
Optimising return to work practices following catastrophic injury

Briefing Document

January 2015



The National Trauma Institute (NTRI) Forum: The NTRI Forum is a three-year project that aims to improve the care of brain, spinal cord or other major traumatic injuries. The NTRI Forum's model involves defining the major challenges through consultation with key stakeholders to understand the issues and complexities; gathering and summarising from publications and further consultation the information necessary to properly consider each challenge; convening stakeholder dialogues to connect this information with the people who can make change happen; and briefing the organisations and individuals who can effect change about their role in developed strategies. For more information visit www.ntriforum.org.au

Authors

Dr Loretta Piccenna, PhD, BSc (Hons), Research Fellow

Mr Loyal Pattuwage, MPH, MSc, MBBS, Research Assistant

Ms Lorena Romero, BA, MBIT, Senior Medical Librarian, The Ian Potter Library, The Alfred Associate Professor Virginia Lewis, PhD, MA, BA (Hons), Director of Research & Evaluation Professor Russell Gruen, MBBS, PhD, FRACS, Professor of Surgery and Public Health, The Alfred and Monash University; Director, NTRI

Dr Peter Bragge, PhD, B Physio (Hons), Senior Research Fellow

All authors are from the NTRI, The Alfred and Monash University; Melbourne, Australia, except Associate Professor Virginia Lewis who is from the Faculty of Health Sciences, Australian Institute for Primary Care and Ageing, La Trobe University; Melbourne, Australia.

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Executive Summary

People with catastrophic injuries face many long-term challenges in the community as a result of their injury: one of the most problematic can be in returning to work (RTW). It may not only be a significant issue for the person with a catastrophic injury but also for their family, friends, the employment industry, and society. Worldwide mean RTW rates for people with catastrophic injury are approximately 30-40%; however, in Australia the overall mean rate is unknown. Internationally, the best RTW rates reported for moderate to severe traumatic brain injury (TBI) come from the UK, Sweden and USA, whilst for spinal cord injury (SCI) they are in Switzerland and Sweden. There are several differences in the way rates reported are calculated such as the time post-injury, making it difficult to definitively identify whether one country achieves better RTW rates than another. Several studies have been conducted to determine the factors which facilitate and limit RTW for people with catastrophic injury. These include having pre-injury employment, age, education, severity of injury, level of cognitive impairment, being functionally independent, fatigue, psychological adjustment to the change, social support and the work environment to name a few. There is a general lack of understanding of the experience of people with catastrophic injury who return to work and, therefore, little known about how job retention can be successful in the long-term.

Four types of VR interventions have been identified to facilitate RTW – 1) program based rehabilitation, 2) supported employment, 3) case co-ordination and 4) hybrid or mixed. An evidence review identified 15 relevant articles and it was found that there was limited high quality evidence to support any type of intervention more effective than the other. There was however moderate evidence identified for the effectiveness of case co-ordination for achieving successful RTW for people with moderate to severe TBI and high level evidence for a specialist TBI-VR combination intervention. A reduction in the claiming of benefits after 1 year was also observed. The most promising RTW intervention for people with SCI appears to be supported employment; however, as only one RCT has provided this evidence, further studies are required. Several factors that affect the likely success of RTW interventions were also identified in exploring the research evidence and implications for future research were identified. Substantial research has been conducted on RTW interventions in people with TBI since the late 1980s, however this is not the same for SCI. High quality evidence and transparent reporting of study details are still lacking.

This NTRI Forum aims to enhance understanding of the features of optimal return to work practices following traumatic brain and spinal cord injury and identify barriers and facilitators to their implementation.

Two questions were identified for deliberation in a Stakeholder Dialogue:

1. In the Australian context, what are the barriers to, and facilitators of, application of strategies to optimise RTW outcomes for people with catastrophic injury?
2. How could identified barriers and facilitators be addressed to ensure successful RTW and better retention of people with catastrophic injury?

An accompanying document (Dialogue Summary) will present the results of the deliberation upon these questions.

Background

Introduction, definitions and demographics

The World Health Organisation's International Classification of Functioning, Disability and Health (ICF) defines employment as "engaging in all aspects of work, as an occupation, trade, profession or other form of employment, for payment or where payment is not provided, as an employee, full or part time, or self-employed".¹ Employment is an important and valuable function of participating and contributing to society. It also provides benefits to an individual such as economic independence, an opportunity for interaction with other people, being able to contribute to an organisation's activities, structure and regularity to one's daily activities, an opportunity to develop their identity, and provide life satisfaction and improved well-being.

People with catastrophic injuries have unique challenges to face when seeking employment or returning to previous work which require significant consideration. Although improvements in treatments and systems of care in the last decade or so have enabled many people with catastrophic injuries to return to the community, their physical, cognitive and behavioural impairments still complicate the smooth return to employment. Hence, this NTRI forum will focus on catastrophic injury, defined as moderate to severe traumatic brain injury (TBI) and spinal cord injury (SCI).

People with catastrophic injuries tend to be of a younger age (16-25 years old), representing the earliest years of employment for the general population. For this reason, it is important to get these people returning to the labour workforce; so that they can receive all of the benefits (social, personal and financial) of being employed and can make a significant contribution to the economic viability of society. Being stably employed also provides people with catastrophic injuries a chance to come to terms with and adjust to their disability, as well as have greater self-esteem and a higher quality of life.^{2,3} However, several studies have revealed that only a small number of people with catastrophic injuries successfully return to employment.^{2,4-6}

Few studies have documented the real-time costs or evaluated the economic consequences to society associated with people with catastrophic injuries returning or not returning to work. In 2009, the lifetime productivity losses for TBI and SCI were estimated using average weekly earnings and reported RTW rates from published studies. In Australia, the lifetime lost earnings for moderate and severe TBI were estimated to be \$452.9 million and \$256.3 million, respectively, and for people with SCI who are paraplegic and for those with quadriplegia it is estimated at \$47.8 million and \$43.8 million, respectively⁷. These estimated costs represent significant losses for the community and society, particularly for those with moderate and severe TBI.

For people with catastrophic injuries to engage in employment two general models exist in Australia in which vocational rehabilitation services are provided – *open employment programs* which are run through Disability Employment Services (DES) and *supported employment programs* run through Australian Disability Enterprises (funded by the Australian Department of Social Services)⁸. At the local or state level, VR services are available through several private providers; however, their effectiveness in meeting people's needs is not

reported publically.

The terminology utilised across relevant studies for “employment” include such terms as work, return to work (RTW), stable employment, open employment, vocational rehabilitation, occupation, participation in work, and productive work or employment. For consistency throughout this document the terms “return to work” and “employment” will be utilised. The focus of this briefing document will be on paid employment, either full-time or part-time, excluding study or voluntary work.

Return to work (RTW) rates for traumatic brain injury (TBI) and spinal cord injury (SCI)

The rates of return to work (RTW) in people with catastrophic injury vary somewhat across different studies. This is due to the study methodology, the definition of employment utilised, time since injury and limited categorisation of the severity of injury.^{2, 9, 10} Systematic reviews have reported that the approximate RTW rates are 35%-40%^{2, 11, 12} for SCI and for TBI 30%-40%^{13, 14}. Currently, in Australia, the overall total rates are unknown for people with a catastrophic injury. In 2009, one study reviewed all SCI employment research in Australia and found the median rate was 35% (range 31 – 47%).¹² A recent study has also found that in a sample of people who have a dual diagnosis of TBI and SCI the RTW rate was 47%.¹⁵

State-wide RTW rates for TBI in Australia - Studies from some states in Australia have reported RTW rates for moderate to severe TBI¹⁶⁻²³. In Victoria, three studies using study samples reported RTW rates at approximately 2 years post-injury – 40% (n=30)¹⁹, 35% (n=36)¹⁶, and 55.5% (n=131)¹⁷. In NSW, the RTW rate for severe TBI has been reported in several studies ranging from 9- 46% (n=25-47)²⁰⁻²³. In Queensland, one study reported a 2 year post-injury rate of 38% (n=79)²⁴.

State-wide RTW rates for SCI in Australia - A systematic review concluded that collectively studies in Australia reveal a RTW rate of 35% (range 31 - 47%) and were more consistent than those in the USA and Europe¹². In NSW, one study has reported the RTW rate for a sample of people with SCI at 32% (n=28)²². One study in a Queensland reported the RTW rate post-injury of 29%²⁵. Several studies have been conducted in Victoria (n=3), with the RTW rate ranging from 30-40% (n=219)²⁶⁻²⁸.

International RTW rates for people with moderate to severe TBI

- **Norway** - In a prospective cohort study of people with moderate to severe TBI (n=100) in a Norway Trauma Centre following 2 years the rate of RTW was 44%²⁹.
- **USA** - Several studies have reported RTW rates in people with moderate to severe TBI^{14, 30-33}, most commonly at 1 year post-injury – with a mean rate of 50%.
- **UK** - The RTW for people with moderate to severe TBI in the UK has been reported as 60.6% in one study following 0.5 – 4 years post-injury³⁴
- **Italy** - In Italy, one study of people with severe TBI (n=230) reported a RTW rate of 54.3% at 2-10 years post-injury³⁵

International RTW rates for people with SCI

- **Canada** - A survey in Canada has revealed that the RTW rate for people with SCI is 36% (in comparison to 70% of peers)³⁶. In another study, it was found that people that did return to work did not go back to their previous pre-injury employment, worked part-time rather than full-time, earned lower wages and looked for employment that was less physically demanding.²
- **Sweden** - A couple of studies have reported RTW rates in Sweden with a mean of 55%^{28, 37, 38}.
- **Netherlands** - A similar rate has been reported in the Netherlands with 50%³⁹. A

systematic review analysed studies of people with SCI post-injury who returned to work¹². It found that RTW rates were higher and more consistent than those in North America, particularly at 1 year and less than 10 years post-injury. The authors also reported that at 5 years or more post-injury the RTW rate (of mostly Scandinavian countries) was approximately 50-55%.

- **Switzerland** - A recent survey of current employment rates in Switzerland was conducted through the Swiss Paraplegic Association in 2008. The participants who returned the questionnaire (n=459) revealed that the RTW rate was 63.8%, however the authors acknowledge the low response rate received cannot be generalised to all the SCI population⁴⁰.
- **USA** - The RTW rates for the USA vary significantly across states and at 1 year post-injury are very low – 22-25% collectively across studies.¹² The rates in Midwestern USA were significantly higher with a mean of 49% (range 38 – 55%), however the authors of a systematic review caution that all the studies were conducted by one set of researchers and that people in this region are more highly educated than other regions in the USA.
- **New Zealand (NZ)** - In NZ, the overall RTW rates for both TBI and SCI at 10-15 years post-injury have been reported as 31%⁴¹. One study has reported a rate of 72% (n=7), however time post-injury varies from 1 – 8 years⁴².

In summary, the RTW rates are diverse across countries. It is difficult to compare different countries due to factors including sampling bias, different follow-up periods, and poor response rates. However, based on the available evidence it can be noted that the European Countries appeared to have better RTW rates in comparison to other countries, such as Australia.

