

# Rehabilitation after Traumatic Brain Injuries - The Challenge of the Elderly

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## Background

Traumatic brain injury (TBI) is a worldwide public health problem, with high mortality rates and long-term loss of function for the survivors. The incidence of TBI is related to environmental, socio-cultural and individual factors that vary over time. International epidemiological studies have reported changes during the last decades with decreasing incidence, hospitalization, and mortality from severe TBI except for the elderly. The TBI survivors in general display functional impairments and physical, cognitive and emotional disabilities causing restriction in activities and participation. Dependency in daily activities is associated to poor quality of life and recognized to be very costly for the society. Vegetative state and reduced consciousness are feared consequences after TBI, and yet incidence and course of these conditions are largely unknown. In the elderly, the consequences of biological ageing and comorbidity may put them at risk of greater injury-related disability and complications. However, the knowledge is generally lacking regarding functional recovery of elderly with TBI and their long term needs. There is a long tradition for public organization and resource allocation for trauma care and following rehabilitation in Norway, rendering representative cohort suited to address the impact of age on outcome as well as the health care offered.

## Results from ongoing Norwegian studies on severe TBI

### Incidence and mortality

International epidemiological studies have reported decreasing incidence, hospitalizations, and mortality of TBI [1]. The mortality rates from head injuries in Nordic countries (Denmark, Sweden, Norway) declined from 1987 to 2000 [2] and this is assumed to be related to more secure cars and prevention of high velocity traffic accidents. Furthermore, the creation of regional trauma referral centers and the introduction of standardized clinical procedures contribute to reduced mortality [3]. Still, severe TBI represent the number one cause of long-term disability for adults and the mortality rate has not declined over the last 10 years [4]. Increasing number of falls in the elderly associated with a high fatality rate in this patient population may outweigh the effects of the overall improvement in TBI management [5]. The average life expectancy in Norway is 83.5 years for women and 79 years for men, representing the top ten countries in the world ([www.fhi.no](http://www.fhi.no)), rendering the population particularly prone to the increase in fall related TBI in the elderly [6].

The elderly are also a particular challenge to the trauma triage. The falls occur most frequently at home [7], and there may be a time delay of medical care and diagnosis. In a national multicenter study in Norway delayed referral to the trauma centers were documented in the elderly [8], and the mortality was twice as high in the group above 65 years [9].

### Early outcome and rehabilitation effort

The elderly have a higher burden of comorbidity, and the potential of recovery may decrease with ageing [10]. However, the treatment of the elderly trauma victims are different from the younger, and lately evidence of improved outcome in the elderly with more intensive

treatment and rehabilitation have emerged [11-13]. In Norway, a national survey was initiated in 2009, including all severe TBI victims admitted to the regional trauma centers [9]. Treatment, rehabilitation and recovery the first year after the injury were recorded. Early pre-hospital care and in-hospital treatment differed between the elderly (i.e., 65 years or older) and younger adults [8]. The elderly were less frequently intubated and more often admitted to neurosurgical care via local hospitals. Intracranial pressure (ICP) and cerebral perfusion pressure (CPP) were measured in less than half of the elderly. At three months, two thirds of the elderly had returned to their homes, while approximately 40% of the adult were still in-patients, mainly in rehabilitation units [14]. To which extent these differences in treatment are adapted to different needs in the elderly compared to younger subjects or reflecting the therapist accommodation that "elderly is less capable for treatment or out of a suitable ageism" should be discussed [13].

### One year outcome

Recovery after severe traumatic brain injury varies, and sustained reduced consciousness is a feared consequences [15]. In the above mentioned national survey of severe TBI victims, only few subjects remained in vegetative or minimal conscious state one year after the injury, but none of these victims were above 65 years [16]. Furthermore, 90 % of the patients were living at home and 85% were mostly able to perform daily activities independently (GOSE scores 5-8). Preliminary results indicate that age has no major influence on functional recovery. Furthermore, the elderly seems to be more satisfied with life one year after the injury than the younger subjects. Transfer to rehabilitation units after the acute care hospital stay improves recovery significantly at the group level. This underscores the need of looking into the rehabilitation trajectories of the elderly in the Norwegian health care system.

## Conclusion

Better knowledge about optimal trauma triage and appropriate neurosurgical and medical interventions in elderly with severe TBI is needed. The effect of more aggressive rehabilitation should be focused in controlled trials. No major ethical contraindications exist to such interventions within rehabilitation and the overall effects may prove cost-effective to the society.

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Received April 23, 2013; Accepted May 21, 2013; Published May 23, 2013

**Citation:** Røe C (2013) Rehabilitation after Traumatic Brain Injuries - The Challenge of the Elderly. Int J Phys Med Rehabil 1: 139. doi:10.4172/2329-9096.1000139

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