm just getting- coming to grips with that. I don't know what to expect. I mean I have trouble putting a pillowcase on a pillow. I don't know how I'm going to be driving a forklift [at work], or tying a rope if I have to tie a rope."[28]*

For those workers who were not working, they expressed grief associated with job loss and the loss of identity associated with not being employed or performing their pre-injury occupation. This was often associated with their pre-injury 'status' of having a certain occupation and the financial remuneration associated with that role. One worker explained that he had worked in his occupation for most of his life and was well-respected in his field, mentoring and training other staff, providing 'expert' advice to senior executives, as well as being viewed as one of the most experienced at his role in the workplace. He lamented not being able to continue in this senior role, and see out his tenure:

> *"But the big thing with me is work because work was a big part of my life and I loved what I did. And just realising that it's not going to happen after 30 years. I always pictured myself retiring, and the fellow saying a speech, and receiving my gold watch."[13]*

For some workers, early RTW was successful in a modified capacity with their pre-injury employer. However, they experienced insurers, employers and/or HCPs whom often did not want to discuss long-term work options, especially when return to their pre-existing duties or occupation was not likely. In some cases, workers had recommendations for job modifications that would enable them to return to their pre-injury role, but felt that insurers and employers did not perceive these as being feasible due to substantial changes with respect to processes, equipment or structure of the work, or associated implementation costs. Workers were fearful that when their claim closed, they or their employer would not be able to afford to implement the requisite modifications, and this may impact on their future job security. This appeared to create as much grief as workers who were aware that they might never return to full capacity in their pre-injury role without these accommodations.

For nearly all workers, loss of employment security was a primary concern due to their permanent physical (and sometimes psychological) limitations. There were concerns about their employability in certain roles, or applying for roles in which their applications would be compared to people who may not have a disability. This worker described the stigma of having both a disability and a workers' compensation claim, and how this might impact on him gaining future employment:

> *"I still think I'm going to struggle to get another job again and as soon as people see my arm… It's not like people are going to miss it. It's a big scar and physically I cannot do my job [compared] to what I did [before the injury]. I physically can't work for as long as I did. I physically cannot do certain jobs. And that part really holds me back. And the blemish on my name as a worker [with a compensation claim] is really difficult. I was trying to get a job and they always ask, "Have you had a previous workers' comp claim" and straight away they're going to say, "No, I don't want you."[7]*

Workers also reported substantial psychological and emotional consequences due to loss of non-occupational roles and the impact of these on their relationships. These included strain on, and breakdown of, relationships, with spouses and families, friends, work colleagues and business partners for those who were self- employed. Not only were workers confronted with relationship loss, but they also feared the thought of losing valued relationships, such as those with co-workers, by not being at work for long periods, or not being able to RTW at all. For some workers who had obvious loss of body parts or mutilating injuries, the aesthetic appearance also caused anxiety in social situations. A few workers reported anxiety attending social events or places in which people may ask them about their injury, or how the injury occurred. Workers reported the loss of identity associated with not being able to perform key domestic duties at home, engage in sexual activity or participate in community roles (e.g., involvement in community organisations, or volunteering) that often also formed a key part of their social lives and identity. One of the participants described the impact the injury had on his relationship with his son:

> *"I mean this whole episode has affected the whole make-up of the family and everything, and it affects us all. It makes it awkward… Especially with my [son], we seem to have drifted apart a little bit. He tends to leave me alone and I tend to I over-react, which is probably normal parenting, but because of all the extra baggage I've got carrying with me at the moment I'm finding it very hard to deal with."[20]*

Workers also described how these changes, related to loss of roles and identity, affected their families and loved ones, who also experienced loss. This often placed added strain on already fragmented relationships. This worker described that his wife also had to cope with the loss of his identity after the injury:

> *"[My wife]-- Well, she still says now that she's lost the old [me]. I'm here but I'm not what I used to be or who I used to be. So, I've had to deal with that and she's had to deal with that."[12]*

Workers reported that the losses associated with roles and relationships usually culminated at a time when the worker needed the most support in dealing with their injury and the subsequent losses. When the losses snowballed to this extent, workers often felt overwhelmed and did not feel like they could ask for support:

> *"It's a very hard situation that you have to deal with. It's first an injury, then it's like the surgery, the repair of the injury and then it's the physiotherapy, it's getting back on your feet and back to work, the money, and then you know other people's understanding of what's happened, which they've got no idea. And then they're not really interested either if you try to tell them... You're on your own, you really are. You're on your own when you have an accident like this."[24]*

However, some workers reported that, over time, the injury had brought them closer to their partners or families. However, this did not come easily and often required open and clear communication of their feelings about how the losses were affecting them both, and what they both could do to maintain their relationships and involvement in previous non-occupational roles.

Workers reported the immense impact of losing life roles on their long-term psychological state, and the feelings of dependence and burden on others, which eroded their feelings of self-worth:

> *"Something as simple as skiing – I can't do that anymore. It's hard to work on my cars. It's hard to do so many things now. I can't ride my dirt bike. I had to sell my road bike. All those things added into the psychological effect of it as well. But physically being held back. That's what started the mental side of it as well."[7]*

As mentioned, reduced participation in work, domestic and community roles contributed to workers reduced sense of belonging and their self-value. Some reported that they felt that they were only known or associated with their injury. A number of workers reported that conversation with family, peers and co-workers frequently centred on their injury, for example, how they were coping or what progress they had made. As this worker reported, they felt defined by the permanency of their injury and the consequences:

> *"My name's not [Bob] any more, my name is "Hands" because every time you see somebody or somebody sees you, "Hi, how are you going? How's your hand?" It's not "How are you?" It's "How's your hand?"[24]*

Loss of income and/or financial status was a key issue for workers. Whilst on workers' compensation, many workers reported only receiving a percentage of their pre-injury income. In Australia workers' compensation insurers often only pay a percentage of a workers salary, and rarely pay over-time or additional salary loading.(254) For those who had closed workers' compensation claims, disability pensions in Australia are not based on workers pre-injury incomes and are pre-set based on the minimum Australian salary standards.(405) For those who were the primary breadwinner, there was the additional stigma as this role was lost. Some reported loss of resources not only with respect to their lost income but also due to sales of assets or depleted savings to pay for treatments, home modifications or assistance or to refinance loans. Few workers reported the stress of living week-to-week, and the fear of defaulting loans or having assets repossessed. Workers also reported not being able to afford their pre-injury lifestyles such as participating in recreational activities and hobbies, taking holidays, or saving towards a home or motor vehicle. This worker reported the sadness of dealing with the loss of his previous life:

“My specialist he wants me to try and get back to work but he said to me, “There’s no way you’re ever going back into heavy industry.” And that’s all I knew really - work and making good money. It was a good lifestyle, and it’s gone.”[33]

These losses in turn also caused workers to try and reconstruct the meaning of their previous lives and what their future lives might look like. Workers tried to make sense of why they worked so hard to have it taken away from them, why the injury happened to them when they believed they were a good person and hard worker, or how the injury would affect their future lives. This resulted in workers grieving the loss of their formers lives and questioning whether their hopes and plans for the future were now realistic.

Physical impairments also caused loss of independence in various activities and roles. Workers begrudged their inability to perform basic self-care and domestic tasks, drive, work or perform leisure activities. This resulted in feeling of helplessness, and questioning of their value:

“I used to like do a lot. I used to help dad with everything– like we built a house. I loved playing with cars and working on ‘em and just going out and helping people. Now I’ve got to watch what I do. I just can’t do as much. And sometimes you just feel like you’re useless and can’t do anything... I don’t really have such a good relationship now with my dad just because of everything… I still talk to dad about it but me and dad used to do a fair bit together… And the other day they prescribed me anti-depressant pills because I was having suicide thoughts [because of it all].”[26]

Workers reported that HCPs often focused on increasing independence in their treatments – to make them “more” independent. Workers reported that independence to them was a binary outcome – you could either be independent or not. Yet, they felt frustrated by HCPs who offered solutions, which still relied on family or colleagues for assistance, which prolonged their feelings of dependence, and uselessness. As one worker stated:

“A lot of [HCPs] talked about gaining some independence mainly. That was the key word, “independence.” And that’s pretty big. And I’ve got to admit in the end, I don’t like anybody using that word, “Make you more independent.” I’m sorry. You either are or you aren’t. There is no “more”.[13]

Workers reported that they often needed to develop solutions on their own to allow them to become independent. One worker reported:

“At first probably socially you don’t really want to go out because you know you’ve got the hand, and dread it. It’s not the greatest thing to look at and you’ve got to explain to everybody what happened and you can’t you know-- You can’t do this and

you can't drive anywhere. You can't you know-- It's a bit hard. I don't really go out too much. I go to the movies every now and again with a couple of friends and even then, you can't even hold your own popcorn... You don't really want to go out and make people look after you. You want to be able to look after yourself… [If you are] getting ready, you can't tie your shoelaces and that is just really annoying. Can't put on a pair of jeans because you can't do the button up and it's just easier to stay at home and just ride it out."[23]

Workers also reported that this reduced independence was compounded by restrictions imposed on them either by their medical practitioners or treating therapists (e.g., not being able to drive or work due to healing concerns, what felt to the workers like arbitrary lifting limits or reductions in work hours); insurers (e.g., accidents caused by driving after the injury may not be covered by car insurance) or their families (e.g., who often felt they were doing the worker good). For workers on workers' compensation, many reported being afraid to leave the house (e.g., to help a spouse with the grocery shopping or going to a friends place to socialize) in case their insurer "caught them in the act" of doing something other than returning to work. This worker, who had an employer who tried to contest his workers' compensation claim, stated that he felt that his employer was watching him for the remainder of his claim:

"I actually felt a few times, just looking over my shoulder all the time and just wondering if he's trying to get me for something and sometimes I do feel like work is trying to get me for something. They make you feel like they don't want you there anymore."[7]

A key issue for workers was that the little control they felt they had over their lives by constantly having to rely on others. They felt like their freedom had been taken away and in many cases felt trapped in their own homes. This worker explained his experience:

"I was not legally able to drive. So I couldn't I couldn't go anywhere. I was relying on others, on my partner, to drive me around. She had to drive me to doctors' appointments, and her and my daughter, it was the same thing… Any time I needed to go down the street or do anything like that. It was just hard for me. I couldn't get in the car and go for a drive or go get what I needed. Or I couldn't go around and see my friends. I had to wait for them to come see me. So it was depressing for me sitting at home losing all [my] freedom, all the stuff you take for granted."[2]

Workers also described loss of emotional and energy-related resources including high levels of fatigue and reduced emotional and psychological coping, which consequently depleted their energy levels and impacted on physical functioning. This in turn affected participation in early RTW programs and activities outside of work, e.g., domestic and community roles and leisure activities. Workers frequently reported difficulties being motivated to perform their requisite exercises and rehabilitation due to fatigue:

> *"I said I wanted to go back to work because I wanted to get back to something and obviously WorkCover [supported that]. I wanted to feel like I was doing something… They got me back into work just doing a few days - a day here and a day there - two to three days a week, depending on what I could do with physio and the doctors' appointments and that sort of thing... But the more time I started putting into the office, the more time I couldn't do anything else when I got out of the office. And it was like, you know, "What do I do? Do I do the physio and everything to try to keep me in form with the body or do keep trying to do the work?"[32]*

All workers described the loss of control they felt at various stages of their recovery, RTW, or with respect to how their futures might transpire. For those who were dealing with insurance agencies, the systems and processes involved exacerbated the feelings of lost control. Workers' compensation systems limited workers' ability to be in total control of decisions regarding their treatments, and in many cases their RTW due to the rigid processes in place and the insurer acting as the gatekeeper to payments for treatments and salary remuneration. Many workers reported that their unique circumstances were not considered. For example, some workers felt that they were not psychologically ready for an early RTW. Yet other workers felt they were ready but due to the severity of their injuries and physical impairments, insurers, employers and HCPs seemed reluctant to consider large (and/or costly) job modifications to facilitate this step in the recovery process. This lack of considering the 'whole' person contributed to losses not been acknowledged or managed adequately. This resulted in workers feeling vulnerable, angry about their situation and apprehensive about the future.