Stability and Trajectory Studies of RTW rates

A further challenge for a person with catastrophic injury who has successfully gained employment is in trying to achieve stability in their employment, and importantly, retaining their employment in long-term. Although (as described above) several studies have reported RTW rates following catastrophic injury usually at 1 or 2 years post-injury, there are limited studies on the stability of employment over the long-term post-injury trajectory. Recently however, a few studies have started to provide some insight into the stability of employment in the first 5 years following catastrophic injury^{17, 43, 44}.

Traumatic brain injury (TBI)

Two recent studies have analysed cohorts of people with moderate to severe TBI in Victoria, Australia¹⁷ and in Norway⁴⁴. Ponsford and Spitz (2013) utilised a cohort (n=236) receiving rehabilitation and measured their employment status at the time points 1, 2 and 3 years following their injury¹⁷. Most people in the cohort had pre-injury employment in roles such as trade/technician workers, labourers or professionals. Modelling through logistic regression analysis found that there was a 98% probability that people who had a lower education pre-injury, were a machine operator or labourer experienced longer durations of post-traumatic amnesia (PTA), lower mobility, and cognitive difficulties (such as memory, planning, concentration and speed of thinking) had greater instability in employment. It was also reported that at each of the 3 years of follow-up, there were 44% of people from the cohort who were in stable employment.

Another recent study in a cohort of people with moderate to severe TBI (n=105) from a Trauma Centre in Southeast Norway were followed at 1, 2 and 5 years post-injury⁴⁴. Most participants were in employment pre-injury (81%), however this decreased to 51%, 44% and 55% at 1, 2, and 5 years, respectively. Following modelling with logistic regression analysis, it was revealed that there was higher probability for greater instability in employment if

people were of a younger age, had a lower Glasgow Coma Scale (GCS) score at hospital admission, had a greater length of hospital stay and a greater length of PTA. The authors reported 39% of people in the cohort were in stable employment, similar to the study above. A commonality between the two studies was the longer duration of PTA which affected job instability over the long-term.

Spinal Cord Injury (SCI)

One study has looked at the employment trajectories in a cohort of people with SCI (n=176) in 8 rehabilitation centres in The Netherlands at 5 years post-injury⁴³. Following modelling and logistic regression analysis, there was a higher probability for instability identified for people without a secondary education and a lower FIM motor score at discharge. The authors reported that 21.6% of people were in stable employment. This has been the only study to investigate and report on the employment trajectories in people with SCI.

In looking over the long-term at return to work for people with catastrophic injury, factors which are more likely to be associated with successful return to work can be identified and utilised in the design of interventions and strategies for retention of employment and less socioeconomic losses.

Positive and negative factors associated with or predictive of RTW

Many studies have investigated predictive factors at the personal and environmental level, which are associated with employment outcomes following catastrophic injury.

Traumatic brain injury (TBI)

Positive factors from two studies reported that the presence of determination in the injured individual, employer support and benefits and adaptability of the individual were key to successful employment. Negative factors included difficulty learning new information, substance abuse, presence of fatigue, lack of employer support, change in self-identity (sense of loss of function and/or loss of confidence), keeping up with work due to attentional and memory difficulties, behavioural and interpersonal impairments, and availability of means of other financial support^{19, 45, 46}. However, due to the heterogeneity of the TBI population, some of these factors may not accurately reflect employment outcomes.

A very recent qualitative study in the Netherlands which supports the finding described above interviewed people with moderate to severe brain injury (n=12) to identify factors impacting on the return to work⁴⁷. The authors identified a total of 37 positive factors with the most common ones being individual's will (motivation), knowledge and support of the employer, colleagues and health specialists, and ongoing recovery over time. The most common negative factors (n=57) identified amongst the participants were physical and cognitive factors including fatigue (tiredness), problems with vision and hearing, limited energy, difficulty concentrating and environmental factors in the workplace including stress and feeling rushed. Overall personal factors associated with successful RTW following moderate to severe TBI include age (<40 years old), gender, education, pre-injury employment, severity of injury, cause of injury, cognitive (specifically executive impairment and self-awareness) and neurobehavioural functioning, length of stay (LOS) in rehabilitation, disability in activities of daily living (ADL) and adjustment to the change.⁵

In Norway, a prospective cohort study of people with moderate to severe TBI (n=100) found that 2 years post-injury, environmental factors impacting on return to employment including those that had social support (by friends) (p=0.07), rehabilitation services at 1 year post-injury (p=0.003), those not in need of well-co-ordinated health services (p=0.04), and driving a vehicle at 1 year post-injury (p<0.001) were more likely to be employed at 2 years post-injury²⁹. Personal factors included less severity of injury (p<0.001) and being employed pre-

injury were more likely to be employed at 2 years post-injury²⁹.

Spinal Cord Injury (SCI)

A few reviews have summarised the plethora of studies which have looked at factors which influence returning to work following SCI^{2, 48, 49}. These include age (employment increases until age 30), gender (male), ethnicity or race (being Caucasian is more favourable), age and duration of injury (being younger), severity of injury (lower and less severe), education (higher pre-injury), having work before injury (and low-intensity work), being functional independent and positive psychological values about work. Following SCI, there are positive personal factors which increase the likelihood of employment including vocational retraining, people with higher wheelchair skills or those with a manual wheelchair, and people participating in organised sports. Negative personal factors such as secondary complications post-injury (e.g. pain, fatigue, bowel and bladder incontinence and pressure injuries) and greater severity of injury decrease ability to return to work.

Positive environmental factors which facilitate return to work include social support from employers, colleagues and friends, being in a stable relationship (married), living in a higher socioeconomic suburban area, the ability to use assistive devices and having access to them, driving a modified vehicle or being able to use transport independently, vocational rehabilitation (e.g. on the job support, job search and placement assistance), and job accommodations or adaptations (such as reduced work hours). Negative environmental factors include physical inaccessibility of the workplace, negative attitudes held by employers and employees (disability discrimination), financial incentives, i.e. compensation, and financial disincentives, i.e. government benefits such as a pension payment.

Although there have been several studies reporting the number of people with a status of being employed or unemployed as an outcome measure, limited studies have investigated the overall impact of the individual of different interventions increasing return to work in people with catastrophic injury. There are also very limited outcome measures to effectively record productivity, understand the person's experience and also identify challenges in participating and/or returning to work. A recent project conducted by the Swiss Paraplegic Research and Swiss Paraplegic Centre shows promise in providing an evaluation tool to measure vocational outcomes and assessed its validity in a subgroup of people with SCI⁵⁰.

Understanding the experience of RTW

The experience of the employer

There are limited studies on the perspective of the employer on employing people with a catastrophic injury or even for people with disabilities⁵¹. However, the studies which were identified reflected that larger organisations are leading employment of people with disabilities. It was also found that there is a need to provide information and support when employing people with disabilities and this can be troublesome for smaller organisations in knowing who to contact and/or how to access them. Overall the review highlighted 3 key themes relating to successful employment of people with disabilities –

- 1) Demonstrated commitment by senior management through their leadership,
- 2) Credible and reliable information sources to understand the person's disability and their associated issues, and
- 3) Networks to successfully identify and employ people with disabilities.

A recent report by the National Centre for Vocational Education Research (NCVER) has looked at the employer perspective in Australia using a subgroup of 40 employers with experience in employing people with disabilities (33 representing small to medium organisations and 7 representing large organisations)⁵². It was found that employers were not

overly confident in employing a people with disabilities due to a lack of knowledge, information, and understanding, they want support and assistance to build their capacity for productive employment of people with disabilities, and they are concerned when the exact nature of a disability is not disclosed as it may be mental or 'invisible' (not physical). Due to the findings of this study and the limited studies available, it would be of benefit to people with a disability to conduct further research on employer perspectives about how to most effectively facilitate RTW. A manual (Work Talk) has been produced by the Australian Government Department of Families, Housing, Community Services and Indigenous Affairs (now known as the Department for Social Services) for employers of people with acquired brain injury (ABI) in effective workplace communication; however this manual was produced in 2008 and may be dated in terms of new evidence available since then.⁵³

People with catastrophic injury

Most research to date has focused on the factors and predictors associated with people with catastrophic injury returning to work. There is limited research on the experience of people with catastrophic injury who have returned to work. It is important to understand their experiences in order to identify real-life successes and to better understand what types of careers can be achieved for people with certain injury types and particular impairments as a result of catastrophic injury.

In Australia, the past approach to providing vocational rehabilitation (VR) was provided through the Commonwealth Rehabilitation Services (CRS) Australia Specialist Units for TBI and for SCI. In 2005, a study with a cohort of clients of the Victorian ABI specialist team revealed that, as a result of the VR services provided (assessment, client-centred practice), 50% of people with ABI achieved employment in comparison to 28-46.5% of the general ABI population (duration > 13 weeks)⁵⁴. However, the funding guidelines terminated approximately 5 years ago so the VR services which were provided by team members with specific ABI expertise in the community are no longer available.

Traumatic Brain Injury (TBI)

Three studies have been conducted most recently involving people with catastrophic injury both in Australia^{8, 55} and in New Zealand⁵⁶. In NSW within the Brain Injury Rehabilitation Program (BIRP) a Vocational Participation Project (VPP) was undertaken with the aim of "improving vocational outcomes for individuals with TBI by investigating, consulting, analysing and reporting evidence gathered about BIRP clients return to work experiences" (pg.7). The project involved a survey of 721 community-dwelling people with TBI from NSW (mostly very severe and extremely severe), 17 focus groups composed of health professionals from the BIRPs in NSW, and case studies (n=33) of people from the BIRPs (11 sites) that had engaged in returning to work, successful and non-successful. Some of the findings of the study included -

- Most people with TBI surveyed were in part-time work following their injury and had returned to their pre-injury work (70% of people). First work placement was on average around 7 months following injury (range 1 month to > 10 years).
- People who had to engage in new work positions (job seekers) required more extensive VR, commencing significantly later in their recovery and worked less hours.
- Only 29% surveyed were currently employed (n=207), with a significant number of people finding it difficult to maintain their employment, dropping out due to continuing impairments (psychosocial and communication) as a result of their injury (n=98).
- More than a third of the people surveyed (n=294) had participated in a VR program which on average was 13 months in duration (range <1 month to 8 years). People who participated in a VR program were found to be more successful in returning to the pre-injury work (73%), but this was not the case for people looking for new work

- (job seekers) (36%).
- People with TBI reported that VR programs were an important part of return to work as they played a positive role in providing continuous support and understanding their needs. Their experiences reflected that a “long-term steady program, working one step at a time (e.g. training course to voluntary placement to paid work stages)” was the best pathway in returning to work. They also reported that the positive aspects of VR programs were on-the-job training, assistance with written documents, work trial and voluntary work placements, and access to wage subsidies. Negative aspects were the limited input/feedback from providers, lack of attention to client goals and poorly understanding their needs, and timing of the intervention.
 - Focus groups with health professionals in the BIRPs found that strong, positive working relationships with VR providers resulted in better outcomes for people returning to work. They also reported difficulties in the complexity of the VR system, in particular between compensable and non-compensable clients, dealing with more than one VR provider, lack of knowledge and skills of people with TBI (due to loss of specialist units in CRS Australia), ineffective job placement by VR providers, and limited supported employment options.

