

## Medical Rehabilitation in Croatia – Impact of the 1991-1995 War: Past Problems, Present State, Future Concerns

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**Aim.** To assess whether the 1991-1995 war has stimulated development of the medical rehabilitation system in Croatia.

**Methods.** Review of documents pertaining to the system, study of clinical reports describing rehabilitation activities as published in the Croatian medical literature, study of data obtained and their consideration in terms of effectiveness and quality of rehabilitation care, and comparison of data from 1991 with those from 1995.

**Results.** There has been no significant change in the number of rehabilitation facilities, beds, and rehabilitation professionals. However, elements of structure and process of rehabilitation care have improved in respect of 1) education and composition of rehabilitation professionals, 2) availability of specialized facilities for rehabilitation of patients with complex impairments (traumatic brain and spinal cord injuries), 3) interdisciplinary team approach, 4) use of functional status measurements, and 5) laying the foundations for community-based rehabilitation in the country.

**Conclusion.** The 1991-1995 war has stimulated the development of medical rehabilitation system in Croatia. Other factors may have played a complementary role, too. This proves that medical rehabilitation is a field that develops in association with war.

**Key words:** amputees; community health services; craniocerebral trauma; Croatia; delivery of health care; disabled persons; health care quality, access and evaluation; rehabilitation; rehabilitation centers; spinal cord injuries; war

War is the most terrible, horrifying event, which debases all ideals and destroys all human values. However, some nondestructive aspects – sociological, technological, medical – are claimed to be attributable to war (1).

Wars always cause large numbers of casualties. Many people wounded in war need restoration of movement, mobility, sensation, self-care, speech, and cognition. Therefore, it is not surprising that rehabilitation is one of the medical fields that partly develop in association with war. In the UK, wheelchair and limb-fitting centers were designed for veterans of the First World War (2). In 1944, a spinal injury center, which revolutionized the treatment and prognosis of these casualties, was established in Great Britain as a part of the preparations for invasion of German-occupied Europe (3). Large numbers of soldiers who sustained head injuries during World War I posed a problem that led the German government to establish military head injury rehabilitation centers in Frankfurt and Cologne. During World War II, services for rehabilitation of patients with head trauma were established in Great Britain (Edinburgh and Oxford), the Soviet Union (in the Urals), and in the USA (San Anto-

nio, TX). Unfortunately, some of the head injury rehabilitation centers that opened during the war were closed down soon afterwards (4).

The term “*medical rehabilitation*” means the restoration of individuals to their optimal physical, psychological, and social capabilities. It differs from other fields of medicine in respect that it is not directed at reversing or arresting pathology, but rather focuses on impairment, defined as any loss or abnormality of the physiological, anatomical, or psychological structure or function. Examples of impairment are the following: amputation of a limb, aphasia, loss of hearing or vision, hemiplegia, paraplegia, tetraplegia, difficulties in reasoning or memory, lack of elan, and so forth. Disability can be defined as a restriction or lack of ability to perform an activity in the manner or within the range considered normal. Examples of disability are limited or restricted movement, disturbed behavior, difficulties carrying out personal care tasks, communication disorders, etc. Medical rehabilitation aims at improving the impaired function and maximizing the physical and psychological abilities of the affected individual.

It is very important to determine whether medical care is effective and its quality acceptable, particularly in the light of rising costs of that care. Effectiveness is a degree to which improvement, known to be attainable, is really achieved; or, the degree to which a program or service fulfills the purpose for which it has been established. Quality is the degree of conformance between the actual care provided and the standards set up for that care (5).

Effectiveness of rehabilitation care is assessed by outcomes, which are measured in relation to rehabilitation goals. Goals may vary from partial independence in self-care to return to education or work, with age and co-morbidity playing an important role in setting the goal. It is important to measure what can be altered and compared, to choose appropriate outcome measures, and to collect data in a consistent and standardized manner (6).

Quality of rehabilitation care is assessed on the basis of three elements of care: structure, process, and outcome, preferably by monitoring them simultaneously (7).

Space, facilities, and equipment necessary to engage in rehabilitation treatment, as well as professionals to provide the treatment (including their education, training, experience, and staffing ratio) are the elements of structure. They represent the capacity of a service to provide adequate care. Patients, admitted to a facility that has the above mentioned elements appropriate to their specific impairment, are reported to achieve better functional recovery than those treated in other settings (8-10).

The process of rehabilitation consists of the activities of professionals intended to result in desired outcomes. In most impairments, favorable outcomes are attributable to early initiation of rehabilitation of adequate intensity and delivered by competent therapists; this includes the choice of appropriate treatment methods, functional training, and selection of adaptive equipment (11).

Outcomes in rehabilitation medicine – enhanced functional performance (ability to ambulate, communicate, and carry out activities of daily living) and a sense of well-being – enable individuals to function to their optimal physical, psychological, and social potential in spite of the impairment. This includes the ability to return to the pre-event dwelling, successful work involvement commensurate with capabilities, and involvement in leisure, recreational, and social activities (12-14).

