

SBU Summary and Conclusions

This report focuses on the management of patients with minor head injury. Minor head injury refers to the short-term loss on consciousness and/or memory as a result of trauma to the skull. People with minor head injury are often taken to a hospital. On arrival, they usually have regained full consciousness and memory, and feel relatively good. A general physical examination usually reveals nothing abnormal.

Although the patient may appear to be fine on examination at the hospital, minor damage may have been sustained within the skull where a hemorrhage can develop. This may cause the patient's conditions to deteriorate hours or days later, and may require rapid surgical intervention.

Due to the risk for severe deterioration, the current strategy involves admitting minor head injury patients to the hospital for one or more days of observation.

Diagnostic radiology studies using computed tomography (CT) offer unique opportunities to identify even minimum hemorrhaging at an early stage. Hence, the question has arisen whether it might be better to perform CT on *all* patients with minor head injury. Such a strategy would allow patients with normal findings to return home instead of being admitted to hospital. The advantage of this strategy is that patients who need special observation and possible surgery could be detected at an early stage. Furthermore, it has been suggested that the CT strategy would not necessarily be more expensive and would in fact conserve resources.

On the other hand, this strategy would involve risk if early CT examination in the emergency room visit was normal, but if the patient deteriorated later at home. This may result in a greater risk for an adverse outcome for the patient and a higher cost of care.

This report reviews the scientific literature on the two strategies, mainly regarding patient benefits and risks, but also regarding the costs to health care and society.

Method

Current practice in Sweden

Current practices – concerning how patients with minor head injury are managed nationwide – were surveyed in 1998 by the National Swedish Board of Health and Welfare and SBU via a questionnaire to all acute care hospitals in Sweden. Statistics from the National Board of Health and Welfare's registry on hospital care were also analyzed.

To determine how observation is managed at hospitals today, random samples were studied at three clinical departments where members of the project group were employed.

To determine whether the current strategy may have disadvantages for patients, malpractice complaints from the National Board of Health and Welfare's Risk Database and the Patient Insurance Register were analyzed.

Systematic literature review

A literature search was conducted in databases from 1966 to 2000. The keywords included combinations of various terms for brain concussion and minor head injury.

Critical review of studies

The studies identified were sorted in three phases, each time by three independent reviewers. Only summaries of articles were reviewed in the first phase, while the entire articles were reviewed in the second and third phases. This process allowed reviewers to identify studies designed in a way that could provide answers to the questions investigated in this report.

One question concerned the rate at which early CT can identify abnormal conditions in minor head injury patients and how often these patients require specialized treatment, eg, neurosurgery. Mortality was also studied. The studies reviewed were graded as being of high, moderate, or low study quality. This determination was based on the size and representativeness of the patient groups, whether they were well defined, and whether CT was used in a high percentage of cases.

To obtain reliable answers to our questions, conclusions were drawn mainly on the basis of studies with high-grade and moderate-grade quality. The cost calculations in economic studies were also reviewed and assessed for quality.

Patient series, case descriptions, and less thorough reports were accepted to analyze the complications associated with the different strategies. The large patient databases used to investigate the questions described above were also reviewed for information about complications.

Grading the strength of evidence for conclusions

The conclusions in the literature review were graded according to the strength of the evidence.

Evidence grade 1 - Strong evidence. At least two studies of high-grade quality from two different study centers.

Evidence grade 2 - Moderate grade evidence. At least one study of high quality and several of moderate-grade quality.

Evidence grade 3 - Limited evidence. Based on at least two studies of moderate-grade quality.

No conclusions were drawn on evidence that fell below grade 3.

Health economics

Three different approaches were used to assess the cost of the strategies of hospital observation versus CT scanning and discharge to the home:

1. The costs in Sweden for acute care of minor head injury patients were estimated from the questionnaire responses and information from public registries and reports.
2. Scientific studies that compared the strategies were searched, reviewed, and assessed for quality based on the categories mentioned above. Conclusions were drawn from studies with high or moderate grade quality.
3. A decision analysis was conducted to compare the costs of the two alternatives. The literature review was used to select reasonable probabilities for different outcomes, and public information was used to estimate costs. These values were varied in a sensitivity analysis.