Spinal Cord Injury (SCI)

A study in New Zealand investigated the meaning of work and perceptions of barriers and facilitators in a purposive sample of people with SCI and vocational rehabilitation professionals. Participants included people with SCI who were employed (n=4), job-seeking (n=3) and unemployed (n=5) together with 6 vocational rehabilitation (VR) professionals recruited from two spinal units in New Zealand⁵⁶. Qualitative analysis of interview transcripts revealed that people with SCI felt that employment was an important aspect of rehabilitation but it wasn't the first priority. Employment was seen as a sign of living a normal life, feeling socially connected and provided them with a feeling of self-worth. People with SCI who were employed pre-injury felt that adaptation of their pre-injury work is a key step of VR⁵⁶. A major facilitator of employment for people with a SCI who were seeking work was hope which VR professionals strongly encouraged. Barriers included time to maintain health and body functioning, morbidities such as pressure sores, pain and bowel and bladder problems, others misconceptions about their abilities and a lack of support⁵⁶. The barriers and facilitators were reported as similar to other studies. The VR professionals felt that their role was to maintain a strong partnership with the person with SCI and to have good problem solving and communication skills to use with the potential employer⁵⁶. The study showed that the VR professionals are an important part in the process to ensure that the person with SCI is able to believe they can return to work and there is hope to do just that.

In Victoria, a cross-sectional, mixed methods study involving 30 people with SCI was conducted to “understand the experience and pathway of a person achieving vocational (and avocational) outcome after SCI.”⁵⁵ Three groups were involved in the study – people with a SCI in stable employment (n=10), people with a SCI in unstable employment (n=10) and people with SCI who had no employment (n=10). People with SCI in stable employment showed that two main pathways, the most common being the first – (1) study and employment pre-injury and RTW in previous or similar employment post-injury (50%), and (2) study pre-injury to study and employment following injury (40%). People with unstable employment only reflected one main pathway: study and employment pre-injury followed by unstable employment post-injury (70%). People with SCI with no employment showed several, highly variable pathways and no one pathway could be established⁵⁵. Features within these groups were revealed in the study and are discussed below –

- People with SCI with stable employment
 - Most had education to level of a university degree or above (70%);

- Most required assistance with aspects of personal care (70%);
- On-the-job training programs assisted in securing employment;
- People strongly believed that work was an accepted part of life post-SCI; there was a strong focus on achieving and maintaining work; gaining and maintaining meaning and a sense of purpose in work and motivation through social and financial needs;
- People had open and effective communication with employers, were aware of legislation and regulations and understood their rights as employees and actively pursued opportunities within their workplace to succeed.
- People with SCI with unstable employment
 - Most had major comorbidities – pain, skin issues, mental health issues and other life responsibilities, e.g. being a primary carer for a child, and had competing life demands.
 - Limitations in their pre-injury employment prevented return to work post-injury; due to this people had to find and recreate their identity in the workplace.
 - Many did not understand their rights as employees and struggled in getting the relevant information which could be applied to their own situation.
- People with SCI with no employment
 - Most had significant mental health issues and comorbidities; they had great difficulty in accepting their loss of physical self, adjusting or modifying and speaking positively of their new identity and skills (grieving), and not much hope for job-related opportunities in the future.

The study did not identify any particular factors (personal, environmental or insurance) that had a significant association with employment outcomes; however, there was a negative correlation found for people who were less optimistic and satisfaction with life. Overall, the study reported that the person's level of skills and a degree qualification, understanding the service system and assisting the employer to understand their injury, dealing with adversity, being willing to problem solve and knowing what support would be needed for them to perform their job increased the success of stable employment⁵⁵.

In 2009, the Victorian Spinal Cord Injury Program conducted a Spinal Community Integration Service (SCIS) Pilot involving vocational consultants and peer support workers who focused on promoting positive expectations about returning to work through early intervention and establishing the motivators, ambitions, goals, and vocational history of people following SCI. This pilot ran for two years and its continuation was dependent on funding. No published results were available on this pilot.

What models/interventions exist for people with moderate to severe TBI and SCI returning to work?

To facilitate returning to work for people with catastrophic injury, a process known as vocational rehabilitation is carried out. Vocational rehabilitation following a catastrophic injury, involves health professionals and the person with catastrophic injury exploring the options of returning to their previous employment or assisting in finding new employment that can accommodate their individual injury. Vocational rehabilitation is a multi-level process encompassing medical, psychological, social and occupational tasks with the overall goal of ensuring the individual has the capacity to work⁵⁷. Past vocational rehabilitation studies with people with moderate to severe TBI demonstrate some benefit for people with TBI; however, for SCI it is still an emerging area.

There is an established evidence base indicating that RTW rates increase following a vocational rehabilitation intervention or program⁵⁸. Four main categories of models or

interventions for returning to work for people with moderate to severe TBI and SCI –

- Program-based vocational rehabilitation
- Supported employment
- Case co-ordination
- Hybrid or mixed

There is limited strong, high-level evidence for these interventions and models. This has been reported to be due several reasons including the environmental context in implementing designed studies and the unjust ethical and legal dilemma of conducting a randomised clinical trial (RCT) which is the gold standard of studies which will unequivocally show effectiveness. In order to try to overcome this problem, there have been a number of systematic reviews which have analysed the quality and credibility of existing studies and provide the strongest existing evidence to date. This will be described in more detail in the section titled “Overview of evidence” (pg. 16).

Summary

The reported return to work (RTW) rates in Australia for catastrophic injury are lower in comparison to those of the European countries. Early evidence of trajectory and stability studies in people with catastrophic injury has indicated that factors such as age, education, length of PTA and FIM scores contribute to stable RTW rates over the long-term. Several studies have reported the positive factors and negative factors which impact on a successful and non-successful employment outcome. For TBI, positive factors included employer support and determination, whilst negative factors included fatigue, cognitive impairments (e.g. difficulties in concentration and memory) and behavioural impairments. For SCI positive factors included vocational training, social support, and the ability to use assistive devices, whilst negative factors included financial disincentives and negative attitudes held by employers.

Limited studies have investigated the experience of returning to work from the perspective of people with catastrophic injury. The relationship of the VR professionals and people with a catastrophic injury were reported to be an important factor, particularly in terms of on-going support, and on-the-job training assisted in gaining employment. VR interventions and programs have an established evidence base of increasing RTW, however further higher quality studies are required.

Aims and Terms of Reference

This NTRI Forum focuses on return to work for people with catastrophic injury, defined as moderate to severe traumatic brain and spinal cord injury predominantly due to road or motor vehicle accidents. It will not consider return to study or people following work-related injuries.

Aim of the Forum

This NTRI Forum aims to:

- Enhance understanding of the features of optimal return to work practices following traumatic brain and spinal cord injury and identify barriers and facilitators to retention of TBI/SCI employees.

Terms of Reference

This NTRI Forum will address the following specific questions:

1. What are the key features of optimal return to work practices following traumatic brain and spinal cord injury? *[Focus of this Briefing Document]*
2. In the Australian context, what are the barriers to, and facilitators of, application of strategies to optimise RTW outcomes for people following TBI and SCI? *[Focus of morning discussion at the stakeholder dialogue]*
3. How could identified barriers and facilitators be addressed to ensure better retention of TBI/SCI employees? *[Focus of afternoon discussion at Stakeholder Dialogue, which will be presented in the accompanying Dialogue Summary for this NTRI Forum]*

Context of this NTRI Forum

NTRI Forum topics are identified through liaison with a broad range of neurotrauma research networks and organisations. All potential NTRI Forum topics are submitted to the Victorian Neurotrauma Advisory Council (VNAC) for approval. VNAC is an expert body representing key stakeholders in the Victorian neurotrauma community including the Transport Accident Commission (TAC) and government, health and community services, researchers, and patient advocacy groups. Further information about VNAC can be found at:

<http://www.ntri.org.au/research/vnac>

The topic for this NTRI Forum was identified through liaison with the TAC. This program is funded by the Transport Accident Commission (TAC) and Workcover through the Institute for Safety, Compensation and Rehabilitation Research (ISCRR). Online available outputs from this NTRI Forum could be utilised by researchers and other stakeholders to inform or develop projects in related areas. This NTRI Forum topic was approved by VNAC in February 2014.

Aims of the briefing document

This briefing document is directed towards researchers, clinicians, service delivery and advocacy organisations and other stakeholders with experience and expertise in the provision of support to informal carers of people with long-term disability. The aims of the briefing document are to:

1. Provide an overview of returning to work that describes success in terms of rates, the experiences and needs of people with catastrophic injury, interventions and their potential impact and existing programs in Australia
2. Review literature regarding the effectiveness of return to work interventions
3. Present questions for deliberation at a Stakeholder Dialogue to inform development of local strategies to optimise return to work interventions for people with catastrophic injury [*Outcomes of the Stakeholder Dialogue will be presented in the accompanying Dialogue Summary for this NTRI Forum*]

Background and Scope

This briefing document was prepared to inform a structured stakeholder dialogue of which research evidence is one of many considerations. The dialogue aims to connect the information from the briefing document with the people who can make change happen, and energise and inspire the participants by bringing them together to address a common challenge. This use of collective problem solving can create outcomes that are not otherwise possible, because it transforms each individual's knowledge to a collective 'team knowledge' that can spark insights and generate action addressing the issue.

Overview of evidence for return to work for traumatic and spinal cord injury

A search of was conducted to identify the evidence for interventions that assist people with catastrophic injuries return to work following injury (Appendix 1). The search yielded a total of 2106 citations. Following screening of titles and abstracts, a total of 57 full text articles were retrieved against the inclusion/exclusion criteria (Appendix 1).

There were 15 relevant full text articles identified for traumatic brain injury (TBI) and spinal cord injury (SCI) (Table 1).

Table 1 – Overview of identified evidence in the period of the last 5 years

Type of article retrieved	TBI	SCI
Systematic review (SR)	3*	1
Rapid or evidence-based review	3	1
Randomised clinical trial (RCT)	2	0
Observational study	4	1
Total	12	3

**protocol only was available for one of the SRs (not yet published)*

A clinical practice guideline (CPG) was also identified (for TBI only) which was not directly relevant, however it should be noted as important to the process of ensuring people with moderate to severe TBI return to work -

- Inter-Professional Clinical Practice Guideline for Vocational Evaluation Following Traumatic Brain Injury. University of Toronto, ON, Canada, 2012.

This guideline contains 17 key recommendations within 7 domains – (1) evaluation purpose and rationale; (2) initial intake process; (3) assessment of the personal domain; (4) assessment of the environment; (5) assessment of occupational/job requirements; (6) analysis and synthesis; and (7) evaluation recommendations⁵⁹.

