



# Rehabilitation for adults with traumatic brain injury

A systematic review and assessment of medical,  
economic, social and ethical aspects

SBU ASSESSMENTS | ASSESSMENT OF METHODS IN HEALTH CARE AND SOCIAL SERVICES

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## Executive summary

### Conclusions

Rehabilitation for persons with mild traumatic brain injury (TBI) and persistent post-concussion symptoms:

- ▶ Specialised brain injury rehabilitation that employs problem-solving therapy or cognitive behavioural therapy (CBT) results in less severe post-concussion symptoms and depressive symptoms, improved psychological function, increased activity and participation and quality of life, when compared to usual care (low certainty of evidence, ⊕⊕○○). A simple cost-effectiveness analysis indicates a cost of about 500 000 SEK per quality-adjusted life year (QALY) for the intervention, but this cost might be overestimated since it does not incorporate possible cost savings resulting from the rehabilitation.
- ▶ Specialised interdisciplinary brain injury rehabilitation results in reduced post-concussion symptoms, when compared to usual care (low certainty of evidence, ⊕⊕○○).

Rehabilitation for persons with moderate to severe TBI:

- ▶ As few high-quality studies were identified, it was not possible to estimate the effects of vocational rehabilitation, rehabilitation with case management/coordinator, rehabilitation in supported living, specialised inpatient rehabilitation or specialised outpatient rehabilitation (very low certainty of evidence, ⊕○○○).

Experiences and perspectives of the rehabilitation process from persons with TBI:

- ▶ A synthesis of qualitative studies showed that the persons with TBI were struggling on their own with adapting in their daily lives and that

family members were important in that process. They experienced limited access to rehabilitation services, and perceived the interventions they receive as neither individualised nor coordinated. Furthermore, they experienced professional and respectful treatment, as well as individualised information, as beneficial for their rehabilitation process.

Current state of research in the field:

- ▶ There is a general need for high-quality studies with control groups in this research field. Standardization of study design, treatment intensity, as well as outcome instruments and measures is needed to allow the effects of different forms of rehabilitation to be compared. It would be preferable if future studies assess the effects and costs of interventions beyond one year. Furthermore, there is a need for studies in settings directly relevant to the Swedish health care system that investigate intervention efficacy as well as individuals' experiences of receiving rehabilitation.

### Aim

The aim of the project was to assess rehabilitation interventions for adults with traumatic brain injury from medical, social, ethical and health economic perspectives.

### Background

Traumatic brain injuries (TBIs) are caused by external force or sudden movement of the head. The most common causes are falls and traffic accidents. The injuries are classified as mild, moderate or severe, based on the duration of unconsciousness and the extent of posttraumatic amnesia. TBI is the most common cause of neurological disability and has often a major impact on life for the affected persons and their family members. According to Swedish hospital data, approximately 10 000 cases are treated in inpatient care and

20 000 in outpatient care every year. Approximately 50% of TBI patients are 65 years or older.

Most persons with mild TBI (including concussions) experience full recovery within a few weeks, but up to 20% experience persistent symptoms including fatigue, headache, hypersensitivity to visual and auditory stimuli, dizziness and memory problems. Access to rehabilitation services for this group varies in Sweden, from specialised care to limited care or no interventions at all.

Persons with moderate to severe TBI typically receive individual rehabilitation from a specialised inpatient brain injury team, but rehabilitation can also take place within geriatric care. After discharge from hospital, rehabilitation is given in outpatient care according to local routines.

## Method

Systematic literature reviews were conducted in accordance with PRISMA guidelines and SBU's standardised methods. All steps in the literature assessment were conducted by two independent reviewers, and any disagreement was resolved by discussion. Quantitative data were combined in meta-analyses when study characteristics and outcome measures were comparable. The findings from the qualitative studies were synthesised through an inductive content analysis. The certainty of evidence of quantitative results was assessed according to grading of recommendations assessment, development and evaluation (GRADE), and qualitative results were assessed with Confidence in Evidence from Reviews of Qualitative research (CERQual).