Loss of control was confounded by insurers, HCPs and lawyers often encouraging workers to remain off work until the cessation of their claim, as they would receive a permanent impairment payout[11]. Workers felt that these stakeholders recommended this, as it was the cheapest option. One worker, who suffered a mutilating arm injury in a machine at his

[11] If a worker sustains a permanent impairment as a result of a workplace injury or illness, they may be entitled to claim a lump sum payment as compensation. *New South Wales Government. Permanent impairment claims. 2016. Available from: https://www.workcover.nsw.gov.au/workers-compensation-claims/making-a-claim/types-of-claims/permanent-impairment-claims.* A minimum level of permanent impairment needs to be present and is made by a medical specialist. In some jurisdictions, a common law claim may also be made against the employer, if the employer allegedly breached their duty of care. Depending on the jurisdiction this claim can be negotiated through the insurance regulator or in court. *Queensland Government. Permanent impairment and common law options: Workplace Health and Safety, Electorical Safety Office, Workers' Compensation Regulator; 2016 . Available from: https://www.worksafe.qld.gov.au/rehab-and-claims/support-and-benefits/lump-sum-payments/permanent-impairment-and-your-common-law-options.*

workplace, explained how he felt he was being forced back to work before he felt mentally ready to return. He reported his exasperation that although he was physically able to return, he had discussed with his doctor that he needed more time off to deal with the psychological manifestations. He explained how he felt like he had no control over his own recovery or RTW:

> *"The case manager always wanted me to do what they said, even if it's good or bad and then they want to finish the things quickly before the doctor say, 'Oh he's done' and then they're just pushing me and making things harder. There's some kind of work I can't do and they say, 'I have to do it'. That's the case manager saying that and doctor say, 'I can't do anything. They're the one paying the bills. They're the one doing this one, so you just got to try your best and do something'…."[3]*

However on the contrary, for workers who did feel like they were involved in the decision-making during the rehabilitation and RTW process, the sense of control was associated with more positive outcomes:

> *"….I had so much decision power in the process [which meant] being able to do something. [My experience] was more constructive and actually helped [my employer and therapists doing the RTW plan] to progress things they had to do."[29]*

Workers described how the complicated and often prolonged bureaucratic processes of the insurer and employer contributed to their feelings of lost control. As treatments and decisions need to be approved by the insurer, workers reported frustration and even anger that time was being lost in the recovery process whilst waiting for decision to be made. This worker described how he saw the process:

> *"I think I've got to go through the hoops. I feel as if I've got to go through the hoops to do the right thing by everyone and to be signed off [by the doctor]."[20]*

Workers in these situations often felt stuck in the system, which prolonged their loss experience. They reported that their lack of control over the RTW process resulted in the decisions regarding RTW not being as meaningful to the worker, then if they were included in making the decisions.

Workers often perceived that they have suffered hardship or loss undeservedly. This was found to arise when the worker was exposed to situations where there was a perceived violation of basic human rights or challenges to equality and justice, as a result of the cause of the injury (e.g., negligence), or stakeholder's actions or perceptions of loss that were not thought to be in the best interests of the injured worker. Often their responses to loss were shaped by the system itself. Thus, workers' negative experiences of loss in the system, their controlled responses to loss and if the stakeholders did not validate the workers loss, could ultimately lead to loss of trust in systems that are theoretically designed to support them. Once the worker loses trust in the system, it was difficult for the worker to believe that this system has their best interests in mind, and that returning to work or complying with their requests was is in fact good for them. They reported experiencing a loss of order, fairness and trust in the system. One worker described his experience of receiving a report prepared by his employer and the workers' compensation insurer, and how this was the last straw in his trusting the system and the associated stakeholders:

> *"I trust my family. I trust my son and my daughter and my wife. I don't trust anyone else. I wouldn't trust anyone else as far as I could kick them... I'm loyal, extremely loyal, but it doesn't pay to be. It does not pay. It's a big shock to the system. And as I said, when I read that [workers compensation] report it blew all the wind out of my sails I can tell you. I sat down physically and just cried and cried and cried."[19]*

Overall, workers stated that the workers' compensation system placed greater emphasis on supporting the insurer and employer needs, and this resulted in the worker losing trust in the system. One worker stated that he just assumed that the insurer and employer were doing everything that was in his best interests. As he explained:

> *"It's not that you need more support from the system, or that things could have been done differently, it's that you think they [the insurer] are doing the best thing, the right thing…You think they are trying to help you… You believe everyone is trying to help you. But you realise in the end they're not. It's not about how confident you are asking for things. It's that you assume that you are already getting everything that you are entitled to. You shouldn't have to ask."[18]*

When workers felt the system had failed them again and again, they reported that it became difficult to be motivated to participate in the rehabilitation and RTW programs. This worker blamed his work for his injury, as a previous injury on the same machine was not rectified by his employer. In addition, this worker reported that he felt his employer treated him fairly or with compassion following his injury. Over time he reported that this eroded his trust in his employer and the psychological aspects of dealing with both the injury and these systems issues.

> *"The hardest part was psychological… To this day I have no drive to be there. I blame work for everything that has happened to me. When [the other guy] hurt himself they didn't put any safety things on [the machine] and it wasn't until after I hurt myself that they actually put proper lock out systems on there. If it were me, I would have shut down the entire room, but that obviously costs the plant money. So, they didn't do that. The fact that they had to wait for me to hurt myself before they actually did anything was very hard to take. It goes over my head all the time. I can't*

sleep sometimes. It's always there. And, the way that they've acted after everything, the way they treated me even after the injury. It kind of eats away at you as well."[7]

Many reported the fear of their physical UL impairments incurring future losses. One worker described that due to financial and employment-related losses caused by his injury, he questioned many aspects of his future including ability to be able to afford to have and to provide for future children:

"Well, like anyone has a- not a plan as such, but you expect what you'll be doing in the next 10 years and what your goals would be. And when that's taken away… You're just like, "No, that's- that's-- I already had this planned. I was already going to be there and I was already heading in that direction." A roadblock is put in front of you. You can't go around, you can't go over, you've got to go through. You've got to start looking at other options."[12]

Responses to Loss

Responses to loss were different for each worker, as people deal with loss in different ways.(404) In this study none of the workers reported being fully recovered from the physical (and often psychological) impact of their injury. For workers with severe UL injuries in this study, they responded by: 1) surviving the experience and moving on (by adapting and/or accepting their losses); 2) developing maladaptive responses, resulting in them being permanently damaged, and finding it difficult to move on; or 3) feeling like they were stuck in the workers' compensation system in which they could not move on until the claim closed (**Fig. 11.2**).

In general, workers' expressed having to overcome their feelings of loss to help them 'move on' from their injury and to ready themselves for both first RTW and beyond; to allow them to be productive in both work and life outside of work. Workers reported about the positive adaptive responses they had to their injury and resulting disability. A female worker who had a hand amputation injury reported that her outlook on life changed and she was able to settle down after her injury [1]. Prior to her injury, she described participating in high-risk behaviours; but following the injury, she was not able to continue the same lifestyle or occupation. She spent her time retraining into a different profession and learning to adapt to her disability.

Some workers reported having difficulty making meaning from their injury and their losses. These workers often reported difficulty coping (and/or maladaptive coping strategies e.g., alcohol of drug abuse), deteriorating resiliency, diagnoses of post-traumatic stress or depressive disorders, and, in a few cases, suicidal ideation. This worker described how he had difficulty coping with his injury and had contemplated suicide as an easier solution to the grief and pain he felt because of his losses:

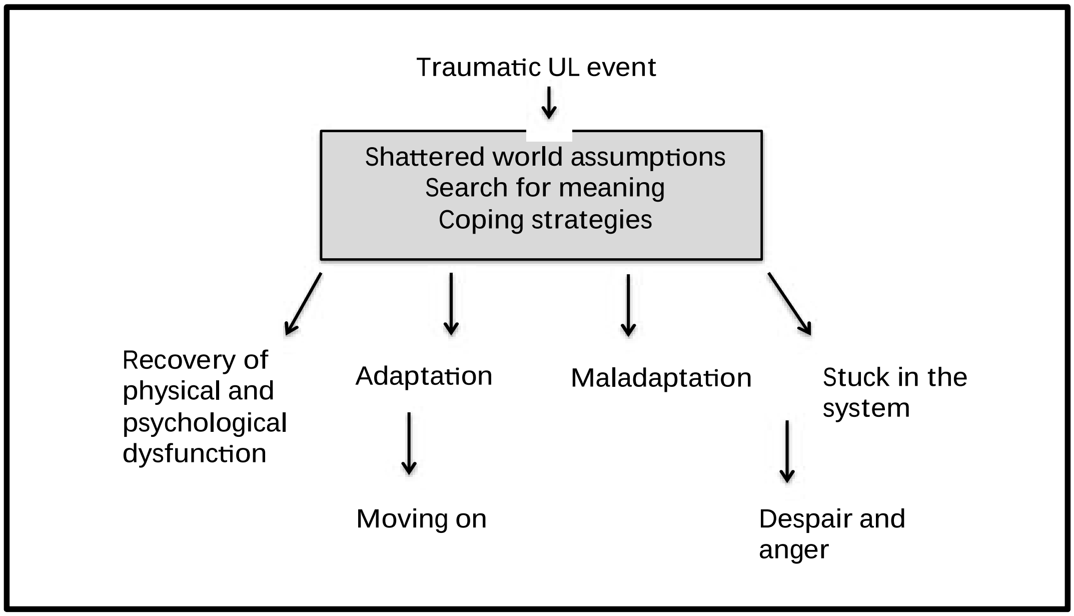
> *"I don't know how to get another job. It's on my record that I've had a workplace incident and everything that's stress of all that got me really down. I'll be honest, I did contemplate suicide and all this other stuff. It was quite a bad time for me. I had breakdowns and just hated everything and everyone"[7]*

The workers responses to loss were also greatly influenced by the processes related to the workers' compensation system. In many instances, workers reported that they were 'stuck' in the system, which prolonged their ability to move on. For example, workers reported that performing alternative duties or host employment, for the sake of returning to work, and avoiding discussion of future vocation, prolonged their experiences of loss associated with loss of occupation and the loss of self-identity related to this. Worker's reported that their understanding of the injury, recovery and permanent impairment and resultant disability contributed to their feelings of loss. This was a dynamic concept, and changed depending on their recovery and RTW experiences at the time, both positive and negative interactions with their stakeholders and success of treatments. One worker described a situation in which he was stuck in a state of going through the workers' compensation processes and was only able to accept his injury and the impact of his losses after his surgeon gave him a clearance and his workers' compensation claim was finalised:

> *"Everyone has had their different opinion on different things, but I still maintain the day that the surgeon said, "Righto, go and live life". I did. I went back and played cricket. I went back and played golf. Yeah I get numb. I get a numb sensation in my hand playing golf. I've just got to deal with it. Whipper snipping I only do it for a little bit because my hand goes to sleep. I find gripping different things or driving or welding or grinding or whatever it is. Things have changed. So, I've just adapted to that."[8]*

Workers also experienced that other stakeholders, such as employers and insurers, perceived their loss(es) as static and unchanging, and this also contributed to the how they adapted or accepted their losses. Stakeholders didn't seem to understand that there were different phases, that losses altered over time and that the process for grieving and coping with their losses also changed. Hence, their losses lacked validation and attention.

Figure 11.2: Responses to loss



11.7 Discussion

It has been long recognized that loss and grief are fundamental aspects of many adverse life situations. When exploring workers RTW experiences in this study, loss was a central theme. However, remarkably, very little has been documented about worker's losses in the occupational health field.

Applying theories of loss to the dimensions

Disentangling the dimensions of loss is difficult. Similar to the main tenants of the theories of loss applied to other events or experiences (**Table 11.1**), in this study loss was multi-dimensional and impacted the physical, psychological and social dimensions. Injured workers experienced loss following an UL injury, either through the primary loss of the injured or amputated body part (i.e. injury related losses), or through secondary losses caused by the impact of the primary loss (e.g., losses relating to work, relationships, self). Roles and relationships are central to the meaning of loss.(408) There were tangible dimensions, such as, job loss or relationship breakdown; and intangible dimensions, (e.g., loss of control and trust). The temporal dimension of loss was also described (e.g., future oriented losses). Furthermore, losses precipitated from one another further fuelling the complex web of losses, and supporting the dynamic nature of loss and responses to loss.