The authors of the guideline report that although other CPGs within the area of occupational therapy and injury recommend that a vocational evaluation should be conducted as part of the person's rehabilitation and recovery, there are "detailed recommendations of what the evaluation process should encompass, and/or do not address inter-professional/stakeholder issues" (pg. 167). Whilst the recommendations in the guideline are of beneficial use to health professionals, employers and people with TBI, the levels of evidence are at the poorer end of the spectrum including non-experimental designs, reports, opinions and experience of experts. No recommendations had a grade A strength, i.e. evidence based on RCTs. Two of

the recommendations under the domain of *Assessment of the person: person domains* had the highest levels of evidence and strength, these included –

- “(5) Assessment of the physical domain should include:

Assessment of the presence of physical and sensory impairments (e.g., fatigue, pain), physical abilities in relation to work goal and/or demands (e.g., mobility, stamina)

Assessment of medical/physical restrictions, medications, treatments that may affect work/job performance

- (6) Assessment of the neuropsychological and cognitive domains should include:

Intelligence/pre-morbid functioning; academic achievement; visual perception; attention and concentration; information processing; memory; praxis; insight; awareness and denial; self-regulation; executive functions

Assessment of an individual’s cognitive skills and abilities in relation to the work goal and/or work/job demands” (pg. 172)⁵⁹.

(Level of evidence – 2, Strength of recommendation – B)

Overview of evidence from the most up-to-date systematic reviews, reviews and primary studies

Traumatic Brain Injury (TBI)

1. Systematic reviews

One systematic review (SR) was identified for interventions to assist people with moderate to severe TBI return to work following injury¹³. This SR included 23 studies between the period of January 1990 to July 2007 all of which were critically appraised for their quality (see Table 1, Appendix 2). This SR reported 3 categories of return to work or vocational rehabilitation (VR) interventions – program based, supported employment and case co-ordination; consistent with another two evidence-based reviews identified^{60, 61}. However, we identified another review which was more comprehensive, separating program-based VR into two sub-groups and also some hybrid or mixed approaches and other individual type approaches⁶². For the purpose of this report the comprehensive review⁶² and SR¹³ identified will be used to discuss the existing evidence.

Program-based vocational rehabilitation

Program-based vocational rehabilitation (VR) is an intervention based on a module style format program provided during rehabilitation that has the endpoint of ensuring the best possible employment outcome¹³. The components of the modules are variable, however they all aim to achieve the same purpose. Program-based VR can be further be divided into two sub-groups – (1) general VR programs adapted for brain injury and (2) specific brain injury rehabilitation programs that contain VR components⁶².

For general VR programs adapted for brain injury there are 7 studies to date that have been published^{10, 63-68}. The components of the study interventions are summarised in Table 1 (Appendix 2). Findings of the studies show that people with moderate to severe TBI,

particularly those with significant cognitive impairments, do benefit from undergoing program-based VR, with more than half gaining full-time employment. However, following a year post-injury a proportion of individuals did not retain employment and/or did not gain competitive employment. This can be due to difficulties in their behaviour, social interaction with work colleagues, problems with cognitive and motor skills, environmental issues and an inability to recognise established work attitudes⁶². These studies were all low level evidence. There was also low level evidence from one study that showed there was a cost-effectiveness to taxpayers associated with people with a brain injury having program-based VR⁶⁹.

For specific brain injury rehabilitation programs with VR components there are 3 studies that have been conducted⁷⁰⁻⁷². There is limited evidence that brain injury specific rehabilitation programs with VR components are more effective than general VR programs adapted to brain injury.

Supported employment

The supported employment intervention is based on providing the person with “job placement, on-the-job training, and long-term support and job skills reinforcement through on-the-job coaching” (pg.199)¹³. This type of intervention has the aim of achieving competitive employment with ongoing job coach support, unlike the other types of interventions. A total of 3 studies have investigated the supported employment model in people with a brain injury^{3, 67, 73-77} (Table 1, Appendix 2). All studies provide low level evidence that supported employment is effective in assisting people with a brain injury in gaining employment post-injury and in some cases for many years following in comparison to not having supported employment. These studies were conducted greater than 10 years ago, hence further research in the current time period should be investigated to identify the effectiveness of supported employment for people with a brain injury.

Case co-ordination

This type of intervention is defined as “a holistic approach in which vocational rehabilitation is part of an overall rehabilitation program that is individualized to suit specific needs. Individuals are overseen by a case coordinator who assesses them for service needs and refers accordingly. This approach often includes referral for various aspects of vocational rehabilitation described in the other models such as vocational counselling, preemployment training, assisted job placement, and on the job support (pg. 199)”¹³.

A total of 7 studies have conducted case co-ordination as an intervention to improve returning to work for people with TBI⁷⁸⁻⁸⁴. There is moderate evidence from the studies to show that case co-ordination is effective in increasing employment and productivity in people with brain injury¹³. However, most of the studies involve mixed populations of individuals with acquired brain injury (ABI), with mostly mild traumatic brain injury^{78, 80, 81}.

Hybrid or mixed approaches

Three studies were identified that incorporated a hybrid or mixed type approach^{8, 85, 86}. The most recent study is a specialist VR that is exclusive to people with ABI that includes a program-based approach, case co-ordination approach and supported employment⁸. Findings of this intervention in a sub-study showed effective RTW rates for greater than 50% of the participants who successfully undertook their pre-injury employment (Table 1, Appendix 2). However, this study provides low level evidence for the effectiveness of a hybrid or mixed approach. Further high quality research is needed to show the effectiveness of this intervention type.

Other approaches

Three other studies were also identified which utilised individual approaches different to the four other types described above⁸⁷⁻⁸⁹. One of the studies was a pilot study that investigated the use of computer adaptive technology in their employment to assist in the productivity of people with a brain injury. The findings of the study were concluded as being of moderate success, with two participants in particular who showed an increase in their work productivity (Table 1, Appendix 2). Although this study was not directly related to improving the RTW outcomes of people following brain injury, it did show an insight into components of VR which may be of use in retaining these individuals in employment in the long-term.

There were two other studies which were community based, and ‘consumer-driven’^{88,90}, involving people attending ‘work-centred clubhouses’ in which staff provide training on predominately practical skills and offer peer support to individuals in way of coping strategies. Employment and productivity was improved in individuals who took part; although this observation is based on low level evidence (Table 1, Appendix 2).

2. Other evidence-based reviews

Another evidence-based review was identified by experts in the field on the effectiveness of segmented rehabilitation to improve return to work outcomes in adults with brain injury⁹¹. This review found very few studies relating to this topic, one specific to segmented rehabilitation and one specific to streaming of patients into impairment types or goal types. It concluded that there is no evidence to show that segmented rehabilitation is effective in increasing employment outcomes. Also, in terms of streaming of patients by goals or impairment type it found no evidence of effectiveness. However, there was limited evidence that there was a reduction in the length of stay of the inpatient setting. Therefore, further research is needed to show the effectiveness of segmented rehabilitation and streaming of patients following brain injury for improving return to work outcomes.

3. Primary Studies

Three primary studies were identified for moderate and severe TBI which were not included in the SR or evidence-based reviews⁹²⁻⁹⁴. One RCT investigated the effectiveness of a TBI specialist VR intervention on return to work following injury as well as work retention for 1 year in comparison to usual care⁹⁴. This type of intervention can be described as a *hybrid or mixed approach* underpinned by a specialist TBI interdisciplinary team. Initially case managers coordinate services and supports needed by the individual based on their VR goals, with an occupational therapist who provides the VR mostly at the individual’s home, work or in the community for as long as is needed. The intervention was commenced early at 4 weeks post-discharge. After 1 year, more people who received TBI-VR were employed compared to those who received usual care (75% vs. 60%); this was observed more so in those with moderate or severe TBI⁹⁴. Most people who received TBI-VR had returned to work at 3 months (93%) in comparison to people with usual care (56%). Also, at 1 year there were less people who had received TBI-VR (18%) claiming benefits than people who had received usual care (31%).

An economic evaluation was also conducted and the authors reported that the mean health costs (e.g. rehabilitation consultant, GP, therapy, medication) in the year following injury were only £75 more with the specialist intervention in comparison to usual care, concluding the intervention was cost-effectiveness in patients with moderate to severe TBI⁹⁴. Although these findings are positive they should be looked at with caution due to the mixed population used and that the effectiveness of the TBI-VR intervention over the long-term on work retention was not reported.

Another RCT employed a 12-session x 20-25 minute structured artificial intelligent virtual reality-based vocational training system (AIVTS) in comparison to a structured conventional psycho-educational vocational training programme (PEVTS) to people with mild and moderate TBI⁹³. The AIVTS intervention group were found to have better vocational outcomes than people in the conventional PEVTS group at 1, 3 and 6 months, although the findings were not statistically significant. The authors reported that the small sample size and mixed population (mild and moderate) may have been contributing factors. People in the AIVTS showed improvements in memory functions and problem-solving skills. However, further studies are needed to show the effectiveness of this intervention.

Another recent observational study has utilised a *program-based VR* approach of 5 hours of integrated therapy, education and/or VR provided on a daily basis (including assessment and ongoing job support) for people with a severe or very severe brain injury for 1 year. At 3 years of follow-up, over half of people with TBI (approximately 70%) had a positive vocational outcome, meaning they had fulltime paid employment, part time paid employment or unpaid, voluntary work. The authors reported that there were no differences between people with a TBI and people without a TBI. A limitation of this study is the age of people with a TBI which was on average 21 years old, hence most had not worked before their injury and returned to education rather than entering employment. Therefore, this is not representative of the true TBI population.

Spinal Cord Injury (SCI)

The most recent SR evaluated interventions targeted to improving RTW outcomes in people with SCI⁹⁵. A total of 14 studies were identified with the highest evidence reflecting that the intervention of supported employment provides the most beneficial outcome. Only 2 RCTs have been published to date, the first one conducted almost 20 years ago (1996)⁹⁶ using social support with service dogs and the second one conducted a couple of years ago involving supported employment in veterans with SCI⁹⁷.

Allen and Blascovich (1996) provided service dogs to 22 people with SCI and compared them to 24 people with SCI not provided a service dog. At 12 months, 58% of people with a service dog (14 out of 24) were in part-time employment compared to 0 in the control group and this increased to almost all at 2 years (96%, 23 out of 24)⁹⁶ (Table 3, Appendix 2). The control group were similar at 24 months when provided a service dog. The study by Ottomanelli et al.⁹⁷ randomised 81 people with SCI to receive supported employment, 76 people with SCI to receive usual treatment to the intervention site only and another group of 44 at an observational site. It was found that the people receiving supported employment had a greater chance of obtaining competitive employment and they earned more per week in comparison to people with SCI who received usual treatment.

Several observational studies have been conducted over the last 10 years or so (n=12). These studies have mostly focused on different types of VR, however the authors of the SR noted that a limitation is that those in VR programs may be 'self-selecting' and hence have better outcomes. In 2008 a study analysed features of VR programs finding that assistive technology, on the job training, job finding services and job placement assistance were reflective of competitive employment⁹⁸. The authors of this SR concluded that there are very limited high quality studies of interventions to improve RTW in people with SCI.