Until 1994, the war in Croatia, which started in 1991, resulted in more than 25,000 wounded in need of rehabilitation, with nearly 1,300 persons with complex impairments, such as amputated limbs – mainly lower ones (770 persons), almost 400 with traumatic brain injuries, and more than 120 with spinal cord damage (15).

In 1993, the *Croatian Medical Journal* published a report that assessed the state of rehabilitation of war casualties in 1992; it concluded that the preparedness and capability of the medical rehabilitation system in Croatia left much to be desired (16).

The purpose of our study was to assess whether and to what extent this war has stimulated development of medical rehabilitation and brought improvements in the rehabilitation care that is being delivered in Croatia. The assessment was based on comparison of effectiveness of medical rehabilitation and elements of its quality before the outbreak of war with those in its aftermath.

## Methods

The following assessment methods were used:

- 1) A review of (a) documents relating to rehabilitation facilities and professionals available in 1991 and today; (b) reports of clinical studies of rehabilitation activities conducted before the war, during the war, and today, as published in the medical literature (mainly in Croatia); and (c) reports on complex impairments, prepared for the study by heads of rehabilitation facilities and the leader of rehabilitation in the community project, describing retrospectively the activities performed in their settings during and after the war.
- 2) Study of the data obtained from the above mentioned reviews and their consideration in terms of rehabilitation effectiveness and elements of quality of care, as well as the comparison of data from 1991 and current data.
- 3) Assessment of the information obtained in the light of accepted principles and practices of medical rehabilitation.

## Results

As in other countries of Central and Eastern Europe, medical rehabilitation in Croatia has its origins in spas (balneology) where some modalities of physical therapy and rehabilitation procedures have developed in due time. During 1950s, some of the spas established departments of physical medicine. In the 1960's, they were renamed "hospitals for rheumatology and rehabilitation", although only 30% of beds were used for this purpose. Most beds were used for patients admitted for convalescence after surgical intervention, acute illness, deterioration of a chronic condition, or just "active rest". In 1993, within the context of health system reform, 11 of these facilities were named "special hospitals for medical rehabilitation".

In addition, university medical centers and some teaching and general hospitals established departments of physical medicine, rheumatology, and rehabilitation. The departments that had beds admitted mainly adults with joint and bone diseases, and also adults with nervous system diseases and children with cerebral palsy. Departments without their own beds provided initial rehabilitation care to the in-patients in medical and surgical wards. Both types of departments developed diagnostic and therapeutic outpatient services. In-patient rehabilitation activities in spas also focused primarily on diseases and injuries of the musculoskeletal system, but some also provided care for patients with diseases of the nervous and cardiovascular system.

### *Situation in Early 1990s*

*Elements of structure.* There were a total of 2,942 rehabilitation beds, 385 in university and general hospitals, and 2,557 in various spas (18). Since Croatia had less than 5 million inhabitants, there were 0.58 rehabilitation beds per 1,000 population.

Among 7,528 medical doctors in the country, 274 were specialists in physical medicine and rehabilitation, so called physiatrists (ie, 5.4/100,000 population). Majority worked in spas or outpatient clinics, and only 20% at the departments of university and general hospitals. There were more than 1,600 physiotherapists, working in spas mostly, and a disproportionately small number of speech and occupational therapists (10 and 5, respectively, per 100 physiotherapists), usually working on ear, nose, and throat departments, and pediatric or psychiatric clinics rather than in rehabilitation. Social workers and psychologists were not employed within the medical rehabilitation field (18).

*Elements of process.* In most in-patient settings, nurses and physiotherapists performed all therapeutic activities. Nurses taught patients basic activities of daily living (BADL), sphincter control, and skin hygiene. Physiotherapists administered modalities of physical therapy and exercises to an equal extent, but were not competent in all contemporary approaches to the latter. Patients were not taught instrumental activities of daily living (IADL).

During the war, departments in university and general hospitals provided initial rehabilitation treatment (respiratory training, walking exercises, correct positioning, and prevention of contractures) to casualties in active surgical care (19), mainly those with fractured limbs, soft tissue injuries, damaged blood vessels and peripheral nerves, and burns. The patients with injuries to blood vessels and peripheral nerves and burns also received their continuing rehabilitation from both the department of physical medicine and the department of plastic surgery, whereas other casualties were referred to various spas to continue their rehabilitation.

*Elements of outcome.* Reports of above mentioned activities reveal the number of casualties treated and sometimes the age and gender breakdown, but not the measured functional status on patient admission and discharge. There are no data on immediate, intermediate, or late rehabilitation outcomes.

*Complex impairments.* There is little information on rehabilitation of patients with spinal cord injuries, traumatic brain injuries, and amputated limbs. These impairments cause catastrophic changes in the life of the afflicted, may cause damage to several body systems, and generally affect life in most aspects. Such patients require intensive, comprehensive care in specialized facilities with appropriate technology and experienced rehabilitation professionals working as a team.