A new finding that has not yet been described in the literature, related to the influence of the workers' compensation system, which intensified the impact of the workers' losses.

The theory of loss of the assumptive world, as described earlier in this chapter, may be a useful loss theory, to guide evaluation and interventions for workers with severe UL injuries.(384-386) As detailed, workers described experiences in which they experienced primary and second losses. These losses "shattered" their assumptions about the goodwill of others and the workers' compensation systems, and the meaningfulness of themselves, their roles in society, their relationships and encounters with others, and their re-integration back into the work force, and life in general. Control over the loss experience and processes were also key to how the workers coped and interpreted their RTW experiences, which also influenced how they (re-)acted in their encounters with others, their coping and responses to loss. Furthermore, for those who had invested considerable emotional resources, their physical, and psychological reserves were often depleted. The workers often became overwhelmed by the RTW processes and their negative encounters with other stakeholders, impacting on the workers' capacity to cope and make meaning from their losses. When losses become insurmountable, the workers lost trust in others and the systems, theoretically designed to support them.

Similarly, loss theories that emphasise the influence of the social environment,(389-391) can be applied. That is, the context of the Australian workers' compensation and health care systems, as well as the immediate social environment (e.g., domestic and community life). In particular, the workers' compensation system unquestionably intensified the loss experiences for the workers with severe UL injuries, and impacted on RTW processes and outcomes. This highlights the multi-faceted nature of loss and the systems-influence on the loss experience, which has not been explored in the occupational health literature. This permeated across various levels, from the workers with the UL injury, to the external influences of others (e.g., insurance agencies and employers). As a theory of loss, and the influence of the workers' compensation system on loss, has not yet been applied to workers with UL injuries in the occupational health literature, this will be discussed below.

Intensification of losses caused by workers' compensation systems

In this study, the workers' compensation system intensified the workers' loss experiences and this consequently impacted on RTW outcomes. One aspect of this was the loss of control that appeared to be exacerbated by insurers, and to a lesser extent HCPs and employers, whom the workers perceived to be in the driver's seat with respect to decisions and choices. Previous research has found that the social context in which the loss occurs has a significant effect of one's reactions to loss.(391) This has been linked to the amount of support provided by the stakeholders in these systems. A perception of positive social support has been associated with positive responses to loss.(409) Strong social supports lead to empowerment, higher self-esteem and self-efficacy, which in turn leads to lower psychological distress.(410) With respect to interventionists providing support to those experiencing loss, the link between support and positive responses to loss is complex, and has been thought to depend on a number of factors including: the type and duration of loss;(380, 386) the HCPs reaction to the loss;(391) the rapport between the provider and the recipient;(411) and the providers evaluation of the costs and benefits of providing support.(412)

The workers in this study reported limited power over decisions and choices related to their treatments and RTW. This was contributed by workplace health and safety legislation and the policies and procedures of the insurance agencies and employers. This resulted in workers feeling frustrated and angry towards a 'helping' system that paradoxically didn't seem to treat them fairly. Assumptions about the world are the consequences of learned responses associated with an even being linked to how a person reacts.(386) Loss challenged the workers sense of security causing them to question their 'shattered' assumptions, and prompting them to respond in certain ways. This often challenged the workers' resiliency and efficacy to move on and recover, and in turn, affected how they trusted those around them and the systems in which they were operating.(381) Unfortunately, distrust of possible sources of help can often occur when individuals need it most.(386) Hence, Ward and Meyer have argue that *trust* is the 'glue' to social cohesion between interpersonal and systemic levels of society,(413) and therefore should be forefront in frameworks for (work) disability prevention.

Choice and trust issues in workers' compensation settings are not a new problem. Similar findings have also been found in previous studies in other workers' compensation jurisdictions.(101, 222, 350, 361) A 'toxic dose' of Canadian workers' compensation systems problems contributed to workers left feeling vulnerable in a system in which they had little control, (222). In a South Australian study, workers feelings of being left “exposed, isolated and disenfranchised”, with “little control whilst spinning in perpetual circles of uncertainty” when trying to reconstruct their future work and home lives, following a work-related injury.(350)

Responses to loss and implications for rehabilitation

Adapting to loss is contingent upon an individual’s ability to accommodate the loss internally in a meaningful way.(386) Workers responded to their losses based on their experiences whilst navigating the workers’ compensation system. This had often deleterious effects on stakeholder encounters and often compromised their recovery and RTW outcomes. Some workers felt overwhelmed by their loss experiences, which sometimes resulted in devastating psychological manifestations. In these cases, despite solutions being proffered in the later stages of their recovery, the workers described responses by stakeholders that were reactive, rather than proactive. Therefore, issues surrounding a workers’ loss should be discussed in the early stages of rehabilitation when interventions (such as, adjustment to injury counselling, or realigning control to the worker with respect to decision making and choices for treatments/RTW options) may be more effective.

The findings indicate that the workers’ compensation, and to an extent, the health care system, do not sufficiently support injured workers experiences of loss, which makes them vulnerable. It appears that current rehabilitation/RTW programs, in practice, don’t seem to provide sufficient support at the front end with respect to managing workers’ experiences of loss. This is further compounded by our systems unintentionally creating power imbalances with the worker feeling like they have no control over their own outcome.(7, 361, 403) If loss is not acknowledged as part of the natural recovery process through appropriate needs assessment, then opportunities to provide interventions to minimize loss may be missed. These will undoubtedly cause barriers in the RTW process, which may slow progress and contribute to poorer disability outcomes.(222) However, if a worker’s loss is addressed, it may also indirectly help employers to also reduce their losses (for example, by a worker coping better with their losses and facilitating recovery and RTW). Currently legal systems in some jurisdictions, compensate for loss in monetary terms following significant injury resulting in disability.(407) Addressing loss earlier in the recovery process may logically help to reduce claims associated with physical and psychological losses, if the ‘invisible’ secondary losses, are remediated.

The current system, as it appeared from the perspective of the workers with severe traumatic UL injuries, was oriented towards the needs of other stakeholders, and as a result their own needs and concerns were often not acknowledged or addressed. Workers' compensation schemes have been criticised for being anti-therapeutic.(7) Previous research supports our finding that workers feel ' lost' navigating a complex and seemingly bureaucratic workers' compensation system.(7, 222, 350) Workers in these systems felt they lacked information explaining the compensation process, or the information was provided in language that was difficult to understand.(222, 414) Using a framework of loss may be a way of considering some of the key psychosocial, emotional and physical aspects that impact on a workers' recovery and cause barriers to returning to work. Hence, a worker-centric paradigm has been proposed as one method to improve workers' experiences in their RTW journey.(7) Worker-centric solutions, such as increasing control over a workers rights to choose (or at least being actively involved and considered in the decision making process for) treatments and RTW solutions best suited to their personal preferences and needs (including access to vocational retraining earlier in the recovery trajectory) may be a small step in the right direction, especially for workers whose injuries necessitate such changes. Improving the quality of communication with workers so that they are better informed regarding the processes might also enhance workers control over their recovery. Accepting the normality of grieving/coping for loss and the importance of individual interpretation and experience of loss, encourages the recognition of loss and facilitated adjustment to losses. Hence, the role of stakeholders, and in particular HCPs, in managing loss should not be evaded. The HCP should be less of a director of the coping process, and more of a facilitator seeking the most appropriate means to assist injured workers to establish meaning and adjust to their changed circumstances.(381, 392) This suggests an interdisciplinary focus on managing these injuries. Goldsworthy suggests that such an approach will remove the language of pathology and illness, and instead frame it as part of the experience of change that naturally occurs after experiencing a loss.(404)

Future oriented losses were also a main concern, with respect to workers' ongoing physical impairment influencing their employability, and participation in future roles. Workers grieved the loss of their pre-injury lives and their reconstruction of their perceived future lives. Central to this, is the importance of establishing realistic future goals and providing workers with the resources to recreate meaningful assumptions. Vocational counselling could play an important role in helping workers to adapt. However a number of workers reported that this was not offered to them throughout the course of their workers' compensation claim.

What this study adds to the existing literature is that losses were intensified by 'unnatural' change, i.e., change related to being caught up in workers' compensation systems. Whilst the literature has focused on loss as a result of the actual health condition, our study found that systems problems can exacerbate loss and result in maladaptive coping behaviours - that is, the systems force the workers to respond to their losses in certain ways that may not be conducive to recovery and optimal RTW outcomes. Thus, we have proposed a number of recommendations that should be considered when developing care plans for injured workers with respect to their loss experience. These include: adequate needs assessment with discussion of worker's loss and coping; collaborative goal setting inclusive of the injured worker mindful of the needs and losses of all stakeholders involved; maximizing the use of support networks; providing support for loss of non-occupational roles; improving psychosocial functioning and coping; incorporating strategies to empower the worker to feel in control of decision making and problem solving; and, providing vocational support during the claim and beyond.

Methodological considerations and implications for future research

This qualitative study using interviews of injured workers was exploratory and open-ended. The methods provided a solid foundation supporting the exploration of loss as an important consequence of traumatic UE injuries. The methods allowed us to explore a wide range of loss experiences from the time of injury, during the claim process, first RTW and longer-term vocational implications, from the data of a larger qualitative study. The approach used was an iterative, phenomenological approach allowing complex concepts to be examined from the perspective of the injured workers. Key strengths are the purposeful sampling across Australian jurisdictions, age range, time following injury, gender representation and geographical region. The study utilized a systematic data analysis approaches using an iterative approach. Future studies could focus on the loss experiences of other stakeholders and how these loss experiences act as influencing factors in the RTW process. While this study identified key themes of loss, this study only touches the surface of broader system related issues with respect to loss of trust in government-regulated systems, quality of stakeholder engagement and the long-term implications of loss as a model to explain barriers to RTW, long-term employability and general working health and wellbeing.

11.8 Conclusions

Loss experienced after severe traumatic UL injuries has the potential to change people's lives. It may be experienced differently for each person, but the consequences can result in long-term effects on both recovery and work disability. The primary loss occurs when workers sustained a severe traumatic injury to their hand or arm. Secondary losses precipitate in both seen and unseen states and often snowballed causing further issues. These losses were intensified by systems problems, for example, workers' compensation systems. Therefore, a theory of loss applied to occupational health should emphasize the uniqueness of loss in this context with respect to not only the phenomena of interest (that is, UL injuries), but perhaps more importantly the setting and the diversity of stakeholders involved. This adds an extra complexity to the traditional theories of loss.

11.9 Acknowledgements

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SECTION H: Summary of Findings, Methodological Considerations and Implications for Best Practice and Future Research

CHAPTER 12: Summary of Findings, Methodological Considerations and Implications for Best Practice and Future Research

12.1 Introduction

This thesis examined factors that influence the return-to-work (RTW) process and outcomes for workers who have had surgery for upper extremity (UE) conditions/injury, from the perspective of key stakeholders including workers, employers, insurers, health care providers (HCPs), lawyers and international experts. The final chapter of this thesis will summarise the findings from the program of studies with respect to the thesis aims. This will be followed by a discussion of methodological considerations, and implications for RTW stakeholders and future research.

12.2 Summary of study findings by thesis aim

Aim 1: To identify gaps in the literature on RTW following UE surgery.

The scoping review revealed that there was a dearth of studies that have focused on examining factors influencing RTW for non-traumatic and traumatic UE conditions, and the surgeries required to manage these conditions/injuries (**Section B**). Specifically it identified substantial gaps in the existing literature. These gaps informed **Aims 2 - 6** of this thesis.

Aim 2: To generate a list of barriers and facilitators for RTW following surgery for UE conditions, that warrants future research and could be used to inform clinical practice.

Several methodological approaches (systematic review, stakeholder survey, Delphi study) were used to generate a list of factors warranting further study to investigate their association with RTW and long-term work disability (**Section C**).

Table 12.1 contains the factors that warrant further investigation and should be considered in both screening for potential risk factors for delayed and interventions to inform clinical practice.

More psychological and social factors were identified (than biological/demographic factors), supporting the impact of these factors on (work-) disability outcomes. Furthermore, the systematic review identified few studies that have examined factors that facilitate RTW and/or were associated with shorter work disability periods. Yet, experts in the Delphi study identified a greater number of RTW facilitators than barriers. Hence, it is recommended that future studies should examine the prognostic potential of factors as either facilitators and/or barriers to RTW.