In 2011, an observational pilot vocational rehabilitation program – InVoc - commenced in NSW. This program ran for 2 years through three NSW SCI units⁹⁹. Funding was provided by

the NSW Lifetime Care and Support Authority (LTCSA). The funders identified a gap in standard service delivery for people with SCI who were not offered RTW goal setting and vocational counselling until following discharge from an SCI unit. The InVoc program involved *early access* vocational sessions in addition to inpatient rehabilitation services, e.g. physiotherapy and occupational therapy, provided by vocational specialists at CRS Australia. Sessions included assessment of goals and expectations, assistance with skills training, counselling, and conversations with the pre-injury employer to facilitate RTW, formulating an individual plan and making certain that vocational rehabilitation continues following discharge from the SCI unit. Evaluation of the pilot program found that after 1 year, 56.3% of program evaluation participants were in primarily full-time employment or actively retraining, of which 39.2% were paid⁹⁹. This increased after 2 years to 62.5% of program evaluation participants in employment or actively retraining (50% were paid). Interviews concluded that staff and participants were satisfied with the program and in addition, having vocational specialists as part of the rehabilitation team⁹⁹. This pilot program demonstrates 'promising' findings in assisting people with SCI to RTW, however it requires further high level studies with larger numbers of participants to increase the evidence for this type of vocational rehabilitation program.

Summary

For moderate to severe TBI, there is limited evidence that program-based VR interventions are more effective than other types in getting to return to work following injury. Many of the studies have been conducted in the USA (n=19), with a few in the UK (n=4) and Australia (n=4), which may have implications in terms of contextual/environmental factors. Interestingly, although European countries have the highest RTW rates, there was only one study from Finland identified. No high quality studies are available for program-based VR. All identified studies were of low level evidence (Level 4), reflecting the need for higher quality evidence.

A limitation of program-based VR interventions is that they do not provide on the job support or long-term follow up, which may contribute to a loss in work retention. There is low level evidence (n=3) that supported employment is more effective in assisting people with a brain injury gain employment than without it. There is moderate evidence for case co-ordination being effective, however most of the studies have utilised mixed ABI populations hence further research is needed to observe the effectiveness in people with moderate to severe TBI only. The quality of studies was moderate to high for case co-ordinated interventions, however the authors noted that several studies were appraised for their quality using secondary data analysis which should be noted.

It should be noted that although there are many studies that have been conducted using program-based VR interventions and case co-ordination, it is difficult to conclude which type of VR has better effectiveness than the other due to methodological variations, demographic diversity in the types of injuries, and contextual factors amongst the studies.

For people with SCI there is promise for supported employment being an effective RTW intervention, however further studies are needed to support this finding. Many of the studies have been conducted in the USA (n=6), with a small number in Taiwan (n=2) and Australia (n=2). Hence, contextual influences should be considered when interpreting the study findings.

Issues to be considered in interpreting research evidence

Due to limited high quality randomised clinical trials (RCTs) being available on return to work (RTW) interventions for people with catastrophic injuries, there are several issues which should be considered in interpreting the research evidence. These include -

- Demographics - Mixed populations are often utilised for studies of brain injury, which include people with stroke or tumours, not TBI alone. Also, types of TBI injury severity are grouped as one which generates an inaccurate effect on the results.
- Study design - There are several documented studies reporting the rates associated with returning to work and the barriers which employers and people with a catastrophic injury have to tackle and overcome. However what is currently lacking are studies reporting what factors promote return to work and the trajectories of people with catastrophic injury who have successfully remained in work over the long-term. Also, numerous studies report on personal and environmental factors which may positively and negative interact to discourage return to work. Although these factors give an insight into the likelihood of a person returning to work, they do not reflect or provide any information on whether the person will be successful or will not be successful.
- Outcome measures - Variable outcome measures are used across studies to demonstrate a successful return to work. A standard definition of success needs to be decided upon in the field of vocational rehabilitation, so that studies can be combined for greater power to reflect the effectiveness of interventions due to small populations of people with catastrophic injuries.
- Decision support tools - Interestingly, although more vocational rehabilitation models and interventions studies are being generated and reported upon, there is still no method for deciding which model or intervention is most appropriate for each person with a catastrophic injury, given the enormous heterogeneity amongst the population and hence their diverse vocational needs. The elements that comprise the models and interventions are not reported consistently and in some cases there are often elements missing. It is therefore challenging to identify the elements which make return to work successful which can be further investigated.
- Other - The cost-effectiveness of particular models or interventions is not commonly reported either which can mean that funding decisions cannot be made accurately. There is also great variability across national and international employment rates so that studies cannot be compared for consistency or in terms of generalisability.

Issues for further consideration

- Explicit and transparent reporting standards of all components of VR intervention studies
- Standardised terminology of types of VR interventions, what constitutes a successful outcome,
- Demonstration of cost-effectiveness of VR interventions
- An algorithm to assist in deciding which VR intervention will be more appropriate and therefore more effective for each individual with a moderate to severe TBI

- Collaborative relationships between health professionals and service providers/industry
- Sufficient and appropriate VR needs to be invested into, particularly with the reduction in specialist services provided by Commonwealth Rehabilitation Services (CRS) Australia
- Improving service development across relevant agencies and funding
- Improvement of data collection methods in studies.

Future research

- Streaming of patients into impairment specific groups (neurophysical vs. neurocognitive)
- Understanding the effectiveness of VR components from the individual's perspective and what effect it has on their quality of life, for example health
- Investigating how to improve job retention over the long-term
- Modelling pathways of several individuals and the different VR approaches to best understand what may or may not occur.

Questions for Deliberation

1. In the Australian context, what are the barriers to, and facilitators of, application of strategies to optimise RTW outcomes for people with catastrophic injury?
2. How could identified barriers and facilitators be addressed to ensure successful RTW and better retention of people with catastrophic injury?

An accompanying document, the Dialogue Summary, presents results of deliberation upon these questions from the Stakeholder Dialogue.

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Appendices

Appendix 1: NTRI Forum search methods to identify interventions for return to work following catastrophic injury

Search methodology

- A comprehensive search of the following databases from January 2009 until August 2014 was undertaken: MEDLINE (search strategy below); The Cochrane Library; CINAHL Plus; PsycINFO and Embase
- Google was also searched using the terms “return to work interventions or employment” combined with “traumatic brain injury” and “spinal cord injury” with date restriction 2009 -2014. The first 100 results were screened
- Reference lists of included studies were also scanned to identify further relevant references.

Inclusion/Exclusion Criteria

Patient group: People with catastrophic injury (i.e. moderate or severe traumatic brain injury and spinal cord injury)

Exclusion – People with mild injury

Intervention: Return to work interventions or programs or models (full-time or part-time)

Exclusion – Voluntary unpaid work

Phase of care: Rehabilitation, non-institutional setting

Exclusion - Nursing homes that have specialised infrastructure, and 24 hour multiple staffing facilities in which multiple residents are located

Study type: Systematic reviews, organisational reports, e.g. TAC, MAA, NZ ACC if available), and primary studies not included in systematic reviews

Exclusion – case studies, reviews (literature, historical)

Date Range: 2009 - Current

Language: English

Example of search strategy (Medline) – limited by patient sub-group to traumatic brain injury (TBI)

- 1 Work/ or Return to Work/ or Work Schedule Tolerance/ or exp "Activities of Daily Living"/
- 2 Work Capacity Evaluation/ or Workload/ or Job Satisfaction/ or Career Mobility/
- 3 Employment/ or Employment, Supported/ or Unemployment/ or Workplace/ or Occupations/
- 4 Occupational Medicine/ or Occupational Health/ or Occupational Health Services/ or exp
Rehabilitation, Vocational/
- 5 Retirement/ or Sick Leave/ or Absenteeism/
- 6 (job* or work* or vocation* or occupation* or employ* or unemploy* or reemploy* or RTW or
presenteeism or labo?r-force or labo?rforce or labo?r market*).tw.
- 7 (retire* or rehire* or re-hire* or sick leave or sickness absence* or absenteeism).tw.
- 8 ((return* or resum* or reintegrat* or re-integrat* or reentry or re-entry or reenter* or re-enter* or
recommence*) adj4 (activity or activities or duty or duties or capacity or capacities)).tw.
- 9 ((modified or modification or limited or limitation) adj3 (duty or duties or activity or activities or
capacity or capacities)).tw.
- 10 (((light adj (duty or duties or activity or activities)) or (full adj2 (duty or duties or activity or
activities or capacity or capacities))).tw.
- 11 (re-train* or retrain* or reskill* or re-skill*).tw.
- 12 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11
- 13 exp Craniocerebral Trauma/
- 14 exp Brain/in or head/in or exp skull base/in
- 15 ((brain* or head or cerebr* or cerebel* or cranio* or crania* or craniu* or encephalopath* or
cortical or intracran*) adj3 (injur* or trauma* or contusion* or lacerat* or damage*)).tw.
- 16 (TBI or ABI).tw.
- 17 13 or 14 or 15 or 16
- 18 12 and 18
- 19 (randomized controlled trial or controlled clinical trial).pt.
- 20 (random* or trial or placebo).tw. or clinical trial*.mp.
- 21 19 or 20
- 22 18 and 21
- 23 exp animals/ not humans.sh.
- 24 22 not 23
- 25 limit 24 to (English language and yr="2007-current")
- 26 limit 18 to systematic reviews
- 27 limit 18 to (evidence based medicine reviews or "article reviews (dare)" or "topic reviews
(cochrane)")
- 28 (metasynthes* or meta-synthes* or systematic review*).tw. or qualitative research/
- 29 18 and 28
- 30 26 or 27 or 29
- 31 exp animals/ not humans.sh.
- 32 30 not 31
- 33 limit 32 to (English language and yr="2007-current")
- 34 case-control studies/ or retrospective studies/ or cohort studies/ or longitudinal studies/ or
follow-up studies/ or prospective studies/ or cross-sectional studies/
- 35 exp animals/ not humans.sh.
- 36 18 and 34
- 37 36 not 35
- 38 limit 37 to (English language and yr="2007-current")

Example of search strategy (Medline) – limited by patient sub-group to spinal cord injury (SCI)

- 1 Work/ or Return to Work/ or Work Schedule Tolerance/ or exp "Activities of Daily Living"/
- 2 Work Capacity Evaluation/ or Workload/ or Job Satisfaction/ or Career Mobility/
- 3 Employment/ or Employment, Supported/ or Unemployment/ or Workplace/ or Occupations/
- 4 Occupational Medicine/ or Occupational Health/ or Occupational Health Services/ or exp
Rehabilitation, Vocational/
- 5 Retirement/ or Sick Leave/ or Absenteeism/
6 (job* or work* or vocation* or occupation* or employ* or unemploy* or reemploy* or
RTW or presenteeism or labor-force or laborforce or labor market*).tw.
- 7 (retire* or rehire* or re-hire* or sick leave or sickness absence* or absenteeism).tw.
- 8 ((return* or resum* or re-integrat* or re-integrat* or reentry or re-entry or reenter* or re-enter* or
recommence*) adj4 (activity or activities or duty or duties or capacity or capacities)).tw.
- 9 ((modified or modification or limited or limitation) adj3 (duty or duties or activity or activities or
capacity or capacities)).tw.
- 10 ((light adj (duty or duties or activity or activities)) or (full adj2 (duty or duties or activity or
activities or capacity or capacities))).tw.
- 11 (re-train* or retrain* or reskill* or re-skill*).tw.
- 12 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11
- 13 exp Spinal Cord Injuries/ or exp Spinal Injuries/
- 14 exp Spine/in
- 15 ((spine or spinal) adj3 (injur* or trauma* or contusion* or lacerat* or transect* or damage*)).tw.
- 16 13 or 14 or 15
- 17 12 and 17
- 18 (randomized controlled trial or controlled clinical trial).pt.
- 19 (random* or trial or placebo).tw. or clinical trial*.mp.
- 20 18 or 19
- 21 17 and 20
- 22 exp animals/ not humans.sh
- 23 21 not 22
- 24 limit 23 to (English language and yr="2007-current")
- 25 limit 17 to systematic reviews
- 26 limit 17 to (evidence based medicine reviews or "article reviews (dare)" or "topic reviews
(cochrane)")
- 27 (metasynthes* or meta-synthes* or systematic review*).tw. or qualitative research/
- 28 17 and 27
- 29 25 or 26 or 28
- 30 exp animals/ not humans.sh.
- 31 29 not 30
- 32 limit 31 to (English language and yr="2007-current")
- 33 case-control studies/ or retrospective studies/ or cohort studies/ or longitudinal studies/ or
follow-up studies/ or prospective studies/ or cross-sectional studies/
- 34 exp animals/ not humans.sh.
- 35 17 and 33
- 36 35 not 34
- 37 limit 36 to (English language and yr="2007-current")

