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Abstract

Objective: To synthesize the best available evidence on return to work (RTW) after mild traumatic brain injury (MTBI).

Data Sources: MEDLINE and other databases were searched (2001–2012) with terms including “craniocerebral trauma” and “employment.” Reference lists of eligible articles were also searched.

Study Selection: Controlled trials and cohort and case-control studies were selected according to predefined criteria. Studies had to assess RTW or employment outcomes in at least 30 MTBI cases.

Data Extraction: Eligible studies were critically appraised using a modification of the Scottish Intercollegiate Guidelines Network criteria. Two reviewers independently reviewed and extracted data from accepted studies into evidence tables.

Data Synthesis: Evidence was synthesized qualitatively according to modified Scottish Intercollegiate Guidelines Network criteria and prioritized according to design as exploratory or confirmatory. After 77,914 records were screened, 299 articles were found eligible and reviewed; 101 (34%) of these with a low risk of bias were accepted as scientifically admissible, and 4 of these had RTW or employment outcomes. This evidence is preliminary and suggests that most workers RTW within 3 to 6 months after MTBI; MTBI is not a significant risk factor for long-term work disability; and predictors of delayed RTW include a lower level of education (<11y of formal education), nausea or vomiting on hospital admission, extracranial injuries, severe head/bodily pain early after injury, and limited job independence and decision-making latitude.

Conclusions: Our findings are based on preliminary evidence with varied patient characteristics and MTBI definitions, thus limiting firm conclusions. More well-designed studies are required to understand RTW and sustained employment after MTBI in the longer term (≥2y post-MTBI).

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Mild traumatic brain injury (MTBI) or concussion represents between 70% and 90% of all treated traumatic brain injury (TBI), and the incidence is likely in excess of 600 per 100,000 people. The incidence is difficult to determine because mild cases are commonly undocumented and inconsistently diagnosed. While cognitive deficits after MTBI are usually resolved within 3 months post-injury, it is estimated that 5% to 15% of all patients suffer persistent symptoms and functional impairments for months to years afterward. Thus, MTBI can potentially contribute to limitations in vocational, recreational, and social areas of functioning, and work disability. Work disability is defined as time off work, sick leave, reduced productivity, or working with functional limitations.

In its 2004 review, the World Health Organization Collaborating Centre Task Force on Mild Traumatic Brain Injury found that studies addressing issues of prognosis had a low scientific quality, and it did not find any acceptable studies on return to work (RTW). Returning to work after an MTBI can be challenging because of possible physical, cognitive, and emotional impairments. RTW is a major indicator of real-world functioning; thus, predicting future work success is a major focus of research. Individuals unable to RTW after a brain injury can experience greater physical ailments, as well as poorer psychosocial adjustment (ie, increased anxiety, depression, social isolation). Conversely, individuals with brain injury who are employed report better health status, an improved sense of well-being, greater social integration within the community, less usage of health services, and a better quality of life than do those who are not employed. Identifying predictors of delayed or non-RTW may help to identify those at risk who may benefit from rehabilitation to facilitate RTW to preinjury levels as quickly as possible. To the best of our knowledge, there are no other recent systematic reviews that assess employment outcomes exclusively in the MTBI population. Existing reviews are either narrative or address all severities of TBI without stratifying the results related to MTBI. Therefore, the objective of this review was to update the World Health Organization Collaborating Centre Task Force on Mild Traumatic Brain Injury findings on RTW after MTBI. Specifically, we aimed to determine (1) the time and course of RTW after MTBI; (2) whether MTBI is a risk factor for long-term work disability; and (3) the predictors of RTW in workers with MTBI.