Results

Current practice in Sweden

According to questionnaire responses from all emergency rooms in 1998, patients with minor head injury were routinely admitted to the hospital for observation. Computed tomography was used to varying degrees, from a few percent to 80%, with a mean of 22%. The indications for conducting CT examination were not uniform. No departments used CT routinely to determine whether it was necessary to admit patients for observation.

Annually, approximately 17 000 patients are admitted to hospital because of minor head injury. This figure has been stable from 1987 to 1997, suggesting that practice routines have not changed. The length-of-stay for patients with minor head injury is relatively short, averaging 1.4 days.

Random samples from the three clinical departments at university hospitals suggested that observation in hospitals is thorough and well documented.

The Risk Database of the National Swedish Board of Health and Welfare and the Patient Insurance Registry revealed 19 claims during the past 3 years where hemorrhaging was detected after considerable delay. CT had not been performed in any of these cases.

Systematic literature review

In the first review phase, 1028 studies were selected based on titles and brief summaries. Most of these studies lacked relevance to the questions posed, and therefore did not receive further consideration. The full articles of 398 studies were reviewed in the second phase. Again, many of the studies were rejected in this phase due to lack of relevance since they were review articles, commentaries, letters, and discussion articles. In the third phase, 127 articles were considered, whereof 47 addressed complications and special cases. The study quality in the 80 remaining studies was high in 13 studies, moderate in 27 studies, and low in 40 studies. Tables and conclusions were developed from facts extracted from the first two groups.

Abnormal findings from CT scanning, severe complications, and mortality

No controlled studies were identified that compared patient outcomes from the two strategies, i.e., CT scanning and discharge versus hospital observation. Hence, no reliable conclusions can be drawn concerning possible differences in morbidity or mortality.

Results concerning the prevalence of morbid changes identified by CT scanning, the need for neurosurgery, and mortality from minor head injury are based on nine studies of high quality and 22 studies of moderate quality. In total, 31 studies were used, including 25 222 patients with minor head injury and normal findings on physical examination at the hospital.

We found that in approximately 9% of the cases, patients with minor head injury had morbid changes identified by CT scanning in the acute phase (Evidence grade 1). Surgery and other extensive treatment interventions were required in 1% of the patients (Evidence grade 1), and mortality was generally low, averaging 0.1% (Evidence grade 1).

Serious complications despite normal CT

The risks associated with the CT strategy and home discharge cannot be reliably assessed since most of the patients in the studies were admitted despite normal CT findings. The time frames for CT examination were seldom reported, and minimum times were not stipulated. It is rare to find an unexpected and negative course in patients where early CT results are normal. In 32 studies of 586 cases with complications and in patient series of 54 000 patients, we found only two confirmed and nine possible cases of deterioration within 48 hours where early CT had been normal (Evidence grade 2).

Special reasons for admission despite normal CT

The frequency of hemorrhaging in the skull from minor head injury is somewhat higher among older patients and for those under the influence of alcohol. Theoretically, the motivation for conducting a CT examination should be greater in these cases. Nevertheless, we found no evidence that children, the elderly, or people under the influence of alcohol experienced greater benefits or were at greater risk with any given strategy. These categories of patients were well represented in all studies. The evidence does not show their situation to be more serious in relation to other patients if CT findings are normal (Evidence grade 2).

No reliable information was found concerning how to proceed in cases of coagulopathy and with patients on anticoagulant therapy. Reasonably, the indication for CT is higher. It is not known how often the above-mentioned factors, ethical, social, and other reasons should lead to admitting patients despite normal CT findings. If anesthesia should be necessary to enable CT or if the capacity of the radiology department is insufficient, observation at the hospital remains an alternative.