Appendix 2: Overview of studies on return to work interventions following catastrophic injury

Table 1 – Summary of return to work programs or interventions for people with moderate and severe TBI

Study/Design	Country	Name of program/model	Intervention	Outcomes	Quality (assessed by Fadyl and McPherson, 2009 ¹³)
<i>General Vocational Rehabilitation Program adapted for people with a brain injury</i>					
Haffey and Abrams, 1991 ⁶³ Observational	USA	The Work Re-entry Programme (WRP)	n = 130 TBI This job development and placement programme consists of: Assessment, job hardening (using real and simulated work experience), job development (vocational counsellors), job performance analysis, actual job placement and short-term support and long-term follow-up.	“There was a 68% placement rate in paid employment, a 71% employment retention rate, and a 75% employment stability rate. By contrast, engagement in paid employment was less than 40% for a group of graduates of a TBI day-treatment program and a TBI group who only received inpatient rehabilitation.”	Poor
Abrams 1993 ⁶⁹ Cost-benefit analysis	USA	The Work Re-entry Programme (WRP)	n=142 TBI Subjects with TBI who participated in an individualized work re-entry program. “The programme was highly individualised, with a primary focus on the least restrictive employment environment that matches the individual’s interest, skills and abilities.”	“During the first year of the program, 65% (92/142) obtained employment. During the entire observation period from October 1988 to June 1992, 75% (106/142) obtained employment. This resulted in a 2:1 ratio of total taxpayer benefit to total program operational cost and a 4:1 ratio of total taxpayer benefit to state cost.”	Not assessed
Preston and Ulicny, 1992 ¹⁰⁰	USA	Intensive transitional job-coaching program	n=84 ABI Patients received daily occupational, physical, speech,	“The majority of the patients (61%) of individuals who participated in the transitional job coaching model were	Poor

			psychological, and recreational therapies	<p>either placed in a competitive job setting or were considered job-ready at the time of completion.”</p> <p>From the rest, 14% entered non-competitive employment (none was employed in sheltered settings before injury), and 11% entered volunteer employment. The rest (14%) had no vocational placement.</p>	
<p>Prigatano et al, 1994¹⁰¹, Klonoff et al. 1998⁶⁴ and Klonoff et al, 2000¹⁰²</p> <p>Observational</p>	USA	Outpatient milieu-based interdisciplinary day treatment program	<p>Prigatano 1994: (n=38 TBI) Klonoff 1998: (n=37 TBI/64) Klonoff 2000: (n=112 TBI)</p> <p>Holistic approach (i.e. milieu rehab programme) based on: Individual physical therapy, occupational therapy, speech and language therapy and cognitive therapies four to five mornings per week.</p> <p>All the above studies report on the outcome of the same program (follow-up).</p>	<p>Prigatano 1994: “Of the 38 treated patients, 33 (86.8%) were classified as productive compared to 55.3% 21 of 38) of controls.”</p> <p>Klonoff 1998: “At discharge, 89.5% of patients showed fair or good adjusted outcome; 62% were gainfully employed/ full-time students; 15.6% resumed pre-injury status. Better working alliance predicted better adjusted outcome. Patients seeking compensation showed significantly lower work eagerness ratings”. “Poorer outcome was associated with better neuropsychological status.”</p> <p>Klonoff 2000: “88.4% of patients were productive up to 11 years after discharge, with 76.8% engaged in competitive activity and with no decline in productivity seen over time from discharge.”</p>	Poor-Moderate
Wall et al, 1998 ⁶⁶	USA	Community-based training program	<p>n=31 TBI/38</p> <p>A patient’s return to work plan</p>	<p>“A total of 59% of these persons remained employed at follow-up,</p>	Poor

Observational			is developed and unpaid actual training is provided. After completion of training job search is initiated with support from a placement specialist	compared to 32% at time of injury.”	
Murphy et al, 2006 ¹⁰³ Observational	UK	Rehab UK vocational rehabilitation programme	<p>n=139 TBI/232</p> <p>The programme was set up to contain two components;</p> <ul style="list-style-type: none"> • A centre-based pre-vocational rehabilitation phase to provide intensive basic cognitive rehabilitation for those who had not received it • An in-situ vocational trial phase for those who had already undertaken comprehensive rehabilitation 	“Forty-one per cent of participants were discharged into paid competitive employment, with a further 16% gaining voluntary work and 15% taking up mainstream training or education. The remaining 28% were referred to other services or withdrew from the programme.”	Moderate
Schonbrun et al, 2007 ⁶⁵ Audit	USA	Further analysis of data of Rehabilitation Administration Database for the fiscal year 2002	<p>N=14,311 TBI</p> <p>The provision of specific services (i.e. assessment, counselling, job placement, job search and diagnosis and treat)</p>	“Consumers who received assessment services were more likely to achieve competitive employment than those who did not receive these services (p = .001). Job placement predicted employment outcome. Consumers who received this service were more likely to have obtained competitive employment than those who did not receive these services (p = .001). Job search and diagnosis/treatment services predicted employment outcome and consumers who received these services were more likely to achieve competitive employment than their counterparts (p = .001). There	Not assessed

				was no significant relationship between counselling/guidance and employment, nor did the provision of counselling/guidance predict employment outcome.”	
Owensworth et al, 2010 ⁶⁸ Case studies	Australia (QLD)	Metacognitive contextual approach	n=2 TBI/3 “Individuals participated in a 16 week metacognitive contextual intervention in the community that emphasized executive strategy training and enhancement of social contextual factors in the return to work process.”	“Each participant met their employment goals, achieving a paid work placement within a 3–16 week period following the intervention with durable outcomes. The participant with a less positive employment prognosis attained a faster work placement than the other participants but required more intensive on the job support.	Not assessed
Specific Brain Injury Rehabilitation Program with Vocational Rehabilitation components					
Ben-Yishay, 1987 ⁷⁰ Observational	USA	NYU Medical Center Head Trauma Program	n = 94 TBI Three phases: 1. Intensive and systematic holistic remedial interventions 2. Individualised, guided occupational trials resulting in actual vocational placements and establishment of liaisons and follow-ups 3. Ongoing follow-up	At the completion, 84% of the previously unemployable/ unproductive patients were engaged in productive work; 63% at competitive level and 21% at subsidized capacity level. Sixteen patients (15%) were unemployable at any capacity.	Moderate
Johnstone et al, 1999 ¹⁰⁴ , 2003 ¹⁰⁵ , 2006 ¹⁰⁶ Observational/ cost analysis	USA	Inquiry of Traumatic Brain Injury Model Systems (TBIMS) national database	Johnstone 1999: (N=110 TBI) Subjects were separated into 3 groups: successfully employed, services interrupted, and no services provided. The two former groups received	Johnstone 1999: Individuals with the most significant TBI-related cognitive impairments benefited the most from vocational rehabilitation, and showed the most successful vocational outcomes.	Poor

			<p>services from the Missouri Division of Vocational Rehabilitation.</p> <p>Johnstone 2003: (n=78 TBI) The following data of seventy eight individuals who received Vocational services from the Missouri Division of Vocational Rehabilitation (DVR) were queried – demographic, injury severity, neuropsychologic variables, vocational services offered, and vocational status at time of case closure (successful, unsuccessful, services interrupted, no services provided).</p> <p>Johnstone 2006: A review of a series of six DVR studies.</p>	<p>Johnstone 2003: “At DVR case closure, 17% were rated as being successfully employed, with nearly all working in industrial, service, or clerical positions (2 in a sheltered workshop, 1 in a professional position)”. “Stepwise logistic regressions indicated that delivery of DVR services (i.e., vocational guidance and counselling, on-the-job training) predicted vocational outcome and demographic, injury severity, and neuropsychologic variables did not.”</p> <p>Johnstone 2006: Majority of the DVR clients are relatively young and suffered significant TBI resulting significant neuropsychological abilities. Only 17% of DVR patients managed to find successful employment with assistance.</p>	
Sarajuuri et al, 2005 ⁷² Controlled trial	Finland (Helsinki)	Individualized Neuropsychological Subgroup Rehabilitation Program (INSURE)	<p>n=19 TBI A post-acute, interdisciplinary, 6-week, inpatient rehabilitation program for selected groups of patients with TBI. The core of the program is neuropsychologic rehabilitation and psychotherapy with vocational interventions and follow-up support.</p>	“At follow-up, 89% of the treated patients were productive compared with 55% of the controls. The rehabilitation program was significantly predictive of the productive status at follow-up (odds ratio=6.96; 95% confidence interval, 1.26 –38.44; P=.017). Other factors did not explain the better productivity of the treatment group.”	Not assessed
Supported employment					
Wehman et al,	USA	Supported	Wehman 1990: (n=41 TBI)	Wehman 1990:	Moderate