**Methods**

The protocol registration, case definition, literature search, critical review strategy, and data synthesis are outlined in detail elsewhere. Briefly, the electronic databases MEDLINE, PsycINFO, Embase, CINAHL, and SPORTDiscus were systematically searched from 2001 to 10 February 2012 with search terms including “traumatic brain injury,” “cerebrocerebral trauma,” “prognosis,” “vocational rehabilitation,” “employment,” and “work status.” The reference lists of all reviews and meta-analyses related to MTBI and articles meeting the eligibility criteria were screened for additional studies. In addition, members of the International Collaboration on MTBI Prognosis provided information about studies of which they had knowledge but that were not found in the databases or reference lists.

Articles were screened for eligibility according to predefined criteria. Inclusion criteria included clinical trials and cohort and case-control studies in English, French, Swedish, Norwegian, Danish, and Spanish. Studies had to have a minimum of 30 MTBI cases and had to assess RTW or employment outcomes to be included. The definition of MTBI had to fall within the definitions provided by the World Health Organization Collaborating Centre Task Force on Mild Traumatic Brain Injury and the Centers for Disease Control and Prevention. The task force states that “MTBI is an acute brain injury resulting from mechanical energy to the head from external physical forces. Operational criteria for clinical identification include: (i) one or more of the following: confusion or disorientation, loss of consciousness for 30 minutes or less, post-traumatic amnesia for less than 24 hours, and/or other transient neurological abnormalities such as focal signs, seizure, and intracranial lesion not requiring surgery; and (ii) Glasgow Coma Scale score of 13–15 after 30 minutes post-injury or later upon presentation for health care.” These manifestations of MTBI must not be due to drugs, alcohol, medications, caused by other injuries or treatment for other injuries (e.g., systemic injuries, facial injuries or intubation), caused by other problems (e.g., psychological trauma, language barrier or coexisting medical conditions) or caused by penetrating cranio-cerebral injury.

Persons with fractured skulls were included if they fit this case definition. The Centers for Disease Control and Prevention provides an additional definition based on clinical records data. MTBI is recognized if an Abbreviated Injury Severity Scale score of 2 for the head region is documented. An administrative data definition for surveillance or research is also provided. Specifically, cases of MTBI are recognized among persons who are assigned certain International Classification of Diseases, Ninth Revision, Clinical Modification diagnostic codes.

Exclusion criteria included cross-sectional studies, case reports and series, cadaveric studies, biomechanical studies, and laboratory studies. We also excluded all studies that had cases of intentional MTBI (eg, assault). In our view, recovery from assault is complicated by victimization and legal proceedings, and to understand their prognosis would require stratifying results by intentional injuries. If the authors of studies did not do this, we excluded the study.

Eligible articles were critically appraised using a modification of the Scottish Intercollegiate Guidelines Network criteria. Two reviewers performed independent, in-depth reviews of each eligible study, rating them as having either a low or high risk of bias. A third reviewer was consulted for disagreements. Studies with a low risk of bias were accepted as scientifically admissible. Two reviewers then independently extracted data from these accepted articles into evidence tables, and the evidence was synthesized according to the modified Scottish Intercollegiate Guidelines Network criteria. A best-evidence synthesis was performed to provide clear and useful conclusions linked to the evidence tables. We also categorized the evidence on relevant prognostic factors as exploratory or confirmatory using the phases of study framework described by Côté et al.
Phase I studies are hypothesis-generating investigations that explore the associations between potential prognostic factors and disease outcomes in a descriptive or univariate way. Phase II studies are extensive exploratory analyses that focus on particular sets of prognostic factors, or attempt to discover which factors have the highest prognostic value. Last, phase III studies are large confirmatory studies of explicit prestated hypotheses that allow for a focused examination of the strength, direction, and independence of the proposed relation between a prognostic factor and the outcome of interest. Information from accepted phase III studies is considered the strongest evidence, followed by evidence from phase II studies. Phase I studies explore the relation between single factors and outcomes and provide more limited preliminary evidence.