Table 12.1: Factors generated from studies

Factor	Systematic Review*	Stakeholder Survey**	Delphi***
Biological / Demographic			
Two or more musculoskeletal pain sites	-	▯	-
Pre-operative work absence due to condition	-		
Pain intensity		▯	
Poor overall body function		▯	
Age	-		
Income	-		
Psychological			
Recovery Expectations	-	▯	+
RTW expectations (number of days desired/expected off work)	+	▯	
RTW self-efficacy		▯	+
Diagnosed mood disorder		▯	-
Coping with the pain		▯	+
Job satisfaction		▯	+
Mental Health status	-	▯	
Pain anxiety/Fear avoidance to pain	+		+
Pain catastrophising			+/-
Fear avoidance to RTW			+
Motivation to RTW			+
Social			
Job accommodation availability	-	▯	+/-
Availability of alternate, suitable of host employment		▯	+/-
Heavy lifting at work		▯	+/-
Supportive employer or supervisor		▯	+/-
Supportiveness of the workplace policies and procedures	-		+
Job control	-	▯	
Quality of co-worker relationships	-	▯	
Workers' perception of job modification		▯	
Employer's willingness to accommodate job modifications or arrange alternate duties		▯	
Return to meaningful work duties			+
Job strain	-		
Baseline work role functioning at time of surgery	-		
UE condition had altered work role	+		
Hand/wrist repetition		▯	
Supportiveness of family/spouse/partner		▯	
System-related			
Workers' compensation status	-		
Attorney involvement	-	▯	
Post-diagnosis surgical wait-time	-		

Key: (-)=Negative association; (+)=Positive association; (▯)=potential association positive or negative depending on direction of the factors e.g., lower recovery expectations associated with worse work-related outcome
* Please note that the systematic review focused on studies of workers who had surgery for CTS. The factors listed here are from the moderate to high quality studies.
** Factors were rated by >75% of stakeholders.
*** Factors were rated by >85% of experts.

Aim 3: To explore key stakeholders' (i.e., HCPs, employer, insurer, and legal representatives) perspectives of barriers and the strategies to facilitate RTW for a complex case of a worker with an upper extremity injury.

In **Section D**, Australian stakeholders reviewed a case vignette of a worker with an UE condition (CTS) with a complex case history. Stakeholders from a range of professional backgrounds identified barriers for RTW and recommended strategies to facilitate the worker's return back to work. Stakeholder groups nominated similar RTW barriers. However, the HCPs nominated more biological strategies, whereas employers and insurers nominated more psychological and social strategies to facilitate RTW. This suggests that HCPs may still be operating in a biomedical framework when recommending interventions. Stakeholders also identified far fewer strategies, and strategies did not offer solutions to remediate all possible modifiable risk factors that they identified. Tools to help identify barriers to RTW and direct RTW interventions might facilitate stakeholders to identify biopsychosocial barriers and strategies.

Aim 4: To determine the assessment tools and methods used by HCPs to evaluate barriers to RTW currently in clinical practice.

In **Section E,** Australian HCPs identified the methods they currently use to identify barriers to RTW for workers with UE conditions. A total of 59 different methods were nominated. The most common method was clinical interviewing. However, different disciplines favoured using different methods. Surgeons, occupational physicians, occupational therapists, and psychologists favoured clinical interviewing. Physiotherapists and exercises physiologists favoured the use of the Orebro Musculoskeletal Pain Questionnaire (which was developed on workers with low back pain). Hand Therapists nominated using strength assessments as their preferred method. No validated tool currently exists that identifies barriers to RTW *specifically* for workers with UE conditions. This, in addition to professionals training and discipline, may explain the wide variability of methods nominated.

Aim 5: To clarify a definition for delayed RTW and determine whether a time-point to differentiate transition from early to delayed RTW is appropriate.

Delayed RTW is a frequently used phrase to denote a poorer outcome after a workplace injury, but has been ill defined in the literature. **Section F** presented the findings from a decision analysis, to clarify a definition for delayed RTW, and whether a time-point cut-off is appropriate to define the transition from an early to a delayed RTW. Experts were divided in the definitions they selected, either as a worker ‘not returning to pre-injury (or similar) work within the expected time frame’, or ‘not returning to any type of work’. This highlights the importance of adequately defining a RTW outcome in research, as differing opinions on its definition exist. This should also be considered in clinical practice when labelling a worker who has had a ‘delayed RTW’. Furthermore, two thirds of experts believed a universal time-based cut-off to delineate a transition to a delayed RTW should be avoided. This supports the use of continuous outcome measures in studies of work disability of workers with UE conditions.

Aim 6: To explore injured workers’ lived experience to understand the structural context surrounding the barriers, facilitators and processes that may influence RTW and work disability.

The interviews with injured workers (**Section G**) revealed that a biopsychosocial model for factors influencing RTW and work disability may require an extended perspective – that is, one that has a stronger emphasis on systems and organisational interplays. From the standpoint of the workers, the RTW process was complicated by aspects of the workers’ compensation systems, which often acted as barriers to RTW. These included: i) stakeholders (HCPs, employers and insurers) roles and responsibilities being vested in their own self-interests, rather than the individual concerns of the workers; ii) rigid processes that disregarded the injury affecting the ‘whole’ person; iii) stakeholder power imbalances related to money and information; iv) systems designed to ‘fit’ the average injured worker; vi) and a short-term view for a longer-term disability. These features of being involved in the compensable process created the paradox whereby workers felt alienated, vulnerable and ‘lost’ in a workers’ compensation system that was theoretically designed to support them.

When analysing workers RTW experiences, ‘loss’ was a central, overarching theme. By applying a theory of loss, the experiences of loss helped to explain sources of barriers in the RTW process. The dimensions of loss were influenced by the workers’ encounters with stakeholders within a complex system, which prompted their (often maladaptive) responses to loss, which were generally prolonged. Workers felt that the process-oriented system focused primarily on the needs of the insurers and employers. Workers reported ‘loss of control’ over decisions and choices to do with their care and RTW. As a result, precipitating losses were amplified and culminated in workers losing ‘trust’ in stakeholders and the system itself.

These findings have important implications for understanding the dynamic and complex nature of factors and processes interacting over different levels – at the level of the injured worker, at an organizational level and at a systems level. While the earlier section (**Section C**) of this thesis worked towards generating lists of factors influencing RTW using quantitative methods, the qualitative study has highlighted yet a different perspective (**Section G**). It was evident that the workers’ experiences and encounters with other stakeholders in the RTW system can have important (potential negative) consequential effects on work disability outcomes. Therefore, this study also supports consideration of these factors in future quantitative studies, and in developing screening tools for RTW and RTW interventions for workers with UE injuries.

12.3 Methodological Considerations

Studies included in this thesis used multiple study designs including a scoping review, systematic review, cross-sectional study of key RTW stakeholders, Delphi study of international experts, and a qualitative interview study of injured workers. The inclusion of quantitative and qualitative studies were complimentary and provided a rich picture from different stakeholder perspectives to understand the factors influencing retuning to work and potentially impacting on long-term work disability. Specific methodological considerations for each of the studies are detailed in the discussion sections of each chapter. However, several points across the program of studies warrant reiteration.

A strength of the program of studies was the use of multiple methods in which data were collected from various stakeholders with representative samples from the key stakeholder groups. This allowed the unique perspective of stakeholders in the work disability field to be voiced including: the workers with the UE condition, HCPs (e.g., medical doctors and allied health professionals providing either clinical treatments or RTW services), insurance agencies (e.g., claims advisors), employer representatives (e.g., owners, RTW coordinators, human resource or injury management personnel), legal counsel and international experts who have completed research in the field. Through consideration of the perspectives of these key stakeholders, a comprehensive framework to address the research aims and individual study research questions was achieved.

An important limitation with the methodologies used for the stakeholder survey and the qualitative study was that they were based in an Australian setting, with stakeholders operating within specific legislations, regulations and practice guidelines for each Australian state. Therefore, findings from these studies may not be considered representative of the perspectives of stakeholders in other countries. However, as pointed out in the discussion sections of each of the chapters derived from these studies, common threads between some of the findings and research conducted in other jurisdictions were found. This suggests that there may be similar factors that influence work-related outcomes regardless of the legislation and insurance systems. Moreover, the Delphi study of international experts representing various countries came to strong agreement on thirteen factors warranting future research that may be applicable across jurisdictions.

Another important consideration is that the systematic review focused on surgery for a non-traumatic condition (carpal tunnel release) and the stakeholder survey and Delphi study focused on surgery following the spectrum of non-traumatic UE conditions (e.g., surgery for CTS, trigger finger, rotator cuff pathology, lateral or medial epicondylalgia, or cubital tunnel syndrome or other (neuro-) musculoskeletal tendinopathies of the UE); whereas, the qualitative study interviewed workers following surgery for severe traumatic UE conditions. Whilst the decision to focus on either non-traumatic or traumatic conditions is detailed within each chapter, this poses a limitation when generalising across studies, as factors across studies of various UE diagnoses may not be identical. It would have been preferable to replicate studies across both non-traumatic and traumatic conditions; however the limited time and resources to complete a PhD program of studies did not afford this. Therefore, the research team opted to study the populations of workers (i.e., either non-traumatic or traumatic) that best suited the research questions and to achieve the best sampling across stakeholder populations. For example, non-traumatic UE conditions were selected for the stakeholder survey as these conditions are more prevalent in the Australian working population. Hence, a greater number of stakeholders would be most familiar with managing workers with these conditions, than traumatic injuries.

12.4 Implications for future research

The scope of this thesis exploring factors influencing RTW following UE surgery was broad, thus it was not possible to answer all of the study questions comprehensively. Further research is critically needed to help us understand the factors and processes that influence work-related outcomes at both the individual (i.e., worker) and organisational level (e.g., workplace), but also at a systems level for workers with UE conditions/injuries.

Specifically, a list of factors that warrant future study to examine their ability to predict work-related outcomes was generated (**Chapter 3-6**). These factors would be best explored in a prospective cohort study in a population of workers with UE conditions. Such a study should implement this thesis' findings when developing the study protocol. Furthermore, this study could also be used to help develop a screening tool specifically for workers with UE conditions. However, when considering the list of factors generated, it is important to note that the cut-offs used in the studies were arbitrary as outlined in each chapter. Lower rated factors should not be dismissed as these may also warrant further investigation depending on the study setting, UE diagnosis and/or if populations of larger samples afford higher numbers of variables to be studied. In **Chapters 3 and 9** methodological considerations, such as defining delayed RTW should also be implemented in future studies.

An exploratory study on the assessment methods currently being used in Australian practice by HCPs was performed (**Chapter 8**). This study highlighted that different HCPs utilise different methods to assess barriers to RTW. It also highlighted the lack of screening tools that have been specifically developed or validated on workers with UE conditions. Research could further explore the processes and methods used by HCPs to identify barriers to RTW. This may also highlight some of the implementation requirements and concerns that HCPs may have in using screening tools. Ultimately, a screening tool that has either been developed or validated on workers with UE conditions/injuries and following surgery to manage these conditions is needed.

The qualitative study identified issues that influenced RTW processes and outcomes, related to systems-related problems and stakeholder encounters (**Chapters 10-11**). Issues related to encounters with RTW stakeholders, and loss of control and trust also impacted on the perceived success of work-related outcomes from the perspectives of the injured workers. Although complex in their nature, these constructs do warrant evaluation in a quantitative study as discrete prognostic factors. Future research should continue to explore how systems issues contribute to these RTW barriers and influence work-related outcomes. The findings from the qualitative study should also be considered in developing and implementing RTW interventions.

12.5 Implications for Return-to-Work Stakeholders

The findings of this thesis have not only provided a solid foundation for future research, but have also yielded findings that should be considered by RTW stakeholders in their dealings of workers with an UE condition/injury. The findings from the systematic review, stakeholder survey and Delphi study should be deliberated, in the absence of high quality prognosis studies across UE diagnoses. The results can form a dialogue when communicating with injured workers regarding potential barriers and facilitating factors in preparation for their RTW. Stakeholders should consider these factors when developing and recommending RTW interventions.