<p>1990⁷⁷, 1993⁷⁶, 1995¹⁰⁷, 2003⁷⁵ Observational</p>		<p>Employment Model (individual)</p>	<p>Wehman 1993: (n=80 TBI) Wehman 1995: (n=87 TBI) Wehman 2003: (n=59 TBI) A university-based supported employment program that uses the individual placement model of supported employment.</p>	<p>“Only 36% of referred clients had achieved any competitive post-injury employment, compared with 91% of the same group who were competitively employed before injury. A job retention rate of 71% was reported, with most jobs in warehouse, clerical, and service-related occupations. A mean of 291 hours of job coaching was required to place and maintain all clients in supported employment.”</p> <p>Wehman 1993: “The monthly employment ratio increased from 13% after injury with no supported employment to 67% with supported employment services. The majority of individuals were employed in warehouse, clerical and service-related occupations. A mean of 250 staff intervention hours were required to train and provide follow-up services to program participants.”</p> <p>Wehman 1995: After 3 months, 73.6% of patients were employed in first position but subsequently went down to 29.5% after 12 months. Employed in second or more rose from 4.6% to 21.8% in 12 months. Total employed went down from 78.2% to 51.3% after a year.</p> <p>Wehman 2003: “The average length of employment for the current sample was 42.58 months.</p>	
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				Average gross earnings were \$26,129.74 for individuals during their entire duration of employment". "Billing charges accrued for employment services averaged \$10,349.37. Individuals with TBI earned an average of \$17,515 more than the costs associated with their supported employment."	
Ellerd and Moore, 1992 ⁷³ Observational	USA	Individual placement model of supported employment	n=24 TBI The service was provided through a job coach and a full time job developer. The patients received onsite training and support.	At the end of 12 month follow-up, 71% patients were employed, but at the end of 30 month follow-up, only 38% were still employed.	Poor
Gamble and Moore, 2003 ⁷⁴ Observational	USA	Supported employment	n=1073 TBI Subjects with TBI who received supported employment (treatment group) and 995 patients with TBI who did not receive supported employment (control group) during vocational rehabilitation were compared. Supported employment consisted of on-the-job training and support for as long as the client needed.	"At the time of closure, 67.9% of the treatment group and 47% of the control group were competitively employed (p < 0.003). However, the control group had significantly higher earnings per week than treatment group and the control group worked substantially more hours per week than treatment group. Additionally, both groups were equally employed in miscellaneous occupations at closure (43.4% of the treatment group versus 42.3% of the control group)."	Good/High
<i>Case coordination</i>					
Buffington and Malec, 1997 ⁷⁸ Observational	USA	A specialized brain injury vocational service delivery model	n=52 TBI/80 A coordinated model of service delivery that integrates medical and vocational services by	"Through emphasizing early vocational intervention, closely integrating this with medical rehabilitative treatment, and providing a smooth	Good/High

			<p>establishing a brain injury vocational case coordinator for patients.</p>	<p>transition from medical to community-based services, 40% of project participants were placed in a job within the first 3 months of project participation; about 70% were placed within 12 months of project participation. Those placed have an average rate of pay of \$7.70 per hour and a 90-day job retention rate of 100%.”</p>	
<p>Malec and Buffington, 2000⁸⁰ Observational</p>	<p>USA</p>	<p>Medical/Vocational Case Coordination System (MVCCS) designed for persons with brain injury</p>	<p>n=73 TBI/114 The MVCCS interfaced a medical center–based BI Nurse Case Coordinator (NCC) with a medical-center based BI Vocational Case Coordinator (VCC) who served as a liaison to community- based services. It consisted of :</p> <ol style="list-style-type: none"> (1) early case identification and coordination (2) appropriate medical and vocational rehabilitation interventions (3) work trials (4) temporary or long-term supported employment in appropriate cases. <p>Some of the elements are: early vocational intervention; integrate vocational goals; develop return to work plans;</p>	<p>“At placement, 46% in independent work; 25% in transitional placements; 9% in long-term supported employment; 10% in sheltered work; and 10% not placed. At 1-year follow-up (<i>n</i> =101), 53% in independent work; 19% in transitional placement; 9% in supported work; 6% in sheltered work; and 13% unemployed. Regression analyses showed time since injury and Rasch Staff Mayo-Portland Adaptability Inventory (MPAI) predicted VIS at placement; only VIS at placement independently predicted VIS at 1-year follow-up; Rasch Staff MPAI and pre-injury education level predicted time to placement.”</p>	<p>Good/High</p>

			and use on-job evaluations provide work accommodation.		
O'Neill et al, 2004 ⁸³ Observational	USA	Program without walls (PWW)	n=42 TBI Participants received person - centered, community-based services from a team of freelance consultants who were recruited, trained, and supervised by the state vocational rehabilitation counsellor overseeing the PWW team.	"The PWW successfully placed more consumers who worked a greater number of hours per week and earned more per week than those who received traditional VR services without increasing the cost of case services."	Moderate
Catalano et al, 2006 ⁷⁹ Audit	USA	Further analysis of data of RSA-911 in 2004	n=7,366 TBI This study analysed the Rehabilitation Services Administration (RSA) case service report (RSA-911) data for fiscal year 2004 to examine effects of demographic characteristics, work disincentives, and vocational rehabilitation services patterns on employment outcomes of persons with traumatic brain injuries (TBI).	"The results indicated that European Americans (53%) had appreciably higher competitive employment rates than Native American (50%), Asian Americans (44%), African Americans (42%), and Hispanic/Latino Americans (41%). Clients without co-occurring psychiatric disabilities had a higher employment rate (51%) than those with psychiatric disabilities (45%). Clients without work disincentives showed better employment outcomes (58%) than those with disincentives (45%). An important finding from this analysis was the central role of job search assistance, job placement assistance, and on-the-job support services for persons with TBI in predicting employment outcomes."	Moderate
Malec and	USA	Vocational Case Co-	n=84 TBI/138	"One year after initial placement 80% of	Not assessed

<p>Moessner, 2006⁸¹ Observational</p>		<p>ordinator (VCC) Model for vocational rehabilitation</p>	<p>Components of PWW model: Hospital-based Vocational Case Co-ordinator assists participant to develop:</p> <ul style="list-style-type: none"> - Self-directed vocational plan - Network of medical centre and community services - Early medical, rehabilitative and vocational intervention - Work trials - Temporary or long-term supported employment - Employer education. 	<p>participants remained in community - based employment, 56% of the total sample with no support. Better outcomes were associated with earlier intervention but not with initial injury severity.”</p>	
<p>O, Brien, 2007⁸² Qualitative survey</p>	<p>Australia (Victoria)</p>	<p>Case coordination</p>	<p>“This paper describes the approach used by the Victorian Acquired Brain Injury (ABI) specialist team of CRS Australia (formerly Commonwealth Rehabilitation Service) to facilitate participation in the workforce for its clients”.</p> <p>There were two components to this research:</p> <p>(1) “a survey of all members of CRS Australia’s Victorian ABI team in 2004”</p> <p>(2) “an audit of closed files</p>	<p>“CRS Australia’s results compare favourably with other published results (50% achieved a minimum of 13 weeks open employment compared to population estimates of 38–46.5%).”</p>	<p>Not assessed</p>

			where a successful employment outcome was achieved was undertaken to describe the severity of injury, timing and duration of services, types of services provided, client feedback and type of work achieved.”		
Trexler et al, 2010 ⁸⁴ RCT	USA	Resource Facilitation (RF)	n=7 TBI/23 Patients were randomly allocated to RF group and a control group. All patients received standard follow up services but in addition, the participants in the RF group were allocated a resource facilitator to assist them in return to work.	“Participation increased significantly for both groups ($F = 60.65, P < .0001$), but the interaction between groups and time demonstrated greater improvement for the RF group relative to controls ($F = 9.11, P < .007$). Also, 64% of the RF group was employed at follow-up compared with 36% of the control group (Wald-Wolfkowitz $z = -3.277, P < .0001$).” “No significant differences were found between groups on measures of depression.”	Not assessed
Hybrid or Mixed approaches					
Tyerman and Young, 2000 ⁸⁶ Observational	UK	Working Out project	n=45 TBI The programme consisted of four phases: <ul style="list-style-type: none"> • Assessment • Work preparation • Voluntary work trials • Supported placements 	“On discharge, 50% returned to paid employment with a further 12.5% returning to a therapeutic earning placement, 22.5% to voluntary work and 5% to pre-vocational education. Outcomes were maintained with 51% in paid employment (or training) at one year follow up.”	Not assessed
Malec and Degiorgio, 2002 ⁸⁵	USA	Specialized vocational services (SVS) for persons	n=73 TBI/114 Participants in 3 distinct rehabilitation pathways	Mayo-Portland Adaptability Inventory (MPAI) Vocational Independence Scale	Not assessed

		with brain injury	<p>were studied:</p> <ul style="list-style-type: none"> SVS only SVS and a 3hours/week community reintegration outpatient group SVS and 6-h/d comprehensive day treatment (CDT) 	<p>“success,” as defined by community-based employment (CBE) at 1-year follow-up</p> <p>“The percentage (77%–85%) of participants in CBE at 1-year follow-up did not differ among the 3 pathways. CDT participants had more limited educational backgrounds, were less recently injured, and showed greater disability and more impaired self-awareness than those receiving limited intervention (i.e., SVS or community reintegration outpatient group). MPAI scores for limited-intervention participants who were unsuccessful were similar in level to successful participants in CDT.”</p>	
Hart et al, 2006 ¹⁰⁸	USA (16 TBI Model system centres)	Vocational or post-acute treatment components of 16 TBI Model System (TBIMS) centres	<p>14 TBIMS centres</p> <p>Vocational director/coordinator from each TBIMS surveyed in semi-structured phone interview.</p> <p>“Survey of vocational services for people with TBI, with about 100 closed and open-ended questions on vocational assessments; pre- and post-job placement treatments; program philosophies; funding; and integration of cognitive,</p>	<p>“Great diversity was found among the vocational services of the TBIMS. Programs fell into 3 clusters emphasizing medical rehabilitation services, supported employment, or a combination of these with an emphasis on case management. Job coaching was identified as a key intervention, but there was great variability in intensity, availability, and funding of coaching services.”</p>	Not assessed

			behavioural, family, and medical rehabilitation interventions”		
McRae, Simpson and Gillett, 2007 ⁸ [Paper presented at the The 4th Asia Pacific Occupational Therapy Congress]	Australia (NSW)	The Head2work program (Liverpool Brain Injury Rehabilitation Unit, NSW)	“An overall case co-ordination approach is followed, with additional elements from the program-based approach, comprised of work-related activities at Head2work (predominantly the carpentry workshop). Individual ‘place and train’ is the main approach used for placement into paid and unpaid positions, with on-job training by Head2work staff for as long as required.”	<p>“An outcome study found an overall RTW rate of 71% at case closure and;</p> <ul style="list-style-type: none"> • 81% of clients with the goal of returning to their pre-injury employer were working • 61% of clients with the goal of finding new work were working • Significantly more clients resuming their pre-injury employment (57%) were working at full capacity, compared with 36% who required new employment • Remaining clients were either working at a reduced performance level or were unsuccessful in mainstream employment” 	Not assessed
Foy, C, 2014 ⁹²	UK	QEF Neuro Rehabilitation Services (QEF Neuro Rehab)	n = 73 people with severe or very severe TBI/97 with ABI Residential Intensive neurorehabilitation, education for young adults. Clients receive up to 5 h of integrated therapy (occupational therapy, physiotherapy, speech and language therapy or psychology), education and/or VR daily for approximately 1 year, which is tailored to meet their specific needs and stage of recovery.	“Over half of the clients attained a positive vocational outcome. Length of time since discharge did not differ between those clients with a positive or negative vocational outcome. Vocational outcome was predicted by cognitive and motor ability at discharge, and gender. Together these variables correctly classified the vocational outcome of 76 % of the clients.”	Not assessed
<i>Other approaches</i>					