Results

After applying the inclusion and exclusion criteria to 77,914 records for our entire review, 299 English articles were determined to be eligible and were critically reviewed. Of these, 101 articles (ie, 34%) were deemed scientifically admissible and 4 of these had RTW or employment outcomes (fig 1). These studies form the basis of our findings and consist of 4 cohort studies (2 phase II and 2 phase I studies) (table 1). Two studies were conducted in Canada, 1 in The Netherlands, and 1 in the United States. Three studies assessed consecutive admissions of patients with MTBI to hospital trauma centers or emergency departments, and 1 study assessed time on workers’ compensation benefits after MTBI. Follow-up periods ranged from 3 months to 2 years. Overall, 1309 participants with MTBI were followed across the 4 studies.

With respect to the specific objectives of our review, we found that most workers RTW within 3 to 6 months after MTBI; MTBI is not a significant risk factor for long-term work disability; and the predictors of delayed RTW include a lower level of education, nausea and vomiting on hospital admission, extracranial injuries, head/bodily pain early postinjury, and limited job independence and decision-making latitude.

Course of RTW after MTBI

Three of the 4 studies that followed workers between 6 and 24 months suggest that most workers with MTBI RTW. In consecutive emergency department MTBI admissions, 76% (152 of 201) of the patients reported full RTW at 6 months postinjury.25 Another study24 that included workers filing compensation claims for MTBI over a 2-year period (n = 816) found 50% to be off compensation benefits after 17 days and 75% off compensation benefits after 72 days. However, a small proportion (5%) still remained on wage replacement benefits 2 years postinjury. Only 1 study27 indicated no RTW at 6 to 9 months postinjury in more than half of the patients who were injured in a motor vehicle collision (n = 99).

Is MTBI a risk factor for long-term work disability?

Kristman et al.24 in a phase II study, found that 5% of MTBI claimants were unable to RTW at 2 years postinjury. In addition, a phase I study27 found no difference in RTW between those with MTBI and those with other injuries. Alternatively, another phase I study26 found that workers with MTBI were almost 3.5 times more likely to be unemployed at 1 year postinjury than the general population, after controlling for age, sex, and education (relative risk [RR], 3.46; confidence interval [CI], 2.87–4.28).

Predictors of RTW in workers with MTBI

Stulemeijer et al25 (phase II) developed and internally validated a clinical prediction rule to predict full RTW and the absence of postconcussion symptoms at 6 months after emergency department admission for MTBI. Those factors associated with a greater chance of full RTW at 6-month follow-up included having more than 11 years of formal education (odds ratio [OR], 6.4; 95% CI, 2.3–18.3), absence of nausea or vomiting on hospital admission (OR, 5.1; CI, 1.8–14.3), absence of additional extracranial injuries (OR, 3.4; 95% CI, 1.6–7.3), and absence of severe pain (head/skull, neck, arms/shoulders, chest/abdomen/back, pelvis/legs) early after injury (OR, 2.3; 95% CI, 0.9–5.9).25 Kristman24 (phase II) found that younger employees, aged 20 to 29 years, discontinued wage replacement benefits more quickly, while sex did not predict time on benefits. One phase I study27 found that patients with MTBI had a significantly higher rate of RTW if the job had greater independence and decision-making latitude. Student, homemaker, professional/semiprofessional, and management categories were defined as occupations offering more independence and opportunity for decision making, when compared with the clerical, sales and service, manual labor, and skilled crafts and trades occupations. Last, another phase I study26 examined, among those persons working preinjury, the risk of unemployment 1 year after MTBI relative to the expected risk of unemployment for the sample under a validated risk-adjusted econometric model of employment in the U.S. population. Doctor et al26 found that compared with the average of each participant’s general population unemployment risk, the RR of unemployment at 1 year postinjury was greater for a subgroup of patients with MTBI with intracranial computed tomography (CT) abnormalities (RR, 4.04; 95% CI, 3.13–5.03) versus those without (RR, 2.85; 95% CI, 1.78–4.16).