The studies in this thesis have contributed toward the greater appreciation of the heterogeneity of UE conditions and the complex and dynamic nature of returning to work following surgery. Unfortunately, this study found that HCPs still frequently used a largely biomedical perspective to identify barriers to RTW. An appreciation of the biopsychosocial model by all stakeholders will improve the effectiveness of RTW interventions. Screening for RTW barriers should utilise the biopsychosocial model as a framework.

Studies in this thesis support the use of the biopsychosocial framework for considering factors influencing work-related outcomes for workers with UE conditions (**Chapters 3-9**), however a broader approach also needs to be implemented as factors interact at the individual, organisational and systems levels. While the underlying tenants of the ‘Arena’ Model for Work Disability Prevention(9) were also supported, the findings questioned the positioning of the worker within the ‘Arena’ (**Chapters 10, 11**). Due to systems-related problems identified from the perspective of the injured workers, the Arena model lends itself to a three-dimensional framework to understand the power balance, choice and decision making processes.

Adoption of a worker-centric paradigm for the RTW process would be a good first step forward. The worker should be elevated in the system as a key decision-maker with a shared involvement in goal setting and choices for treatment and RTW. This would allow workers to have greater control in the RTW process to make decisions that will better suit their individual circumstances. This approach will promote buy-in from the injured worker and improve cooperative efforts. Workers would in turn trust that stakeholders are considering the workers interests and provide a more even playing field for all stakeholders. A culture of support, respect and trust are key elements of a worker-centric focus, which are also the main characteristics of collaboration.

12.6 Conclusions

This thesis has used various methodologies and stakeholder perspectives to explore factors influencing RTW following UE surgery. Although the aims of this thesis were achieved, there is an urgent need for more research to fully understand the prognostic effect of factors influencing RTW (and long-term work disability), and to examine the complex and dynamic interaction of biopsychosocial factors at the level of the injured worker, the level of the organisations involved in the RTW process, and from a systems perspective. The importance of screening workers with UE conditions for risk factors has not been fully appreciated. Understanding factors and processes influencing RTW can help design effective interventions designed to both remedy modifiable barriers which contribute to a poorer (work) disability outcome, and emphasize facilitators to support RTW.

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Appendices

Appendix I: Medline OVID Search Strategy

1	Carpal Tunnel Syndrome.mp. or Carpal Tunnel Syndrome/
2	(carp$ tunn$ or tunn$ syndrom$ or carp$ syndrom$).mp. [mp=protocol supplementary concept, rare disease supplementary concept, title, original title, abstract, name of substance word, subject heading word, unique identifier]
3	(nerve entrapment or nerve compression or entrapment neuropath$).mp. [mp=protocol supplementary concept, rare disease supplementary concept, title, original title, abstract, name of substance word, subject heading word, unique identifier]
4	median nerve entrapment.mp.
5	nerve compression syndrome/s or nerve compression syndrom$.mp. [mp=protocol supplementary concept, rare disease supplementary concept, title, original title, abstract, name of substance word, subject heading word, unique identifier]
6	1 or 2 or 3 or 4 or 5
7	epineurotomy.mp.
8	reconstruct$.mp.
9	Release.mp.
10	SURGERY.mp. or General Surgery/
11	Surgical Procedures, Operative/ or SURGICAL PROCEDURES.mp.
12	Carpal tunnel release.mp.
13	Surgical approach.mp.
14	Surgical technique.mp.
15	(surgery or surgical or operation).mp. [mp=protocol supplementary concept, rare disease supplementary concept, title, original title, abstract, name of substance word, subject heading word, unique identifier]
16	7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15
17	Exp work/
18	Exp employment/
19	Sick Leave/ or return to work.mp.
20	Return to employment.mp.
21	Exp absenteeism/
22	unemployment.mp. or Unemployment/
23	(sick$ absence or sick list$).mp. [mp=protocol supplementary concept, rare disease supplementary concept, title, original title, abstract, name of substance word, subject heading word, unique identifier]
24	Time off work.mp.
25	Workloss.mp.
26	Work resumption.mp.
27	Work disability.mp.
28	17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27
29	Exp cohort study/
30	Exp follow-up study/
31	Exp prospective study/
32	Exp retrospective study/
33	Incidence.mp. or Incidence/
34	Mortality.mp. or Mortality/
35	(prognos$ or predict$ or determin$).mp. [mp=protocol supplementary concept, rare disease supplementary concept, title, original title, abstract, name of substance word, subject heading word, unique identifier
36	Course.mp.
37	29 or 30 or 31 or 32 or 33 or 34 or 35 or 36
38	6 and 16 and 28 and 37 129

Appendix II: Verification of Study Eligibility Form

Study Name:
Author:

Inclusion Criteria	**YES**	**NO**
Studies included patients that have undergone a CTR and are returning to work		
Participants included those employed for a wage at the time of the surgery		
Study design was longitudinal and the paper reported results with statistical analysis appropriate to prognostic studies (multivariate statistics)		
Studies included investigation of at least one prognostic factor		

INCLUDE **YES / NO**

Comments:

Critical Appraisal of Cohort/Case Control Studies

Name of Reviewer: ____

Record Number: _________________________________

Paper: ____

Year: ______________ Author: ____________________________________

Criteria	YES	NO	Unclear
JBI Cohort/Case Control Specific Questions			
1. Is sample representative of patients in the population as a whole?			
2. Are the patients at a similar point in the course of their condition (post-surgery)?			
3. Has bias been minimised in relation to selection of cases and of controls?			
4. Are confounding factors identified and strategies to deal with them stated?			
5. Are outcomes assessed using objective criteria and were the outcomes defined in adequate detail?			
6. Was follow-up carried out over a sufficient time period?			
7. Were the outcomes of people who withdraw described and included in the analysis?			
8. Were outcomes measured in a reliable way?			
9. Was appropriate statistical analysis used and was there enough information provided to interpret the results provided?			
Question Specific to identifying bias for Prognostic Factors Review			
10. Was there clearly defined and justified constructs of what prognostic factor(s) were measured?			
OVERALL JBI APPRAISAL: ***INCLUDE / EXCLUDE*** ***COMMENTS:***			

Appendix IV: Data Extraction Instrument

DATA EXTRACTION INSTRUMENT – PROGNOSTIC STUDY

Study:

Author/s:

Year:

Reviewer:

DESCRIPTION OF STUDY

Study Design:

Method:

Setting:

Participants:

Inclusion/Exclusion Criteria:

No of Participants:

Timing:

PROGNOSTIC FACTOR/S INVESTIGATED

DEFINITION OF FACTOR/S	METHOD OF MEASUREMENT

OUTCOME MEASURES

DEFINITION OF OUTCOME/S	METHOD OF MEASUREMENT

RESULTS

Prognostic Variables	**Univariate Analysis**			**Multivariate Analysis**		
	OR	**95% CI**	**P value**	**OR**	**95% CI**	**P value**

AUTHORS CONCLUSIONS

REVIEWERS COMMENTS

COMPLETE YES / NO

QUALITY OF STUDY:

Appendix V: Description of included studies

Study	Study Design	Setting / Methods of data collection	Participants	Pre-operative Variables	Work Outcome	Timing of outcome assessment
Amick 2004(192) Analysed from *"Work and Carpal Tunnel Study in Maine"*	Prospective community-based observational study	Community based physician offices in Maine USA April 1997-Oct 1998 Mailed questionnaire (Prognostic factor & outcome measurement)	197 recruited 181 returned ≥1 questionnaire 128 at 2mo 122 at 6mo 80 at 12mo Mean Age 45.7 105 f; 76m 55% Workers' compensation ECTR and OCTR	**Socio-Demographic** · Age · Sex · Education · Annual household income · % Household income contributed by participant · Marital status · Number of children living at home **Clinical/physical** · 6-item wrist/hand symptoms severity scale (Levine) · Two or more musculoskeletal pain sites · Bilateral CTS symptoms · Endoscopic versus open surgery · Nerve conduction study result (DML >6ms) · Baseline Health Status using the SF-12 Physical Component Score · General baseline comorbidity count (summed number of chronic health conditions) **Psychosocial** · 4-item self-efficacy scale in managing symptoms and activities · Depression- score of <52 on SF-36 MHI-5 · High family social support **Work-related** · Baseline work role functioning · Degree of hand/wrist force and repetition · Psychosocial job conditions (Job Content Survey) · Job accommodation availability · Employer size · Employee union membership · Appropriate organisational policies and procedures **Economic/legal** · Workers compensation · Hired attorney **Post-operative** · Change in symptom severity scale between baseline and follow-up · Change in self-efficacy score · Change in depression status · Presence of scar tenderness	Successful work role functioning (Work Role Functioning Measure includes 5 domains: Work scheduling demands; psychological demands; social demands; Physical demands; Output demands)	2, 6 and 12 months Only 2 and 6 months analysed
Atroshi 1998(200)	Prospective observational study	Sweden Independent assessor	140 recruited 128 analysed Mean Age: 51 (Range 21-94)	**Socio-Demographic** · Age · Sex · Dominance	Time to RTW after surgery	3 and 6 months

		completed a standardized evaluation	96f; 32m 2-portal ECTR	**Clinical/physical** · Daytime numbness and tingling (present/absent) · Nocturnal paraesthesia (present/absent) · Diminished sensibility (present/absent) · Patient reported weakness (present/absent) · Phalen's sign (present/absent) · Tinel's sign (present/absent) · Thenar atrophy (present/absent) · Static two-point discrimination · Grip strength · Lateral pinch strength · Distal motor latency · ADL score (study specific questionnaire; 5 point scale) **Psychosocial** – none reported **Work-related** · Type of work · Vibration exposure **Economic/Legal** – none reported **Post-operative*** · Palmar pain · Tenderness of scars/proximal midpalm, thenar or hypothenar regions · Complications · Satisfaction with surgery		
Butterfield 1997(203)	Cross-sectional observational study Phase 2 prognosis study	Oregon, USA Data collected May 1993. Surgery was August 1990 – February 1993. Insurance Claims Database (Prognostic factor & Outcome) + Mailed Questionnaire (Prognostic Factor) + Medical Report audit (Prognostic factor)	509 eligible 324 recruited 196 CTR participants 192 analysed 109f; 83m Mean Age: 40 (18-75) All participants were Oregon State WC Both ECTR and OCTR included	**Socio-Demographic** · Sex · Martial Status · Hand Dominance · Ethnicity (Race) · Age · Education level **Clinical /Physical** · Severity of symptoms (Levine CTS questionnaire) · CTS severity for both hands (no evidence of CTS; mild; moderate; severe) · Functional status (Levine CTS questionnaire) · General Health/Quality of Life (SF-36) · Unilateral or bilateral surgery · Rehabilitation before surgery · Low energy / high fatigue **Psychosocial** · Mental health status (SF-36) **Work-related** · Occupation · Frequency of hand intensive tasks (low; moderate; high) (adapted NIOSH scale) · Job accommodation (had the employer modified the job activities or work setting) · Perceived low control over work tasks (adapted NIOSH scale) · Perceived high ambiguity in work role (adapted NIOSH	Time loss days (administrative data)	Cross-sectional Participants were between 5 months and 3 years post-op

				scale) **Economic / Legal** · Attorney involvement · Claim duration · Ability to "get along on your income" **Post-operative*** · Satisfaction with surgery · "It took longer than I thought to recover from the CTS release surgery"		
Carmona 1998(204)	Cross-sectional community based observational study Data subset from NIOSH Californian Health Department Cohort study	23 Hand Surgeons practices in Santa Clara County, California, USA Telephone interview using closed ended questions (Prognostic factor & Outcome)	61 eligible participants in cohort 59 analysed 42f; 17m Age: 46±10	**Socio-Demographic** · Age · Sex · Education · Hand dominance **Clinical/Physical** · Symptoms (frequency, intensity and recurrence) · Functional status · Duration of symptoms · Number and type of comorbidities · Nerve conduction study result (Motor conduction velocity <38 m/sec; Motor latency >3.5m/sec; Sensory latency >4.4 m/sec) · Previous CTR **Psychosocial** – none reported **Work-related** · Decision latitude (Job Content Questionnaire (Schwartz)) · Psychological workload measuring perceived job demands (Job Content Questionnaire (Schwartz)) · Ergonomic demands (NIOSH modified questionnaire) – time / intensity of exposure to repetition, force, awkward, constrained postures, vibration, extreme temperature · Occupational Matrix (Blanc) – number of minutes assigned to physical risk factors converted into hours of exposure for each occupation · Worker believes work was cause of injury **Economic/Legal** · Workers' compensation status	Patient reported Time to RTW after CTR: Participants were asked whether they had returned to work, and whether they did so in <2 weeks, 2-4 weeks, 5-6 weeks or > 6 weeks. Those who had not returned to work were asked if they were planning to do so, and whether they would plan to return to the same of different workplace. Those who did not RTW at the final time-point were censored.	Median 12 weeks (Range 1 week to 13 years) Continuous variable was created from the responses assigning midpoint values of 1, 3 and 5 weeks.
Cowan 2011(177)	Prospective community based observational study	USA March 2005-May 2010 Worker completed Questionnaire facilitated by research coordinator (Prognostic factor & Outcome)	92 eligible participants 66 analysed 49f; 17m Age: 49.7±11.3 No participants were Workers' compensation 100% OCTR	**Socio-demographic** · Age · Gender **Clinical/Physical** · Symptoms (numbness; pain; sleep quality; weakness) · Disability of the Hand, Arm and Shoulder (Hudak 1996) **Psychosocial** · Depression (Centre for Epidemiologic Studies – Depression (Radloff 1977)) · Job burnout (Shirom-Melamed Burnout Measure (Melamed 1992)) · Catastrophic thinking (Pain Catastrophizing Scale (Sullivan 1995))	Participant completed number of days between surgery and RTW to either: · Modified work; · Full duty	Between 2-4 months

