



CLINICAL REVIEW

Self-report instruments for assessing sleep dysfunction in an adult traumatic brain injury population: A systematic review

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SUMMARY

Objectives: To review the number and characteristics of self-reported sleep measures used to evaluate impaired sleep/wakefulness in traumatic brain injury (TBI) populations.**Methods:** We conducted a comprehensive peer-reviewed literature search of Medline, Embase, PsycINFO, CINAHL, and various bibliographies. Only standardized self-report measures for evaluating sleep dysfunction and its signs were taken into consideration.**Results:** Sixteen self-report measures used in TBI research and clinical practices were identified. Five were generic, five symptom-related, and six were condition-specific measures. The Pittsburgh sleep quality index and Epworth sleepiness scale were partially validated in post-acute TBI.**Conclusion:** Although no instrument has been specifically developed for TBI patients, there are scientific benefits to using the existing measures. However, additional research is needed to examine their applicability to the TBI population. The design and introduction of a new instrument able to triage sleep-related complaints between depressive, other medical, and primary sleep disorders—with a section for caregiver reports—might assist in the identification of the etiology of sleep dysfunction in persons with TBI. In choosing or developing a sleep measure, researchers and clinicians must consider the specific domains they want to screen, diagnose, or monitor. Polysomnography is recommended for diagnosing specific sleep disorders that cannot be diagnosed solely using a self-report measure.

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Introduction

Traumatic brain injury (TBI) is a major global health problem. According to the World Health Organization, TBI will surpass many diseases as the major cause of death and disability by the year 2020.¹ With an estimated 10 million people affected annually by TBI, the burden of mortality and morbidity that this condition imposes on society makes it a pressing public health concern.

Recently, there has been growing interest in sleep/wake disturbances, with numerous studies published reporting on sleep problems in patients who sustained a TBI.^{2–8} According to a recent systematic review,⁹ research has shown that patients present a number of different sleep and wakefulness symptoms, including an acute or chronic inability to sleep adequately at night (insomnia¹⁰), chronic fatigue,^{11,12} sleepiness,³ circadian rhythm disturbances,¹⁰ and behavioral manifestations associated with sleep itself. The recognition of the importance of systematically

assessing sleep difficulties in a TBI population has influenced clinical practice and research in the field of TBI. This reflects clinicians' concerns of how there should be better evaluations and treatments for people with TBI who report significant disturbances in sleep/wake cycles post-injury.

Researchers and clinicians have analyzed sleep using both subjective and objective tools. The former are generally questionnaires completed by subjects; the latter are techniques such as polysomnography (PSG),¹³ actigraphy,¹⁴ the multiple sleep latency test (MSLT)¹⁵ and the maintenance of wakefulness test (MWT).¹⁶ PSG evaluates the nocturnal sleep structure by quantifying sleep disturbances. The MSLT quantifies daytime sleepiness. Finally, the MWT evaluates a person's ability to remain alert (i.e., it is a wakefulness test). Unfortunately, these tests are costly and currently require a specialized hospital or sleep clinic setting. In addition, they may not adequately capture the fluctuating nature of some sleep disorders such as insomnia and circadian rhythm sleep disorders. Furthermore, PSG results might be influenced by the first night effect, or the alteration of the sleep structure as a result of being in an unfamiliar environment. Actigraphy is another objective method that has been

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Abbreviations

BSIQ	Brock sleep and insomnia questionnaire
CBT	cognitive behavioral therapy
DSM-IV	diagnostic and statistical manual of mental disorders, 4 th edition
DII	diagnostic interview for insomnia
DBAS	dysfunctional beliefs and attitudes about sleep scale
EDS	excessive daytime sleepiness
ESS	Epworth sleepiness scale
FSS	fatigue severity scale
GCS	Glasgow coma scale
ISI	insomnia severity index
ICSD	international classification of sleep disorders
LESEQ	Leeds sleep evaluation questionnaire
LOC	loss of consciousness
MWT	maintenance of wakefulness test
MOS sleep scale	medical outcomes study sleep scale