A number of factors were not shown to be significant predictors of full RTW by Stulemeijer (phase II).25 These included preinjury factors such as age, female sex, no emotional problems, no physical comorbidities, and no prior head injury; perinjury factors such as Glasgow Coma Scale score of 15, no loss of consciousness (LOC), posttraumatic amnesia (PTA) duration, no traumatic abnormalities on brain CT, mechanism of injury (eg, fall, sports), and no headache on admission; and early postinjury factors encompassing posttraumatic stress, no general self-efficacy, and a moderate level of pain.

Overall, it was consistently shown by 2 phase II studies that sex did not predict RTW.24,25 Inconsistencies exist regarding 2 factors, age and intracranial CT abnormalities, as predictors of RTW. With respect to age, Kristman (phase II)24 found that age predicted time on benefits, while Stulemeijer (phase II)25 found that age did not significantly predict RTW. Regarding intracranial CT abnormalities, Doctor (phase I)26 found this to predict RTW, while Stulemeijer (phase II)25 did not.

Discussion

We reviewed 299 articles relating to the prognosis of MTBI, of which 101 were accepted on the basis of scientific merit and 4 had RTW outcomes. The majority of these suggest that most workers RTW within 3 to 6 months after MTBI.24,25 There is still, however, a small percentage (about 5%–20%) of injured workers who face persisting problems 1 to 2 years postinjury.24,26 MTBI does not appear to be a significant risk factor for long-term work
disability. Predictors of delayed RTW or unemployment seem to include a lower level of education, nausea or vomiting on hospital admission, extracranial injuries, severe pain early after injury, and limited job independence and decision-making latitude. These findings add to this body of literature because the World Health Organization Collaborating Centre Task Force on Mild Traumatic Brain Injury did not find any acceptable studies on RTW after MTBI in 2004.

Varying patient characteristics, geographic regions, occupational categories, compensation systems involved, and MTBI definitions used in the studies we accepted likely influence the inconsistent findings we present. For instance, 2 studies were conducted in Canada, 1 in The Netherlands, and 1 in the United States. Demographic characteristics, such as level of education and socioeconomic status, may vary on the basis of geographic region and may influence RTW and employment outcomes.\(^\text{28}\) None of the studies discussed the occupational categories of their participants in relation to their course of recovery. Interestingly, it has been reported that individuals with TBI holding professional/managerial positions are 3 times more likely to RTW than those in the manual/laborer occupations.\(^\text{29}\) Comparable observations with respect to occupational category may occur in those with MTBI, and this requires further study.

Workers with brain injury from at least 2 different compensation systems were included in our accepted studies. Kristman et al.\(^\text{24}\) examined RTW in a population receiving worker’s compensation benefits and found that 75% of the workers with MTBI went off wage replacement benefits in about 2.5 months.
Table 1  Evidence table of accepted studies (n=4)