				· Pain anxiety (Pain Anxiety Symptom Scale (McCracken 1992)) **Work-related** · Work status (Full time/Part time) · Work classification (desk-based or light; intermediate; heavy labour) · Work role (employee, midlevel, leadership) · Job accommodation ("Alteration in work role") · Amount of time worker wants off work · Amount of time worker expected to stay off work · Relative desire to RTW (ASAP; after taking a week off; or when fully recovered) · Whether CTS had altered role at work (yes/no/somewhat) **Economic/Legal** – none reported		
De Kesel 2008(202)	Cross-sectional observational study using data obtained retrospectively from medical records	Medical Centre in Belgium Data collected in May 2005 for surgeries performed Jan 2005 – March 2005. Mailed questionnaire + medical records	275 participants contributing 332 hands eligible 208 participants (252 hands) completed baseline 107 hands eligible after baseline 68f; 20m Mean age 48 (SD 8) OCTR or single portal ECTR NB – Each hand was entered into the study as a separate case All participants in Belgium covered by similar insurance system	**Socio-Demographic** · Age · Sex · Marital status · Number of children · Body Mass Index **Clinical/Physical** · Smoking status · Alcohol consumption · Diabetes · Previous wrist fracture/trauma · DASH questionnaire **Workplace-related** · Occupation categorized into type or work (non-manual; light manual; heavy manual) · Working conditions (exposure to vibration; manual handling; repetition; extreme temperatures) · Whether the worker liked their job and job environment **Economic/Legal** · Self-employed or employed · Sick leave due to CTS or income replacement or social security benefit **Post-operative*** · Would recommend surgery to friends/family · Mobility (participant reported – normal, some problem severe problem) · Grip (participant reported - normal, some problem severe problem) · Scar sensitivity (participant reported – absent; some; severe)	Duration of work incapacity after surgery (Patient-reported)	Appears to be a continuous variable
Gimeno 2005(176) Subset of Carpal Tunnel Release participants	Prospective community-based observational study	Community based physician offices in Maine USA	197 recruited 181 returned ≥1 questionnaire 128 at 2mo 122 at 6mo 80 at 12mo	**Socio-Demographic** – none reported **Clinical/Physical** - none reported **Work-related** a. Job psychological demands (Job Content Questionnaire shortened version) b. Job content (Job Content Questionnaire shortened version)	1. Work role functioning (short form used for the purpose of this study) measuring physical, psychological / cognitive, social and output demands. This was used to create a three level outcome variable:	2, 6 and 12 months Only 2 and 6 months analysed

from the *"Work and Carpal Tunnel Study in Maine"*		April 1997-Oct 1998 Mailed questionnaire (Prognostic factor)	Mean Age 45.7 105 f; 76m 55% WC ECTR and OCTR	These two domains of the Job Content questionnaire were used to create a measure of "Job Strain". The scores from the two domains than allowed a four tiered variable to be created: 1) Low strain i.e., fewer demands and high control; 2) High strain i.e., higher demands and less control; 3) Active i.e., higher demands and more control; 4) Passive i.e., fewer demands and less control. **Economic / Legal** – none reported **NB** - Other variables are mentioned as covariates and are reported in Amick et al 2004.(192)	i) had returned to work and were functioning successfully (able to meet job demands at least 90% of the time; ii) hand returned to work but were functioning with limitations (unable to meet the job demands at least 90% of the time; iii) hand not returned to work for health reasons. These measures of work role functioning were then dichotomised into RTW and did not RTW at the time points.	
Hansen 2009(193)	Prospective observational study	Two regional hospitals in Denmark Participant completed questionnaires (Prognostic factor & Outcome)+ Nerve conduction study (Prognostic factor)	75 recruited 75 analysed Mean age 46 (SD 10.1) 53f; 22m 100% single portal unilateral ECTR	**Socio-Demographic** · Age · Sex **Clinical/Physical** · Boston CTS questionnaire (symptoms subscale) - Danish version · Boston CTS questionnaire (function subscale) - Danish version · Nerve conduction study result · Duration of symptoms · Comorbidities · Self-reported health status · "What do you think about your general hand status?" **Psycho-social** · "Do you think that you would be able to use your hand normally three months after the operation?" · "Are you afraid of getting chronic problems with your hand?" · "Do you blame yourself for the hand problem?" · "Do you feel yourself alone with your hand problems?" · "How supportive are your family and friends?" **Work-related** · Worker is considering a job change · "Do you find your job to be hand demanding?" · "If you look at your work, salary, career possibilities, management and colleagues as a whole, how satisfied are you?" **Economic/Legal** · Workers compensation status · Pre-operative sick leave **Post-operative*** · Change in nerve conduction study result	Duration of sick leave (participant reported)	Dichotomised into two group ≤21 days and > 21 days duration of sick leave
Katz 1997(201) Subset of Carpal Tunnel Release participants from the *"Maine*	Prospective community based observational study	Maine, USA Recruitment through practices of physicians July 1992 – October 1993	184 eligible 167 enrolled 135 analysed 93f; 42m Age not reported 56% Workers'	**Socio-Demographic** · Age · Sex · Marital status · Education **Clinical/Physical** · Grip strength	Participant self-report of whether they were out of because of their CTS	6 months post surgery

CTS Study"		Questionnaires (Prognostic factor & Outcome) and physical examination (Prognostic factor) completed by study personnel Pre-surgery was completed in person. Six month data was completed by mailed questionnaire.	Compensation 24% ECTR; 76% OCTR	· Two-point discrimination · Tinel's sign · Phalen's sign · Smoking status · Consumed > 2 alcoholic drinks / day · Symptoms severity (Levine CTS questionnaire (1993)) · Functional status (Levine CTS questionnaire (1993)) · Previous CTR **Psycho-social** · Worse mental health score subscale (SF-36) **Work-related** · Occupation (US Census Occupation Codes and aggregated into managerial / professional; technical / administrative; serve; farming; forestry/fishing; craft; labourer / machine operator) · Frequency of UE stressors at work (Twisting motions; hyperextension/flexion; forceful pulling/pushing; lifting >10pounds; keyboard use; unpadded workstation hand rests) – *Investigator questionnaire with factor analysis completed* **Economic/Legal** · Off work due to CTS pre-operatively · Attorney involvement · Workers' compensation **Post-operative*** · Scar tenderness · Endoscopic CTR		
Katz 2005(178) *"Work and CTS in Maine study"*	Prospective community based observational study	Maine, USA Recruitment through practices of physicians April 1997-October 1998 Mailed Questionnaires (Prognostic factor & Outcome)	197 eligible and returned baseline 181 completed ≥1 follow-up questionnaire (168 2months; 158 6 months; 157 12 months) 105f; 76m Mean Age 45.7 55% Workers' Compensation ECTR and CTR	**Socio-Demographic** · Age · Sex · Years of formal education · Marital status · Number of children living at home · Household income (<$20k, $20-50k, >$50k) **Clinical/Physical** · Smoking status · Alcohol consumption (>2 alcoholic drinks/day) · Brigham Symptom Severity Scale (Levine 1993) · Brigham 6-item Functional Limitations Scale (Levine 1993) · Driving status · Participation in vigorous activities · Sleeping status · Duration of symptoms (months between onset and baseline) · Presence of musculoskeletal discomfort in hand, wrist, forearm, elbows, shoulders, neck, back (summed number of positive responses for each site; multiplied x2 for bilateral) · Obesity - BMI · General Functional Health Status - Physical Component Score (SF-12) (Ware 1996)	Work status: Working full time / part time / not working Whether the work absence was attributed to CTS, or other reasons This information was dichotomized representing whether participants were "working" or "not working"	2, 6, 12 months

				· Nerve conduction study result (median sensory latencies) · ECTR/OCTR · Unilateral or bilateral symptoms **Psycho-social** · Psychological status / Depression: 5 item Mental Health Index (MHI-5) included in the SF-36 (dichotomized at score 52) (McHorney 1994; Wells 1989) · 4-item self-efficacy scale (Lorig 1989) · Social support measured using two items on a 4-point scale: "Whether it was easy of difficult to talk with your spouse or friends and relatives when you have a concern?" **Work-related** · Occupation (US Census Occupational Codes) · Physical exposure at work: calculated by multiplying two variables (measured on Likert Scales) and dichotomizing at 36 (Amount of repetitive hand or wrist activity x Amount of force required of the hand and wrist on the job) · Psychosocial exposure at work: perception of psychological demands, perceived control over work and job security (Karasek 1988). · Social support at work: Summed total of two item re. coworkers and supervisors (Karasek 1988) · Job satisfaction: "I am satisfied with my job" on 4-point scale · Organisational policies and procedures: Summed total of an 11–item scale measuring organization policies and procedures including people-oriented culture; safety climate; ergonomics policies and procedures; and disability management (Habeck and VanTol 1998; Amick 2011) · Number of employees **Economic/legal** · Workers' compensation claim status · Hired an attorney · Workers' compensation claim and hired an attorney · Union involvement		
Parot-Schinkel 2011(205)	Retrospective observational study	Maine and Loire regions in France Data collected in 2004 for surgeries conducted in 2002-2003 Mailed questionnaires after surgery	2284 identified 2025 included 1248 responded 935 analysed 682f; 253m *Maine* Mean age females: 47 ±8 Males: 46±9 *Loire* Female age: 46±9	**Socio-Demographic** · Age > 50 years · Sex · Geographic area **Clinical/Physical** · Duration of symptoms pre-surgery · Bilateral or unilateral release · Associated surgery · Obesity · Pregnancy · Diabetes Mellitus · Thyroid disease	Duration of sick leave (participant reported)	Continuous data analysed in 30 day intervals up to 360 days

		(Prognostic factor & outcome measurement)	Male age: 46±8 100% Mini-open CTR	· Upper limb trauma /fracture · Rheumatoid arthritis · Other musculoskeletal pain sites **Work-related** · Occupation (Farmers, self-employed, managers/executives, intermediates, lower white collar, blue collar) · Subjective imputation of cause to work · >15 years at the same job · Availability of modification of job tasks **Economic/Legal** · Workers' compensation status **Post-operative*** · Dissatisfaction with surgery		
Spector 2012(207)	Retrospective sub-study nested within a prospective observational community based study Data subset from Washington State Workers' Compensation Disability Risk Identification Study Cohort	Washington State Workers Compensation July 2002 – May 2004 Telephone interview (Prognostic factor) + WC database (Prognostic factor & outcome)	3983 identified 2055 enrolled 690 met inclusion criteria 670 analysed 412f; 255m Mean age 44.9± 9.6 All participants were workers' compensation	**Socio-Demographic** · Age · Sex · Race · Ethnicity · Education level **Clinical/Physical** · Pain intensity · Pain interfered with work · No of days missed for wrist symptoms in the year prior to the workers' compensation claim · Functional Status scale (Levine CTS Questionnaire) · Duration of symptoms · Bilateral or unilateral surgery · Prior episodes of CTS symptoms · Long-term medical conditions · BMI (Height & Weight) · Alcohol consumption (Alcohol Use Disorders Identification Test) · Smoking status · Medical specialty of first provider seen **Psycho-social** · Mental Health Scale - SF36 · Catastrophizing (Pain Catastrophising Scale (Sullivan 1995)) · Vermont Prediction Disability Questionnaire (recovery expectations, relationship with co-workers) · Fear avoidance to work (Fear Avoidance Beliefs Questionnaire -work scale) **Work-related** · Occupation (Standard Occupational Classification System) · Industry (Standard Industry Classification System) · Job physical demands (adapted ergonomic risk checklist / categorization of overall job as sedentary; light; medium; heavy; very heavy) · Employer offered job accommodation	1. Long term work disability (365 or more disability compensation days prior to 2 years after claim filing) 2. Long term post-surgical work disability	Dichotomised as no long term work disability(<365 days) or Long term work disability (365 or more compensated days)