mTBI	mild traumatic brain injury
MEQ	morningness-eveningness questionnaire
MAF	multidimensional assessment of fatigue
MFI-20	multidimensional fatigue inventory
MSLT	multiple sleep latency test
PLM	periodic leg movements
PLMD	periodic limb movement disorder
PSQI	Pittsburg sleep quality index
PSG	polysomnography
PTA	post-traumatic amnesia
RBD	REM behavior disorder
SDQ	sleep disorders questionnaire
SWD	sleep-wake disturbance
SSS	Stanford sleepiness scale
SNS	Swiss narcolepsy scale
TBI	traumatic brain injury
UNS	Ullanlinna narcolepsy scale

used to study sleep/wake patterns in clinical research and practice. It can conveniently record people's activity/inactivity periods up to 24 h a day over long periods (i.e., weeks or months). Although actigraphs provide useful collateral measures of sleep patterns, especially when the patient's own report is in question,¹⁴ they have been found to be less reliable in distinguishing between quiet wakefulness and sleep.¹⁷ Discrepancies between these subjective and objective measures¹⁸ raise the question as to which type of data is more important: subjective reports of quality of sleep and daytime sleepiness/alertness or objective evaluation reports. Many researchers are now using patient-report scales in assessing sleep, as they believe that self-perceived health outcomes are more significant and of greater relevance to the patients' treatment than objective data. Although it may not be accurate, especially in the TBI population where sleep state misperception is common, questionnaires are often the instruments first used to assess sleep. This is partly because of their cost effectiveness, their ability to capture unique patient experiences, and the added privacy during completion, which can enhance the validity of the responses. Thus, it is necessary and timely to provide a systematic consideration, solid description, and in-depth understanding of the strengths and limitations of the whole range of self-reported measurements utilized in the assessment of sleep dysfunction in TBI research and clinical practice.

Objectives

The purpose of this review was:

1. To identify and comprehensively assess a variety of the existing self-report sleep measures that have been used to evaluate impaired sleep and wakefulness in adults with TBIs in the acute and chronic stages.
2. To examine these instruments' psychometric properties when tested in the TBI population.
3. To outline the strengths and weaknesses of self-report sleep measures when applied to the TBI population.

Methods

Types of studies

All studies focusing on the TBI adult population and that used a standardized patient-report sleep measure were considered for this review.

Search methods for identification of studies

A comprehensive search strategy was performed to identify all relevant studies, using electronic databases as well as manual selection from relevant bibliographies. The following electronic databases were screened for updated results as of July 2, 2011: Medline and PsycINFO (1980 to present), CINAHL (1982 to present) and Embase (1988–2011, week 31). Furthermore, the reference lists of relevant review articles were scanned for published studies that may have been missed by the electronic literature search.

The inclusion criteria were:

- Published, peer-reviewed studies in English that included data on adult subjects with TBI.

The exclusion criteria were:

- Studies that focused on a different topic (e.g., quality of life, fatigue).
- Studies that used measures specifically created for one study only or studies that used adapted measures.
- Letters to editors, reviews without data, case reports, technical reports, or unpublished manuscripts.

Search terms

Under the supervision of an expert librarian, the following key search terms were used: “exp sleep*” or “sleep disorders” along with “exp brain injuries,” “craniocerebral trauma,” “coma, post-head injury,” “head injuries, penetrating,” “intracranial hemorrhage, traumatic,” or “exp skull fractures”; to this, we added “questionnaires,” “self report,” “survey,” “exp data collection,” “tool,” “scale,” “test,” or “exp weights and measures”; finally, we added, to some combination of the above, “exp reproducibility of results,” “reliability,” or “validity.” Appropriate truncations were included. The above search strategy was used only for Embase. For Medline, PsycINFO, and CINAHL, this strategy was slightly altered (Table S1).

Selection of studies and data abstraction

The abstracts and full articles (when abstracts were not available) were thoroughly screened by two independent reviewers in order to ascertain that a self-reported sleep measure had been used in each study. Furthermore, the full texts of all selected articles

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