<table>
<thead>
<tr>
<th>Author, Year, and Country</th>
<th>Source Population, Study Size, Participation, Follow-Up</th>
<th>Inclusion/Exclusion Criteria</th>
<th>MTBI Case Definition</th>
<th>Prognostic Factors/Outcomes</th>
<th>Findings</th>
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<tbody>
<tr>
<td>Kristman et al, 2010, Canada</td>
<td>All Ontario workers covered by the WSIB in 1997 and 1998 (n=816) F/U: 2y; no loss to F/U</td>
<td>Inclusion: only claimants with no claim for MTBI in the year before the index claim. Exclusion: workers aged 18–19y</td>
<td>WHO: acute brain injury resulting from mechanical energy to the head from external forces; operationalized using the WSIB coding system</td>
<td>Prognostic factors: sex, age Outcome: time on benefits</td>
<td>A total of 87% had a single episode of wage replacement benefits with a median duration of 11d (95% CI, 10–12). 13% had at least 2 benefit periods with median time on benefits of 2–7mo. 5% remained on benefits up to 2y after MTBI. 50% off benefits after 17 cumulative days; 75% after 72d. No sex effect, but age effect, with younger workers coming off benefits faster</td>
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<td>Stulemeijer et al, 2008, The Netherlands</td>
<td>All consecutive MTBI admissions to the ED of a level I trauma center from October 2004 to August 2006 (n=201) F/U: 6 mo postinjury; loss to F/U = 28%</td>
<td>Inclusion: age 18–60y, able to speak and write in Dutch Exclusion: premorbid mental retardation or dementia, questionnaires that were completed &gt;6wk postinjury</td>
<td>European Federation of Neurological Societies definition of MTBI: history of impact to head with or without LOC of ≤30min, with or without PTA, hospital admission GCS score = 13–15</td>
<td>Prognostic factors: 1. Preinjury: age, sex, education, emotional problems, physical comorbidities, or prior head injury. 2. Periinjury: GCS score, LOC, PTA duration, brain CT abnormality, early symptoms (ie, dizziness, nausea/vomiting, headache), additional extracranial injuries (ie, score 2 or more on the AISS). 3. Early postinjury: postconcussion symptoms (RPSQ), posttraumatic stress (IES with scores of &gt;26 classified as severe), severe fatigue (AFQ with a cutoff value of 20), pain severity score in 5 body regions, self-efficacy (ie, GSES median split) Outcomes: RTW</td>
<td>Prediction of full RTW: high level of education (≥11y): OR = 6.4 (95% CI, 2.3–18.3), middle level of education (11–14y): OR = 4.6 (95% CI, 1.7–12.6); absence of nausea/vomiting on admission: OR = 5.1 (95% CI, 1.8–14.3); absence of additional extracranial injuries: OR = 3.4 (95% CI, 1.6–7.3); no severe pain early after injury: OR = 2.3 (95% CI, 0.9–5.9)</td>
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<td>Doctor et al, 2005, U.S.</td>
<td>Consecutive admissions to a level I trauma center from 1980 to 1994. Subjects compared with general population risk of unemployment controlling for age, sex, and education level (n = 228). F/U: 1y; loss to F/U = 10%</td>
<td>Inclusion: had to be working before injury</td>
<td>Positive evidence of TBI (eg, any period of LOC, PTA of at least 1h, CT evidence of brain lesion), hospitalization, survival for at least 1mo, GCS score = 13–15</td>
<td>Prognostic factors: MTBI, CT abnormalities</td>
<td>Compared with general population risk, excess risk of unemployment was 22.3% (95% CI, 16.3–28.7) (RR = 3.46, 95% CI, 2.87–4.28). Unemployment was greater for those with CT abnormalities (RR, 4.04; 95% CI, 3.13–5.03) than for those without (RR, 2.85; 95% CI, 1.78–4.16); similar results found for excess risk estimates</td>
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<td>Friedland and Dawson, 2001, Canada</td>
<td>Consecutive admissions for MVC to a tertiary care center in Toronto over a 20-mo period ending April 1994 (n = 99). MTBI group (n = 64). No MTBI control group (n = 35). F/U: 6–9 mo; loss to F/U = 23%</td>
<td>Inclusion: admission to hospital after MVC, age 19–65y, English-speaking Exclusion: history of head injury, neurological disease, or hospitalization for psychiatric illness; MVC resulted in severe head injury (ie, GCS score ≤12, LOC &gt;30min, PTA &gt;24h), severe disfigurement, amputation, or spinal cord injury</td>
<td>American Congress of Rehabilitation Medicine (1993); initial GCS score ≥13 (after 30min); LOC ≤30min; or PTA ≤24h. Control: GCS score = 15, no LOC/PTA, normal CT scan (if done), no documented brain injury</td>
<td>Prognostic factors: MTBI, occupation type (high vs low decision latitude)</td>
<td>No difference in no RTW between MTBI (56%) and non-MTBI (59%); RR = 1.13 (95% CI, 0.48–2.65). MTBI group had higher RTW if job had greater independence and decision-making latitude (P = .004)</td>
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Abbreviations: AISS, Abbreviated Injury Severity Score; AFQ, Abbreviated Fatigue Questionnaire; CBF, cerebral blood flow; ED, emergency department; F/U, follow-up; GCS, Glasgow Coma Scale; GSES, General Self Efficacy Scale; IES, Impact of Event Scale; MVC, motor vehicle collision; RPSQ, Rivermead PostConcussion Symptoms Questionnaire; WHO, World Health Organization; WSIB, Workers’ Safety and Insurance Board.
Friedland and Dawson\textsuperscript{27} examined those with coverage from automobile insurance and found that nearly 60% of the participants injured in a motor vehicle collision did not RTW, but there was no difference between those with an MTBI and those with other injuries.\textsuperscript{27} Compensation has been shown to have an effect on recovery from MTBI\textsuperscript{30} and may contribute to the range of findings in this review.