				· Job psychosocial conditions (Job Content Questionnaire) · Job satisfaction **Economic/Legal** – none reported		
Wasiak 2007(206)	Retrospective community based study	WC claims database that insures 10% of USA private WC in California, Florida, Illinois, Indiana, Missouri, Texas Administrative data from claims database (Prognostic factor & Outcome) 1995-2002	1697 included participants 1078f; 619m Mean age 41.9 years (SD 10.4) All workers' compensation 83.1% OCTR; 16.9% ECTR	**Socio-Demographic** · USA jurisdiction (CA, FL, MO, TX, IN, IL) · Age · Sex **Clinical/Physical** · Type of surgery (endoscopic; OCTR) **Economic/Legal** · Days to procedure · Attorney involvement · Work disability days before surgery **Post-Operative*** · Work disability days after surgery	Number of compensated days off work (administrative data). Waiting periods were controlled for across jurisdictions. Partial disability, light duty or reduced hours was classified as time at work.	Continuous variable

NB- Although post-operative prognostic factors were measured in some of the studies, these were not a phenomena of interest for this review

Appendix VI: Tables of statistical analysis results from the included studies

Key:
ns = Not significant, no statistics reported
NR = Not reported in the results but included in the methods
sig= reported significant in the text, but no p-value reported

Work Role Functioning at 2 months post CTR

Study	Prognostic Factor	Multivariate analysis ORs (95% CI), p value
Amick 2004(192)	Worker's Compensation	2.51 (0.86-7.37), 0.094
	Physical Health Status	2.24 (0.85-5.89), 0.101
	Baseline hand/wrist symptoms/UE function	1.44 (0.67-3.09), 0.349
	Supportive work organization	1.02 (1.01-1.04), 0.005
	Baseline WRF	0.32 (0.14-0.74), 0.008
	Family social support	0.30 (0.14-0.66), 0.003
	Income	ns
	Obesity	ns
	Bilateral CTS symptoms	ns
	Depression	ns
	High physical work demands	ns
	Job control	ns
	High work-related social support	ns
	Distal median nerve latency	ns
	Type of surgery	ns
	Health-related comorbidities	ns
	Gender	ns
	Marital Status	ns
	Family Size	ns
	Union membership	ns
	Employer size	ns
	Psychosocial job demands	ns
	Job security	ns
	% household income earned by patient	ns
	Job accommodation availability	ns
	Age	NR
	Education level	NR
	Attorney involvement	NR
	Union Membership	NR
	Baseline Self-efficacy	NR

	Musculoskeletal pain sites	NR

Work role functioning at 6 months post CTR

Study	Prognostic Factor	Multivariate analysis ORs (95% CI), p value
Amick 2004(192)	Supportive work organisation	5.20 (1.68-16.05), 0.004
	Physical Health Status	1.95 (0.49-7.75), 0.345
	Baseline WRF	1.04 (1.02-1.05), 0.000
	Job control	0.91 (0.34-2.39), 0.844
	Baseline self-efficacy	0.86 (0.32-2.32), 0.770
	Musculoskeletal pain sites	0.37 (0.09-1.46), 0.156
	Income	ns
	Obesity	ns
	Baseline hand/wrist symptoms	ns
	Bilateral CTS surgery	ns
	Depression	ns
	Family social support	ns
	Worker's Compensation	ns
	Attorney involvement	ns
	High physical work demands	ns
	High work-related social support	ns
	Distal median nerve latency	ns
	Type of surgery	ns
	Health-related comorbidities	ns
	Gender	ns
	Marital Status	ns
	Family Size	ns
	Union membership	ns
	Employer size	ns
	Psychosocial job demands	ns
	Job security	ns
	% household income earned by patient	ns
	Job accommodation availability	ns
	Age	NR
	Education Level	NR

Return to work status at > 21 days post CTR (Prognostic for not returning to work)

Study	Prognostic Factor	Multivariate analysis ORs (95% CI), p value
Hansen 2009(25)	Pre-operative sick leave	7.40 (2.12-25.03), <0.05
	Pre-operative distal motor latency	1.74 (1.14-2.41), <0.05

	Blaming oneself for hand problem	1.26 (1.01-1.52), <0.05
	Known risk factors	ns
	High demands on hand function at work	ns
	Gender	ns
	Worker's compensation	ns
	Age	ns
	Duration of symptoms	ns
	Health-related comorbidities	ns
	Self-reported health status	ns
	Pre-operative function	ns
	Pre-operative symptoms	ns
	Pre-operative sensory response Finger 2	ns
	Pre-operative amplitude Finger 2	ns
	Pre-operative sensory response Finger 3	ns
	Pre-operative amplitude Finger 3	ns
	Pre-operative conduction palm to wrist	ns
	Afraid of having chronic problem	ns
	Feeling of being alone with hand problem	ns
	Belief in cure for hand problem 3 mo post-op	ns
	Consideration of job change	ns
	Support from family / friends	ns
	Job satisfaction	ns

Return to work status at 2 months post CTR

Study	Prognostic Factor	Multivariate Analysis ORs (95%CI), p value
Gimeno 2005(176)	Low psychological job demands	Reference
	Low job control	1.87 (0.76-4.58), p0.174
	High psychological job demands	ns
	High job control	Reference
	Low job strain	Reference
	High strain	0.93 (0.26-3.32), p0.909
	Passive	1.03 (0.36-2.95), p0.952
	Active: High demands/High control	0.22 (0.09-0.59),p0.003
	Job strain quotient (1st-3rd quartile)	Reference
	Job strain quotient (4th quartile)	ns
	Passive	Reference
	Low Stain	0.97 (0.34-2.77), p0.952

	High Strain Active Active Learning Quotient (1st-3rd quartile) Active Learning Quotient (4th quartile)	0.90 (0.23-3.55), p0.888 0.22 (0.65-0.74) p0.014 Reference 0.64 (0.26-1.53), p0.313

Return to work status at 3 months post CTR

Study	Prognostic Factor	Multivariate analysis ORs (95% CI), p value
Atroshi 1998(200)	Age Sex Dominance Daytime numbness and tingling (present/absent) Nocturnal paraesthesia (present/absent) Diminished sensibility (present/absent) Patient reported weakness (present/absent) Phalens Test (present/absent) Tinel's sign (present/absent) Thenar atrophy (present/absent) Static 2 point discrimination Grip strength Lateral pinch strength Distal motor latency ADL score (study specific questionnaire; 5 point scale) Type of work Vibration exposure	ns ns ns ns ns ns ns ns ns ns ns ns ns ns ns ns ns

Return to work status at 6 months post CTR

Study	Prognostic Factor	Multivariate Analysis ORs (95%CI), p value
Katz 1997(201)	Worker's compensation Pre-operative work absence due to CTS Poorer mental health status Gender (female) Age Marital status (married) Education > high school Alcohol consumption (>2 / day) Smoking status Baseline symptom severity	5.7 (1.6-21), <0.01 3.6 (1.3-9.7), <0.01 1.4 (1.1-1.7), <0.01 ns ns ns ns ns ns ns

	Baseline function status Grip strength Bilateral surgery Attorney involvement Exposure to repetition / force Keyboard use Type of surgery (ECTR) Occupational Category	ns ns ns ns ns ns ns ns
Katz 2005(178) **NB:** significance level was set at p=0.15	Attorney involvement More than 2 MSD sites Lower income Sex Education Occupation Smoker Alcohol intake Marital status Symptom severity Functional limitations Duration of symptoms BMI Bilateral/unilateral symptoms Type of surgery Sensory latency Mental health state Depression Self-efficacy Supportive family Income Worker's compensation Exposure to force and repetition Workplace psychological demands Job control Supportive work colleagues Supportive supervisors Job security Job satisfaction Union involvement No of employees Not working pre-operatively Less supportive organisational policies and procedures	8.8 (2.0-38), 0.15 4.3 (1.2-15), 0.15 3.6 (1.5-8.8), 0.15 ns ns ns ns ns ns ns ns ns ns ns ns ns ns ns ns ns ns ns ns ns ns ns ns ns ns ns ns ns ns

	Age (per 10 years)	ns
Gimeno 2005(176)	Low psychological job demands High psychological job demands High job control Low job control Low job strain Passive Active: High demands / High control High strain Job strain quotient (1st-3rd quartile) Job strain quotient (4th quartile) Passive (Karasek quadrant) Active Low Stain High Strain Active Learning Quotient (1st -3rd quartile) Active Learning Quotient (4th quartile)	Reference ns Reference 0.64 (0.23-1.75), p0.381 Reference 1.11 (0.29-4.31), p0.882 1.03 (0.27-3.93), p0.966 0.35 (0.09-1.49), p0.148 Reference 0.14(0.04-0.43), p0.001 Reference 0.93 (0.23-3.73), p0.917 0.90 (0.23-3.51), p0.882 0.32 (0.86-1.17), p0.084 Reference 0.93 (0.27-3.26), p0.915
Atroshi 1998(200)	Age Sex Dominance Daytime numbness and tingling (present/absent) Nocturnal paraesthesia (present/absent) Diminished sensibility (present/absent) Patient reported weakness (present/absent) Phalen's Test (present/absent) Tinel's sign (present/absent) Thenar atrophy (present/absent) Static 2 point discrimination Grip strength Lateral pinch strength Distal motor latency ADL score (study specific questionnaire; 5 point scale) Type of work Vibration exposure	ns ns ns ns ns ns ns ns ns ns ns ns ns ns ns ns ns

Return to work status at 12 months post CTR

Study	Prognostic Factor	Multivariate Analysis ORs (95%CI), p value
Katz 2005(178) NB – significance level was set at 0.15.	Less supportive organisation Worse physical function Older age (per 10 years) Attorney involvement More than two musculoskeletal pain sites Lower income Sex Education Occupation Smoker Alcohol intake Marital status Symptom severity Duration of symptoms BMI Bilateral/unilateral symptoms Type of surgery Sensory latency Mental health state Depression Self-efficacy Supportive family Income Worker's compensation Exposure to force and repetition Workplace psychological demands Job control Supportive work colleagues Supportive supervisors Job security Job satisfaction Union involvement No of employees Not working pre-operatively	2.94 (1.18-7.34), 0.15 2.02 (1.21-3.39), 0.15 1.8 (1.07-3.01), 0.15 ns ns ns ns ns ns ns ns ns ns ns ns ns ns ns ns ns ns ns ns ns ns ns ns ns ns ns ns ns ns ns

Long-term work disability (≥12 months of work disability compensation prior to 2 years after claim filing)