Smith 2006 ⁸⁹ Case series	Australia	Computer Adaptive Technology	n=6 This is a pilot study on the role of Computer Adaptive Technology in the employment of those with brain Injury. The study used a case study methodology to identify the possible role for adapted computer technology in assisting the employment of people with brain injury.	“In terms of impact, the project had moderate success. Two participants were able to contribute to an increase in on-the-job effectiveness. Another two were unable to act upon, due the weaknesses in the Workplace Modifications Scheme.”	Not assessed
Niemeier et al, 2010	USA	The Vocational Transitions Program	n=38 TBI/71 Thirty nine acquired brain injury patients were assigned to 20-session, manualised, employability-enhancing intervention and 32 to a waiting group.	“The percentage of participants who were working post-treatment was not significantly different between the treatment and control groups (23.1% versus 14.3%; Chi-square = 0.69, df = 1, p-value = 0.4052). The percentage of participants who were productive post-treatment was significantly greater in the treatment group than the control group (80.8% versus 46.4%; Chi-square = 7.06, df = 1, p-value = 0.0079). “Persons who had disability income and had high employability ratings from staff were less likely to be employed following treatment.”	Not assessed
Kolakowsky-Hayner 2012 ¹⁰⁹	USA	Community-based mentoring programme	N=131 The over-arching goal of the Mentoring Program was to improve the ability of individuals with disabilities to access and maximally utilize the services	“Of those with vocational goals, 5/12 achieved vocational goals and 1/12 achieved educational goals. Of those with both goals, 5/12 achieved educational goals and 1/12 achieved vocational goals. Significant community	Not assessed

			<p>and programs that are available in the community.</p> <p>The two objectives of this study were:</p> <p>1) to demonstrate continuing increases in standardized measures of community integration from the time of enrolment in the programme to the time of exit from the program,</p> <p>2) to improve the percentage of youth and young adults with disabilities who successfully access post-secondary education or employment opportunities.</p> <p>53 participants had post-secondary education as a goal.</p> <p>12 participants had an employment goal.</p> <p>12 participants had both education and employment as a combined goal.</p>	<p>integration and independence improvements were noted for program participants (CHART Mobility and Cognitive Independence, M2PI, DRS, and SRS).”</p>	
Man 2013 ⁹³ RCT	Hong Kong	Artificial intelligent virtual reality (VR)-based vocational problem-solving skill training programme	<p>n = 40 (20 with moderate TBI)</p> <p>VR based vocational problem solving skills training programme was compared with that of the conventional psycho-educational approach.</p>	<p>“Improvement in selective memory processes and perception of memory function were found. Across-group comparison showed that the VR group performed more favourably than the therapist-led one in terms of objective and subjective outcome measures and better vocational outcomes.”</p>	Not assessed

Radford et al. 2013 ⁹⁴	UK	TBI specialist vocational rehabilitation (TBI-VR)	<p>n = 94 (17 with severe and 9 with moderate TBI TBI-VR group; 21 with severe and 7 with moderate in usual care group)</p> <p>TBI-VR is delivered by a specialist TBI interdisciplinary team comprising three case managers with professional backgrounds in occupational therapy, social work and intensive care nursing.</p> <p>The programme consists of:</p> <ul style="list-style-type: none"> • TBI impact assessment • Educating participants and families • Community integration training • Pre-work training • Liaison with employers, tutors or employment advisors to advise about the effects of TBI and to plan and monitor a graded work return. <p>Follow up by postal questionnaire at 3, 6 and 12 months post-hospital discharge.</p>	<p>“At 12 months, 15% more TBI-VR participants (27% more with moderate/severe TBI) were working than UC (27/36, 75% vs. 27/45, 60%). Mean TBI-VR health costs per person (consultant, GP, therapy, medication) were only £75 greater at 1 year. Secondary outcomes showed no significant baseline differences between groups.”</p>	Not assessed
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Table 2 – Summary of return to work programs or interventions for people with SCI

Study	Country	Name of program/model	Intervention	Outcomes	Quality
<i>Program-based vocational rehabilitation</i>					
Wang et al, 2002 ¹¹⁰ Observational	Taiwan	Not reported	<p>n=91 Functional independence, psychological functioning</p> <p>Asylum Center Spinal Cord Injury (ACSCI) group: Training program with 6 months of training including: psychosocial consulting, functional, strengthening exercises, endurance, and vocational training; Spinal Cord Injury Association of the Republic of China (SCIAROC): No specific training program.</p>	<p>SCIAROC group: All subjects with tetraplegia were unemployed; 1 subject with paraplegia was a student, 11 were employed, and 22 were unemployed.</p> <p>ACSCI group: all 36 subjects were unemployed because they were just completing the ACSCI program.</p>	Not assessed
Hansen et al, 2007 ¹¹¹ Observational	Bangladesh	Centre for Rehabilitation of the Paralyzed Program	<p>n=46 “The participants were assessed and provided with pre-work training, and physical conditioning was given priority with the aim of building strength, endurance and motor function, while focusing on activities relevant to the individual participant’s</p>	<p>“An estimated 50% of the participants successfully reintegrated into paid employment, of which three quarters returned to occupations very similar to their previous ones.”</p>	Not assessed

			<p>vocational training.”</p> <p>“The vocational training was then extended to a scheme involving simulated work practice through a strategy of graded activities.”</p>		
<p>Phillips et al, 2012¹¹²</p> <p>Retrospective cohort</p>	USA	<p>Analysis of data on secondary outcomes from a cohort of newly injured people who participated in a telerehabilitation intervention</p>	<p>n=111</p> <p>“Patients with spinal cord injuries were recruited during their initial stay at a rehabilitation facility in Atlanta. They received a video-based intervention for nine weeks, a telephone-based intervention for nine weeks, or standard follow-up care. Participants are followed for at least one year, to monitor days of hospitalization, depressive symptoms, and health-related quality of life.”</p>	<p>“Increasing age and being on Medicaid significantly decreased the likelihood of returning to productive activities (P=0.01), while being white (P=0.05) and having a higher median income (Po0.001) significantly increased this probability. The same factors, bar being on Medicaid, affected the return to employment. Whites returned to productive activities 2.5 times sooner than African Americans and employment twice as fast (P=0.001). Being in the 75th income percentile compared with the 25th shortened time to employment by 209 days.”</p>	Not assessed
<i>Supported Employment</i>					
<p>Ottomanelli et al, 2012⁹⁷</p> <p>RCT</p>	USA	Supported employment program	<p>n=201</p> <p>“The intervention consisted of an supported employment (SE) vocational rehabilitation program called the Spinal</p>	<p>Subjects in the SE group were 2.5 times more likely than the TAU-IS group and 11.4 times more likely than the TAU-OS group to obtain competitive employment.</p>	PEDro=5

			<p>Cord Injury Vocational Integration Program, which adhered as closely as possible to principles of SE as developed and described in the individual placement and support model of SE for persons with mental illness.”</p> <p>“The programme consisted of; integrated vocational and medical rehabilitation treatment, rapid engagement in job finding, competitive employment, inclusion regardless of severity or type of disability, ongoing job support, and focus on participant preferences.”</p>		
Ottomanelli et al, 2013 ¹¹³ RCT	USA	Supported employment program	<p>n=157</p> <p>“This study compared supported employment (SE) versus treatment as usual (TAU) for vocational issues.</p> <p>Subjects in the supported employment condition received the Individual Placement and Support (IPS) model of SE that</p>	<p>“There were no significant differences between Veterans who participated in SE compared to those who received TAU in study measures. Participants obtaining competitive employment demonstrated significantly higher scores on the Social Integration, Mobility, and Occupation dimensions of the CHART. There were no</p>	PEDro=5

			included: integrated vocational and medical rehabilitation treatment, rapid engagement in job finding, competitive employment, inclusion regardless of severity or type of disability, ongoing job support, and focus on participant preferences.”	observed differences in VR-36 scores or FIM scores for those obtaining competitive employment.”	
Case co-ordination					
King et al, 2004 ¹¹⁴ Case series	USA	Marcus Community Bridge Program	“Community integration An enhanced case management program (Marcus Community Bridge Program) assisting people to return to the community and to return to work or educational training. The program provides consistent support over time, with a focus on education.”	1 year after discharge the rate of return to work was 17% (i.e., identical to the rate reported by the U.S. Model Systems) and the rate of return to educational training was 31.6% (compared with 5.3% reported by U.S. Model Systems)	Not assessed
Other approaches					
Allen and Blascovich, 1996 ⁹⁶ RCT	USA	Trained service dogs	n=48 Trained service dogs for 2 years (n=24) and wait list controls (n=24)	<ul style="list-style-type: none"> • Improvement on all psychosocial tests at 6 and 12 months • Significant decrease in time (hours) needed for assistance at 6 and 12 months • A decrease of 68% of bi-weekly paid assistance 	PEDro 6/Level 1b

				<p>hours after 1 year</p> <ul style="list-style-type: none"> Increased part-time employment, social interaction and use of public transport 	
Jang et al, 2005 Observational ¹¹⁵	Taiwan	NA	<p>n=219 Vocational rehabilitation Report on access to vocational training (which included computer-related courses, jewellery design, handicrafts, engraving, broadcasting and marketing).</p>	<p>88% were gainfully employed at time of injury; 47% were employed post injury 53% were unemployed. 50% of those employed received vocational training compared with 28% of unemployed</p>	Not assessed
Jongbloed et al, 2007 ¹¹⁶ Observational	Canada	NA	<p>n=357 (eligible surveys for analysis) Vocational rehabilitation Mailed questionnaire inquiring about factors influencing employment, including access to vocational counselling and job retraining.</p>	<p>Most important factor in getting a job was educational upgrading, followed by job retraining, assistance seeking employment, and vocational counselling.</p>	Not assessed
Rowell and Connelly, 2010 ²⁵ Pilot	Australia	Adult Lifestyle Support Packages	<p>n=181 (responders to the questionnaire) Functional independence No intervention per se but examines the impact of a publicly funded set of services to enable return to work, i.e., ALSP, which aims to support activities of daily living</p>	<p>“No statistically significant effect of either the ALSP or support packages from private insurance sources (i.e., PPSP) on labour market participation was found.” “The marginal effects for the ALSP are statistically insignificant. Thus, the hypothesis that the ALSP has a zero effect on u market</p>	Not assessed

				participation cannot be rejected.”	
Shem et al, 2011 ¹¹⁷ Prospective	USA	Social support with mentoring	Each mentee with SCI was matched with a community-based mentor, with or without a disability. The mentoring relationship was planned for 2 years. Participants were evaluated with standardized questionnaires at intake, 3 months after entry, every 3 months thereafter, at the time of post-secondary education or employment entry and 4 months post entry.	7 out of 29 (24%) participants returned to school; 2 (6.9%) participants returned to work; 1 (3.4%) participant returned to school part-time.	Not assessed
Johnston and Cameron, 2014 (In Voc pilot) ⁹⁹ Observational	Australia	InVoc Pilot – Early Access to Vocational Rehabilitation Services (for People with Spinal Cord Injury)	n=39 Participants in the programme received a variety of vocational services aimed towards streamlining and accelerating their return-to-work. InVoc sessions were conducted in addition to traditional rehabilitation services such as physiotherapy and occupational therapy.	“At 12-months after injury, 56.3% of InVoc evaluation participants were working or actively retraining, with 39.2% in paid-employment (primarily full-time positions).” “At 24-months after injury, 62.5% of participants were working or retraining, with 50% in paid employment (again primarily full-time).”	Not assessed



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