The definition of MTBI also varies across the studies. For instance, Doctor et al\textsuperscript{26} studied all consecutive patients with TBI at a level I trauma center in the United States. Participants had to have positive evidence of TBI (eg, any period of LOC, PTA of at least 1h, CT evidence of a brain lesion). They stratified MTBI from more severe TBI only by the Glasgow Coma Scale score, which had to be between 13 and 15. While they concluded that MTBI is a risk factor for unemployment at 1 year postinjury, it is possible that their participants had more severe MTBI than did participants in other studies because they had to be hospitalized and could have had longer periods of LOC and PTA. These factors may indicate more severe head injury and thus influence RTW prognosis. However, the participants in the Kristman et al\textsuperscript{24} study from Canada were workers who made an MTBI claim but were not necessarily hospitalized for their head injury. Furthermore, their definition of MTBI specified an LOC of less than 30 minutes and a PTA duration of less than 24 hours. While they concluded that only 5% of the claimants remained on wage replacement benefits for up to 2 years postinjury, their participants could have had a less severe MTBI than did those of the Doctor\textsuperscript{26} study, thus accounting for the different findings.

Many variables need to be considered when studying RTW after MTBI. For instance, key prognostic factors from 5 domains have been identified as relevant to vocational rehabilitation after TBI.\textsuperscript{28} Some of these may also be relevant to MTBI and should be investigated. They are (1) preinjury personal factors: age, sex, marital status, race, educational level, and psychological status; (2) injury-related personal factors: injury severity, type/mechanism of injury/CT scan results, concurrent symptoms (eg, nausea, vomiting, pain), acute impairments and patterns of recovery, and length of hospital stay; (3) postinjury personal factors: physical status, neuropsychological and general cognitive status, psycho-social status (eg, depression, anxiety, posttraumatic stress), functional abilities (at admission and discharge), and self-reported status (eg, subjective complaints); (4) occupational factors: pre- and postinjury occupational category/complexity; and (5) environmental factors: economic factors, workplace supports, and social and instrumental supports.

More research is needed regarding compensation-related issues. The World Health Organization Collaborating Centre Task Force on Mild Traumatic Brain Injury reported that compensation/litigation is related to persistent postconcussive symptoms in adults.\textsuperscript{9} It has also been suggested by others that some patients would have fewer or no problems with RTW in the absence of secondary gain.\textsuperscript{31} Also, disagreement and a lack of communication between the injured worker and the insurer can deter the pursuit of employment or RTW after an injury.\textsuperscript{31} In other cases, it is possible that for those not employed before their injury, receiving some type of disability payment may be an improvement in financial stability and an incentive to remain on disability benefits. If an injured person is receiving sufficient insurance payments, he/she may not wish to return to a job he/she is unsatisfied with. In other cases, there are some injured persons who could RTW in some capacity, but opt not to. This may occur in the event that workers feel they have poor employment prospects for the future and that they might be better off receiving disability payments. In a population-based study of MTBI after traffic collisions, Cassidy et al\textsuperscript{30} found that insurance legislation had a profound effect on recovery, with claim closure occurring much faster in the absence of payments for pain and suffering (ie, comparing tort to no-fault insurance systems). These findings have important policy implications for RTW after MTBI sustained in traffic collisions.

