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Long-term health condition in major pediatric trauma: a pilot study☆

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Abstract

Purpose: Major trauma is the leading cause of death in children of developed countries. However, little is known about its long-term health consequences in survivors. Our aim was to describe the health condition in children at long-term after major trauma.

Methods: Prospective cohort study of severely injured children (Injury Severity Score ≥16, age <16) admitted to a Dutch level I trauma center in 1999 to 2000 (N = 40). About 7 years after trauma (median, 7.3; range, 6.3-8.2 years), survivors' health condition was assessed with the following: guides to the evaluation of permanent impairment of the American Medical Association (AMA-guides), Glasgow Outcome Scales (GOS/GOSE), Vineland Adaptive Behavior Scales (VABS), Child Behavior Checklist (CBCL), and Strengths and Difficulties Questionnaire (SDQ).

Results: Of 40 children, 28 were followed up. Most (n = 16; 57%) had no impairments (AMA guides); minor to severe impairments were found in 12 of the respondents. About 80% (n = 22) had good recovery (GOS 5 and GOSE 7/8); the remaining had moderately disability (GOS 4 or GOSE 5/6). The mean scores on the VABS and the frequency of behavioral problems on the CBCL (24%) and the SDQ (20%) were comparable to healthy peers.

Conclusions: This long-term follow-up study after major trauma revealed that most children had a health condition comparable to healthy peers; about 40% of the respondents was physically impaired or

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restricted in daily activities. Our experiences with different measures may be helpful to apply age-appropriate outcome measures for the clinical follow-up of children after major trauma and to design future longitudinal studies.

In developed countries, injuries are the leading cause of death among children in the age range of 1 to 18 years old [1,2]. The survival rate of major trauma in children is about 80% [3,4]. Fortunately, most children recover fully from an accident, but there is a subgroup of patients who are left with physical disabilities or with cognitive or psychosocial problems [5-10].

According to the International Classification of Functioning, Disability, and Health (ICF) of the World Health Organization [11], health condition can be described by 3 domains as follows: body function and structure, activities, and participation (Fig. 1). These 3 domains are interrelated and also influenced by personal and environmental factors. An example will clarify the use of the ICF model in describing a person's health condition. The health condition of a 15-year-old boy with a traumatic lower leg amputation can be described as follows: (1) on the domain of body function and structure, his amputation means not only the absence of his lower leg, including his ankle and foot, but also related impairments such as skin problems, phantom pain, muscle weakness, and others. (2) On the domain of activities, his amputation means that he has limitations in mobility-related activities but is able to walk with prosthesis or crutches. (3) On the domain of participation, his amputation means that he is restricted in his participation to play tennis at his tennis club at the same level.

The available literature about the health condition after pediatric trauma generally focuses on minor trauma [12-14] or traumatic brain injury [15-17]. *Major trauma* is defined as life-threatening injury of 2 or more body regions or organ systems [18]. Literature about the health condition of children after major trauma is sparse, and the results are diverse. In children after major trauma, physical disabilities were found in 20% to 30% at discharge [3,6]. One year after major trauma, 20% to 55% of the children was found to have a physical disability [4,8]. At 2 to 9 years (mean, 4.2 years) follow-up, physical disabilities are found in 10% to 30%, cognitive problems in 10% to 40%, and psychosocial problems in 20% to 50% of the children after major trauma [4,6-8]. Literature about the health condition of children after major trauma with a mean follow-up period of more than 5 years is missing. Furthermore, there is limited experience with measures of health condition in children after major trauma.

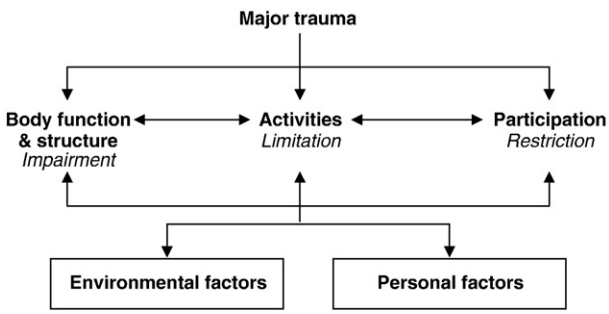

Fig. 1 International Classification of Functioning, disability and health of the World Health Organization [13].

In summary, to understand better the problems after trauma, there is a need for large longitudinal studies that describe the long-term health condition at all levels of functioning in children after major trauma. The aim for this pilot study is to describe the health condition at each ICF level of functioning in a cohort of children 6 to 8 years after major trauma.

1. Methods

1.1. Study population

From January 1999 till December 2000, a consecutive cohort of patients with major trauma who were at the emergency department of the University Medical Center Utrecht, The Netherlands, was defined [19]. The University Medical Center Utrecht is a level 1 trauma hospital with a population of 1.1 million people in a densely populated region with high traffic intensity. Only children who survived the accident were part of the cohort. Included were children younger than 16 years at the time of the accident and who had an Injury Severity Score (ISS) [18] of at least 16. The injury severity is based on anatomical and physiologic disturbances in 6 body areas and rated on a 1 to 5 scale. The Injury Severity Score is calculated by summing the squares of the 3 most severely injured body areas.

1.2. Procedure

Patients and their parents were asked by written invitation to participate in a follow-up examination 6 to 8 years after their trauma. If they did not respond, the investigator (LJ) contacted the patients and their parents by telephone. After obtaining written informed consent, respondents were sent the parent-report Child Behavior Checklist (CBCL) and the self-report Strength and