Study	Prognostic Factor	Multivariate analysis ORs (95% CI), p value

Spector 2012(207)	Pre-surgery disability compensation	5.38 (2.89-10.01), <0.001
	CTS Functional score > 75th percentile	4.87 (1.53-15.37), <0.05
	CTS Functional score 50-75th percentile	2.89 (0.89-9.33), ns
	Low recovery expectations	2.51 (1.39-4.54), <0.05
	CTS Functional score 25-50th percentile	2.23 (0.73-6.78), ns
	Poor-medium relations with co-workers	2.09 (1.12-3.89), <0.05
	Job satisfaction (dissatisfaction)	2.08 (1.03-4.22), <0.05
	Pain intensity 8-10	1.87 (0.57-6.09), ns
	≥30 work days missed for wrist in past year	1.69 (0.76-3.80), ns
	Smoker	1.64 (0.92-2.94), ns
	No health related comorbidities	1.61 (0.84-3.07), ns
	High to very-high work fear avoidance	1.35 (0.66-2.74), ns
	Pain interference with work	1.23 (0.50-3.05), ns
	Catastrophizing - ≥3	0.93 (0.31-2.74), ns
	Job duration ≤6 months	0.88 (0.42-1.86), ns
	1-29 Work days missed for wrist in past year	0.88 (0.40-1.95), ns
	Pain intensity 5-7	0.87 (0.29-2.61), ns
	SF-36 – 31-40	0.83 (0.39-1.77), ns
	Age – 45-54	0.78 (0.41-1.48), ns
	Catastrophising – 1-1.9	0.74 (0.26-2.09), ns
	No Bilateral symptoms	0.65 (0.29-1.47), ns
	Catastrophizing – 2-2.9	0.63 (0.23-1.76), ns
	Age - ≥ 55 years	0.62 (0.25-1.58), ns
	SF-36 – 41-50	0.48 (0.21-1.09), ns
	SF-36 - ≤30	0.42 (0.16-1.10), ns
	Job accommodation available	0.34 (0.17-0.69), <0.05

Long-term work disability after surgery for CTS

Study	Prognostic Factor	Multivariate analysis ORs (95% CI), p value
Spector 2012(207)	CTS Functional score > 75th percentile	4.31 (1.26-14.72), <0.05
	Pain intensity 8-10	3.02 (0.85-10.73), ns
	Pre-surgery disability compensation	2.94 (1.57 -5.52), <0.0001
	CTS Functional score 50-75th percentile	2.82 (0.81-9.82), ns
	Poor- medium relations with co-workers	2.26 (1.17-4.35), <0.05
	Low recovery expectations	2.15 (1.15-3.99), <0.05
	CTS Functional score 25-50th percentile	2.12 (0.64-6.95), ns
	≥30 work days missed for wrist in past year	1.97 (0.86-4.50), ns
	Job satisfaction (dissatisfaction)	1.80 (0.85-3.82), ns
	Smoker	1.66 (0.89-3.08), ns
	High to very-high work fear avoidance	1.41 (0.66-3.00), ns

	Pain intensity 5-7 1-29 work days missed for wrist in past year SF-36 – 31-40 Age - ≥ 55 years Catastrophising - ≥3 Age – 45-54 Catastrophizing – 1-1.9 Catastrophizing – 2-2.9 Heavy alcohol intake SF-36 – 41-50 Job accommodation available SF-36 - ≤30	1.28 (0.39-4.21), ns 1.05 (0.46-2.39), ns 0.98 (0.45-2.13), ns 0.92 (0.38-2.24), ns 0.81 (0.26-2.49), ns 0.80 (0.41-1.57), ns 0.75 (0.25-2.26), ns 0.61 (0.21-1.80), ns 0.55 (0.24-1.28), ns 0.41 (0.17-1.01), ns 0.38 (0.18-0.80), <0.005 0.38 (0.14-1.08), ns

Time to RTW (continuous variable)

Study	Prognostic Factor	Multivariate analysis statistic (95% CI), p value
Carmona 1998(204)		**RELATIVE RATE OF RTW** **(RR<1.0 indicates risk of slower RTW)**
	Exposure to bending-twisting of hand	0.7 (0.5-0.9), <0.01
	Aged 25-35 Aged 36-45 Aged 46-55 Aged >55 years	0.6 (0.3-1.5), 0.30 Reference 0.6 (0.3-1.3), 0.16 0.9 (0.5-1.8), 0.85
	≤12 years education >12 years, ≤14 years education >14 years education	Reference 0.6 (0.4-1.0), 0.05 0.8 (0.6-2.7), 0.69
	Female gender Workers compensation Duration of symptoms pre-operatively No. of health-related comorbidities Dominant hand operated Positive NCS Had other CTS surgery previously Exposure to hand-wrist forceful tasks Exposure to hand-wrist repetition Decision Latitude Psychological work load Occupational CTS diagnosis	0.5 (0.3-0.8), <0.01 0.2 (0.1-0.5), <0.01 ns ns ns ns ns ns ns ns ns ns

	Difference between self-reported/assigned exposure Occupational category	ns ns

Time to return to modified work (continuous) - factors prognostic for an earlier RTW

Study	Prognostic Factor	Multivariate analysis
Cowan 2011(177) **NB**: R^2 reported for the individual prognostic factors is the part correlation coefficient squared The non-significant variables listed were non-significant for all subjects	 Less expected time until RTW Less desired time until RTW Work type (desk-based) Less desired time until RTW Lower pain catastrophizing Less expected time until RTW Less desired time until RTW Less desired time until RTW Less expected time until RTW Age Gender Symptoms DASH	**Regression Coefficients** **All Subjects** R^2=0.68 F=43.8, p<0.001 R^2= 0.36 R^2= 0.06 R^2= 0.02 **Desk-based subjects** R^2=0.61 F=26.0, p<0.001 R^2= 0.45 R^2=0.15 **Non-desk-based subjects** R^2=0.70 F=35.0, p<0.001 R^2=0.53 R^2=0.05 **Full time subjects** R^2=0.42 F=33.9, p<0.001 R^2= 0.42 **Part time subjects** R^2=0.57 F=15.8, p=0.003 R^2= 0.57 ns ns ns ns

	Job burnout Pain anxiety symptom scale Work role (employee/mid-level/leadership) Work status (full-time/part-time) Job accommodation Whether CTS had altered role at work	ns ns ns ns ns ns

Time to return to full-duty work (continuous) – factors prognostic for an earlier RTW

Study	Prognostic Factor	Multivariate Analysis Regression Coefficients
Cowan 2011(177) **NB**: R^2 reported for the individual prognostic factors is the part correlation coefficient squared The non-significant variables listed were non-significant for all subjects	 Less expected time until RTW Work type (desk-based) CTS had not altered role at work Lower pain anxiety symptoms Lower pain anxiety symptoms Better post-operative DASH score* Less expected time until RTW Less desired time until RTW Work type (desk-based) Less desired time until RTW CTS had not altered work role	**All Subjects** R^2=0.43 F=12.6, p<0.001 R^2= 0.18 R^2= 0.06 R^2= 0.03 R^2=0.03 **Desk-based subjects** R^2=0.29 F=7.7, p=0.002 R^2=0.09 R^2=0.09 **Non-desk-based subjects** R^2=0.40 F=10.8,p<0.001 R^2=0.29 R^2=0.06 **Full time subjects** R^2=0.47 F=15.7, p<0.001 R^2= 0.23 R^2= 0.10 R^2= 0.06 **Part-time subjects** R^2=0.47

	Lower pain anxiety symptom s Better pre-operative DASH score Age Gender Symptoms Job burnout Work role (Employee/mid-level/leadership) Work status (full-time/part-time) Job accommodation	F=5.3, p=0.03 R^2= 0.23 R^2= 0.21 ns ns ns ns ns ns ns

*Post-operative factors were not the focus of this review and will not be detailed in the review findings

Time to return to full-duty work (continuous) – factors prognostic for an longer RTW

Study	**Prognostic Factor**	**Multivariate Analysis**
De Kesel 2008(202)	 Exposure to heavy lifting Job Classification (Heavy, light, non-manual) Exposure to repetitive movements Sex (female) Exposure to vibration BMI Marital status Number of children Involved side Smoker Alcohol intake Diabetes Wrist fracture Wrist arthritis Type of CTR surgery Exposure to vibration Job satisfaction Job environment satisfaction Duration of symptoms pre-operatively Self-employed (versus employed)	**MANOVA, p-value** **Longer incapacity** F=16.4, <0.05 F=14.8, <0.01 F=14.5, <0.05 **Shorter incapacity** F=12.7, <0.05 F=2.0, <0.05 ns ns ns ns ns ns ns ns ns ns ns ns ns ns ns
Parot-		**HAZARD RATIOS (95% CI), p≥0.05**

Schinkel 2011(205)	Gender (male/female) Geographic area in France Age >50 years Bilateral release Associated surgery Obesity Diabetes Upper extremity trauma (fracture) Rheumatoid arthritis Other musculoskeletal disorders Occupation – Farmers Occupation – Self- employed Occupation – Intermediates Occupation – lower white collar workers Occupational – blue collar workers ≥ 2 year symptom duration pre-operatively Subjective imputation of cause to work >15 years at the same job Workers' compensation Job accommodation (modification of tasks) Pregnancy Thyroid disease Any personal risk factor for CTS	0.98 (0.82-1.18), ns 0.90 (0.77-1.06), ns 1.03 (0.87-1.20), ns 1.41 (1.05-1.87), 0.02 1.37 (1.13-1.67), 0.0015 1.25 (1.02-1.54), ns 1.22 (0.82-1.83), ns 1.17 (0.79-1.72), ns 0.79 (0.42-1.49), ns 1.19 (1.02-1.38), ns 1.47 (0.88-2.46), <0.0001 1.08 (0.63-1.86), ns 2.21 (1.49-3.27), <0.05 2.49 (1.71-3.61), <0.05 3.34 (2.28-4.90), <0.05 1.01 (0.87-1.16), ns 1.88 (1.43-2.48), <0.0001 1.14 (0.98-1.34), ns 1.06 (0.90-1.24), ns 0.99 (0.79-1.24), ns NR NR NR
Butterfield 1997(203)	 Decreased ability to get along on your income Attorney involvement Fewer years education Having bilateral CTR surgery (versus unilateral) Having PT or OT pre-operatively Longer claim duration Hand-intensive occupational tasks Sex Martial Status Hand Dominance Race Age Severity of symptoms CTS severity for both hands Functional status (Levine CTS questionnaire) General Health/QOL (SF-36) Low energy with high fatigue	**Regression Coefficients, p-value** β=-0.268, <0.001 β=0.22, <0.001 β=-0.182, <0.003 β=0.172, <0.006 β=0.162, <0.009 β=0.160, <0.018 β=0.115, <0.06 ns ns ns ns ns ns ns ns ns ns

	Mental health status (SF-36) Occupation Job accommodation Perceived low control over work tasks Perceived high ambiguity in work role Claim duration	ns ns ns ns ns ns Overall F 14.918 ($p<0.001$) r^2=36%, adjusted r^2=34%,
Wasiak 2007(206)	 Age Gender (female) Attorney involvement Work disability days before surgery Days to surgery Type of surgery (OCTR) Jurisdiction (Texas reference) - California Florida Illinois Indiana Missouri	**Regression Coefficients, p-value** β=-0.004, ns β=0.02, ns β=0.54, <0.01 β=0.33, <0.01 β=-0.31, <0.01 β=0.13, ns β=-2.32, <0.05 β= -0.32, ns β=-0.24, ns β= -0.22, <0.05 β= -0.88, <0.01 Intercept = 4.15, $p<0.001$ Overall F=47.93 R^2=24%

Appendix VII: Vignette

Sally is a 50-year-old woman who has carpal tunnel syndrome of her right dominant hand for the last 12 months. She works full-time as a factory worker packing food items into boxes. She has a number of absences from work due to carpal tunnel syndrome over the last few months but attributes her most recent exacerbation to increased work leading up to Christmas. All absences have been documented as work-related and she has an active worker's compensation claim. She has been prescribed a number of treatments including anti-inflammatories, hand therapy (including splinting and ultrasound) and acupuncture with little relief. Sally has found that her symptoms have been progressively getting worse over the last month. Her General Practitioner has sent Sally for a number of diagnostic tests, which were all negative. However, she continued to report symptoms of pain and tingling in her hand. Three months ago she had surgery for her carpal tunnel, and has seen the hand therapist regularly for treatment. Her therapist has reported that Sally is continuing to report higher than usual pain in her arm and appears quite anxious when work is discussed. Sally has told her therapists that she does not believe she will ever be able to return to her pre-surgery job as a factory worker, due to the repetitive nature of the work and the frequent heavy lifting. After speaking with her union representative, she has consulted a lawyer. Her doctor has requested that a suitable duties program be organized for Sally. However, Sally has indicated that she feels she has a strained relationship with her co-workers and supervisor. Her personal life is also in turmoil following the recent separation from her partner of 10 years.