Other systematic reviews in this special issue also report that psychosocial factors (eg, litigation) are more important predictors of recovery after MTBI than biomedical factors related to the injury (eg, LOC, PTA duration).\textsuperscript{32}

The accepted studies in our review followed workers for only up to 2 years. We do not know whether workers who returned to work after MTBI were actually able to sustain their employment beyond the relatively short follow-up periods. More research is required to assess this important outcome because even in the acquired brain injury literature, including all TBI and stroke, there are very little data available on sustained employment beyond 2 years.\textsuperscript{34} Moreover, the accepted studies did not provide information according to the hierarchy of RTW.\textsuperscript{32} For instance, we do not know whether a worker was able to RTW with the same job and employer or whether he/she was no longer able to do his/her preinjury job and required retraining. To better understand RTW after MTBI, future research must not only state the RTW rate after injury but also examine the levels of RTW.

This review has implications for vocational evaluation and rehabilitation after MTBI. Work disability is multifactorial and can be due to problems at the individual, environmental, and societal levels.\textsuperscript{36,37} Future research should investigate RTW levels and processes for individuals after MTBI that involve all important stakeholders, such as the affected workers, health care providers, coworkers, supervisors, employers, unions, insurers, governments, and society at large.\textsuperscript{37,38}

**Study limitations**

Although our review has several strengths, such as the use of a comprehensive and sensitive search strategy, a best evidence synthesis including studies only with higher methodological quality and the review of studies in multiple languages, important limitations also exist. Publication bias is possible because we reviewed only those studies that were published in peer-reviewed journals and in specific languages. Therefore, potentially relevant studies may have been missed. We may have also excluded potentially high-quality studies that consisted of relatively few intentional MTBI cases. Several different review teams assessed studies for eligibility and quality. There is a certain amount of subjectivity involved with this process. As such, some teams may have rejected articles that others would have deemed admissible and vice versa. Similarly, certain studies could have been excluded that other teams may have deemed eligible. We attempted to guard against this by having 2 reviewers independently assess studies using explicit criteria for inclusion and exclusion, as well as standard Scottish Intercollegiate Guidelines Network criteria. We also tried to prevent this by pairing clinicians with methodologists.

The number and quality of studies that make up our review limit our work. Our findings are based on 2 phase II and 2 phase I studies with varying patient characteristics, occupational and compensation settings, and MTBI definitions. The data in the accepted studies are relatively outdated and collected mainly from single sites. In addition, the studies did not provide information on whether injured workers underwent any form of vocational
rehabilitation. This is a potential confounder because vocational rehabilitation may affect the course and predictors of RTW after MTBI in those receiving services. These issues decrease the generalizability of our findings and limit our ability to make firm conclusions.

Overall, the studies we accepted have some biases (although not fatal flaws), which may have influenced the conclusions of our review, but we present the best available evidence on this issue.39

Conclusions

It is clear that RTW after MTBI can be complex, given the multitude of variables and stakeholders involved. Firm conclusions cannot be stated on the basis of a low number of studies offering preliminary evidence, with varying patient characteristics, occupational and compensation settings, and MTBI definitions. The best available evidence suggests that most people RTW within 3 to 6 months after MTBI. However, 5% to 20% still experience persisting problems in the longer term. Limited evidence indicates that MTBI does not appear to be a significant risk factor for long-term work disability. Some evidence also suggests that predictors of delayed RTW or unemployment include a lower level of education, nausea or vomiting on hospital admission, extracranial injuries, a high level of pain early after injury, and limited job independence and decision-making latitude. Further high-quality research is needed to determine long-term RTW prognosis and determinants for individuals with MTBI across different occupational categories. MTBI definitions need to be more specific and uniform to compare participants across studies. This will contribute to developing evidence-based assessments and guidelines for RTW and sustained employment after MTBI.

Keywords

Craniocerebral trauma; Employment; Rehabilitation; Work

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