Health economics

The direct costs for acute care of patients with minor head injury have been estimated at 100 million SEK per year in Sweden. Additional costs would include direct costs during the subsequent course in some cases, but mainly the indirect costs of lost production from absenteeism, early retirement, and premature death. There is a lack of reasonably reliable information that would enable conclusions about these costs. However, they are higher than the direct healthcare costs.

No studies were found that directly measure and compare the costs of the two strategies for treating patients with minor head injury. The literature search yielded four economic studies involving 4126 patients. A smaller study was conducted in Norway, the other three were conducted in the United States. The costs for the observation strategy were compared to a model constructed to estimate the cost of the CT strategy. In all four studies, the costs were approximately one third lower with CT.

The decision analysis performed in the project also showed that costs for the CT strategy were approximately one third below the costs for observation. A sensitivity analysis showed that the CT strategy would result in lower costs in nearly all cases.

Need for further studies

Regardless of the treatment strategy, the risks for patients with minor head injury appear to be low, but potentially serious. No comparative studies on the two strategies are available. Using a study size of 2 – 3 000 thousand patients, the hypothesis can be tested that the CT method does not give inferior long term results as compared to hospital admittance. At the same time it is possible to assess practical implementability and economics. Such a study is essential.

Furthermore, there are no larger studies on the ongoing course following minor head injury. Reliable information about the frequency and scope of late symptoms is needed, as is information about the social and economic consequences of potential residual conditions. It is also essential to investigate the extent to which the patient's recovery depends on the acute care strategy used.

Conclusions

Current practice in Sweden

- In Sweden, approximately 17 000 patients per year are hospitalized for minor head injury. This figure has remained stable during the past decade. All hospitals report using observation as a care strategy for minor head injury. Despite observation, computed tomography (CT) is used, on average, in approximately 22% of the cases.
- During the past 3-year period, 19 claims were registered concerning patients in whom brain hemorrhaging was detected late.

Systematic literature review

- Approximately 9% of all minor head injury patients who are received at a hospital have abnormal findings based on CT scanning (Evidence grade 1).
- On average, 1% of the patients need neurosurgery or other interventions (Evidence grade 1).
- Mortality is low, 0.1% (Evidence grade 1)
- Of more than 50 000 minor head injury cases studied, only a few showed that early CT findings were normal, and that the patient deteriorated after several days (Evidence grade 2)
- No studies directly compare hospital observation to CT scanning and discharge. Based on large series of patients, the differences between the results of these strategies can be neither proved nor disproved.
- It is not known how many patients need to be admitted for ethical, social, and medical reasons although CT findings may be normal.
- Nothing suggests that risk are greater in children/elderly or in people under the influence of alcohol if CT findings are normal (Evidence grade 2).
- There are no studies addressing patients with coagulation disorders or those on anticoagulation treatment.

Economic aspects

- The direct costs of acute care hospitalization for patients with minor head injury in Sweden are estimated at 100 million SEK per year. The indirect costs to society for production lost due to absenteeism, etc, cannot be estimated with reasonable accuracy.
- Based on the literature review and the decision analysis, the cost of the CT scanning strategy is estimated to be substantially lower (potentially 30 to 40 million SEK) than the cost of hospital observation. The potential savings means that other patients with greater needs for hospitalization would have 11 000 days at their disposal.
- A large group of patients and staff would be affected by changes in such well-established practice routines. Reliable information based on direct comparisons between the two strategies is not available.
- Regardless of the strategy selected, both must be available in practice – some patients will require hospitalization despite normal CT results while others will require CT scanning despite observation at the hospital. Hence, a new strategy should be initiated in the form of a study where all factors are monitored and where the strategies are actually compared as regards benefits, risks, practical implementability, and economics.

Comment regarding the English summary of the SBU-report on Mild Head Injury

Four parts of the report are now transferred into scientific publications. Links to the abstracts in PubMed of these publications are presented below.

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=10965829&dopt=Abstract

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=14577005&dopt=Abstract

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=14734377

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=15662058