## Inclusion Criteria

### Quantitative studies

#### Population:

Adults ( $\geq 16$  years old) with traumatic brain injury (TBI). Studies with mixed populations were accepted if the proportion of TBI patients comprised  $>50\%$ .

#### Interventions (1-6):

- Specialised inpatient rehabilitation at an early stage after injury for patients with moderate to severe TBI
- Specialised outpatient rehabilitation at a later stage after injury for patients with moderate to severe TBI
- Specialised outpatient rehabilitation for patients with mild TBI and persistent residual symptoms
- Rehabilitation with case management or coordinator

- Supported living in residential homes
- Vocational rehabilitation

#### Comparisons (1-6):

- Less specialised rehabilitation or no rehabilitation
- Less specialised rehabilitation or no rehabilitation
- Less specialised rehabilitation or no rehabilitation
- Rehabilitation without case manager
- Living at home or other forms of living
- Other forms of rehabilitation or no rehabilitation

#### Outcome:

- Function
- Activity and participation
- Quality of life
- Mortality

## Health economic studies

Population, Interventions, and Comparison: same as for quantitative studies

#### Outcome:

Resource use, costs and cost-effectiveness

## Qualitative studies

**Population:** Same as for quantitative studies

**Phenomena of Interest:** Experiences of the rehabilitation process and health care contacts

**Context:** Hospital and at home

## Study design

Quantitative studies: Randomised controlled trials (RCT) or non-randomised controlled studies of interventions (NRSI).

Health economic studies: Relevant study designs included cost studies, comparative studies of resource use, and economic evaluations, including modelling studies.

Qualitative studies: Studies with qualitative design exploring patients' experiences and perspectives

Systematic reviews were included if inclusion and exclusion criteria were matched by our stated criteria.

Language: English, Swedish, Norwegian, or Danish.

Search period: From 1990 or 2000 (depending on intervention) and onwards. Final search: March 2019.

Databases searched: Cochrane Controlled Register of Trials (Central), PubMed (NLM), EMBASE (Elsevier), CINAHL (EBSCO), PsycINFO (EBSCO), SocINDEX.

Client/patients involvement: Yes

## Results

In total, 19 RCTs, 12 NRSIs, 10 qualitative and 3 health economic studies were included in the report (see flow charts, [www.sbu.se/304e](http://www.sbu.se/304e)).

### Effects of the rehabilitation interventions

The results from the quantitative studies assessing the interventions' effects on health and quality of life are summarised in Table 2. The 6 initial research questions resulted in 15 unique comparisons. Results favouring the intervention group were seen from specialised brain injury rehabilitation for persons with persistent post-concussion symptoms after mild TBI, when compared to usual care (low certainty of evidence). For all other comparisons, the results had very

low certainty of evidence, which means that it was not possible to assess the effects of these interventions.

### Health economic assessment

The systematic literature review resulted in three studies that fulfilled the eligibility and quality criteria; these studies only addressed partial aspects of the research questions. A study from the US compared telephone-based problem-solving therapy to usual care in a military health care setting. A Dutch study analysed costs for supported living one year before and one year after the intervention. Finally, an economic evaluation from the UK compared specialised vocational rehabilitation to usual care.

Research question	Intervention	Comparison	Outcome (certainty of evidence)			
			Function	Activity and participation	Quality of life	Mortality
Specialised inpatient rehabilitation, moderate to severe TBI	Specialised inpatient rehabilitation	Less specialised rehabilitation	Very low ⊕○○○	Very low ⊕○○○	Very low ⊕○○○	No studies
Specialised outpatient rehabilitation, moderate to severe TBI	CBT	Usual care	Very low ⊕○○○	Very low ⊕○○○	No studies	No studies
	Multidisciplinary outpatient rehabilitation	Usual care	Very low ⊕○○○	Very low ⊕○○○	Very low ⊕○○○	No studies
Specialised outpatient rehabilitation, mild TBI	CBT or problem-solving therapy	Usual care	Low ⊕⊕○○	Low ⊕⊕○○	Low ⊕⊕○○	No studies
	CBT	Counselling	Very low ⊕○○○	Very low ⊕○○○	No studies	No studies
	Interdisciplinary rehabilitation	Usual care	Low ⊕⊕○○	Very low ⊕○○○	Very low ⊕○○○	No studies
Rehabilitation with coordinator	Case Management	Without Case Management	No studies	Very low ⊕○○○	No studies	No studies
	Peer mentoring	Without peer mentoring	Very low ⊕○○○	Very low ⊕○○○	Very low ⊕○○○	No studies
	Resource facilitation	Without resource facilitation	No studies	Very low ⊕○○○	No studies	No studies
Supported living	Residential living + rehabilitation	Living at home + rehabilitation	No studies	Very low ⊕○○○	No studies	No studies
	Transitional living + rehabilitation	Living at home + rehabilitation	No studies	Very low ⊕○○○	No studies	No studies
Vocational rehabilitation (VR)	Virtual reality-based VR	Psychoeducation	Very low ⊕○○○	Very low ⊕○○○	No studies	No studies
	Individual VR	VR in groups	No studies	Very low ⊕○○○	No studies	No studies
	Goal-directed, environment-focused outpatient VR	Goal-directed, environment-focused home-based VR	No studies	Very low ⊕○○○	No studies	No studies
	Specialised VR	Usual care	Very low ⊕○○○	Very low ⊕○○○	Very low ⊕○○○	No studies

CBT = Cognitive behavioural therapy, VR = Vocational rehabilitation

A simple cost-effectiveness analysis was conducted for specialized brain injury rehabilitation consisting of telephone-based problem-solving therapy, which resulted in a cost of around 500 000 SEK per QALY. It is possible that the costs are overestimated, since the calculation does not incorporate possible cost savings resulting from the rehabilitation. Whether or not the intervention should be considered cost-effective depends on what cost decision-makers deem appropriate in relation to the effect in this particular patient population.

### **Experiences and perspectives on the rehabilitation**

The systematic review of qualitative research resulted in 10 studies, for which the findings were synthesised into three main categories. The synthesis showed that the persons with TBI were struggling on their own with adapting in their daily lives and that family members were important in that process. They experienced limited access to rehabilitation services, and perceived the interventions they received as neither individualised nor coordinated. Furthermore, they experienced professional and respectful treatment, as well as individualised information, as beneficial for their rehabilitation process.

### **Ethical and societal aspects**

Persons with traumatic brain injury may have impaired capacity to make informed decisions and to make their own voice heard. This means that their autonomy is reduced, and they may be dependent on the help from family members or health care staff. Unstructured care pathways involving many different care givers in combination with the individuals' complex rehabilitation needs and vulnerable situation,

amplifies the importance of adequate support, information and coordination.

It is necessary for the health care system to provide various forms of rehabilitation interventions in order to meet patients' individual needs. More research is needed, however, in order to conclude on which interventions that are the most effective, and in order to make health economic assessments preceding priority decisions.

It is important to acknowledge aspects related to equity and justice regarding the distribution of rehabilitation interventions, where the patient's geographical residence, age and ability to work may impact on the access to rehabilitation. Presence or absence of family members may also have influence on the patient's access to support and services.

### **Discussion**

It should be noted that very low certainty of evidence does not imply that an intervention lacks effect, but rather that its effect has not been sufficiently researched. This assessment has identified several scientific knowledge gaps where there is a substantial need for further research. As there was an extensive heterogeneity across the included studies regarding design, treatment intensity, outcomes and instruments, it is desirable for the field to strive for improved consistency in design and reporting.

It is also important to acknowledge that the assessment did not target rehabilitation interventions that focus on treating single symptoms. Therefore, there are several rehabilitation forms that are not included in the report.

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