In most developed and some less-developed countries, there are specialized units for rehabilitation of patients with spinal cord injuries (20), whereas in Croatia there is no unit designated for that purpose. In 1984, one of the 50-bed wards for general rehabilitation at Varazdinske Toplice, in association with the Spinal Surgery Department of the Zagreb University Trauma Hospital, started to focus on patients with spinal cord injuries. The whole ward had 4 physiatrists, with only the head of the department having special

training in the subject. There were a sufficient number of physiotherapists, but they had no training in the care of patients with such injuries. There was shortage in specific equipment, such as disposables for intermittent catheterization, antidecubitus cushions, self-propelling wheelchairs, tilt-tables, and balance boards. Around 100 patients with spinal cord injuries were admitted annually; half of them were new cases (21).

Units for the rehabilitation of patients with traumatic brain injuries have been generally slower to develop, except in Australia, Great Britain, Israel, and the USA (20). In Croatia, there was no such specialized facility, except Krapinske Toplice, which organized, in 1986, a 5-bed unit for patients with traumatic brain injuries within a 35-bed section of the Neurological Rehabilitation Department, where 5 physiotherapists, 3 occupational and 3 speech therapists, and 10 nurses were employed. There were no social workers or psychologists working at the Department. The unit annually admitted 30 patients with traumatic brain injuries accompanied with mild motor and some cognitive impairment. The facility for physiotherapeutic treatment was small and not adequately equipped, and the staff was not appropriately trained in the rehabilitation of patients with traumatic brain injury (22).

Urgent need for well-established specialized units for patients with spinal cord and traumatic brain injuries becomes apparent during war and other disasters (20). A general ward may then be converted into such a unit, with professionals and equipment recruited by international organizations, as was the case in Romania after the Bucharest Christmas turmoil (23), or in Japan after an earthquake (24). In Croatia, the two available nuclei of specialized care were expanded and strengthened to admit casualties with spinal cord (Varazdinske Toplice) or traumatic brain injuries (Krapinske Toplice).

In Varazdinske Toplice, 360 casualties (all men) with spinal cord injuries were admitted, all new cases (52% of injuries were caused by fragments of explosive devices), which made 90% of all such casualties in the country. They were transferred to rehabilitation facilities after surgical intervention, ie, decompression and revision of the spinal canal (25), on the 14th day after the intervention in paraplegia and paraparesis, and after stabilization of respiratory function in tetraplegia and tetraparesis. Within 3-6 months of a comprehensive individual program, patients were rehabilitated to the maximal state of independence possible at that time. Since homes of most patients were destroyed or occupied by the enemy, rehabilitated persons remained in the hospital (in other premises) and were thus enabled to have suitable care, in spite of the need for their re-socialization on completion of medical rehabilitation (26). As the number of casualties with spinal cord injuries grew during the war, another 50-bed general rehabilitation ward opened.

In Krapinske Toplice, 170 casualties with traumatic brain injury (mean age, 26.5 years) were treated between 1991 and 1994, the majority having sus-

tained penetrating injuries. Treatment focused on physiotherapy of locomotion impairment; there was no cognitive or behavioral assessment or treatment. On discharge, all patients were sent home, including those in coma. There was no follow-up and the late outcomes have remained unknown (27).

The only specialized rehabilitation institution at the outbreak of war was the National Referral Center for individuals with recently amputated limbs. It was established in Zagreb, in 1961, as apart of the university orthopedic hospital, but at a different location. In the beginning, it had 20 beds and its main activities were inpatient prosthetic rehabilitation, ambulatory diagnosis, and therapy in physical medicine and orthopedics (particularly prescription of devices). It cared mainly for individuals after amputation due to diabetes or vascular disease. At the outbreak of war, the number of beds was 30 and during the war it grew to 65, since most casualties with amputations and all of the more severely injured were referred to that facility. During the war, 864 casualties were rehabilitated with primary prosthesis (mean age, 33 years; 67.5% below knee amputation). Most injuries (68.5%) were caused by land mines and 24.5% by mortar grenades. The absence of the possibility of providing psychosocial care was badly felt, but a cooperation of the psychiatrists and social workers (provided by the Armed Forces) was of help. There was no follow-up (28).

*Community.* The described system of medical rehabilitation was institution-based and city-centered. Its concern with problems of patients was episodic (from admission to discharge) and focused on physical aspects of disability; it reached only a small section of persons in need of rehabilitation and was not accessible to those living in rural areas.

The absence of rehabilitation services in the community was felt particularly hard during the war, when it was essential to provide continuity of treatment and coordinated services that would address also the psychosocial needs of war casualties. This deficiency was compounded by the lack of training and experience of primary care physicians in managing the disabled persons.

#### *Situation in Late 1990's*

*Elements of structure.* During 1990s, 126 rehabilitation beds were abolished in some hospitals and, towards the end of the decade, there were 265 rehabilitation beds in university and general hospitals and 2,557 in special hospitals for medical rehabilitation, which made a total of 2,822 beds (18), ie, 0.56/1000 population.

There were 265 psychiatrists available (4.7 per 100,000 population), which was the highest ratio in Europe (29). Of them, 83 worked in the 11 special hospitals for medical rehabilitation (these employed additional 62 physicians of other specialties), 51 in university or general hospitals, and the rest in various spas, the hospital for children with neurodevelopmental disorders, polyclinics, health centers or private practice (18,29).

Nearly 40,000 persons were hospitalized for rehabilitation in 1997, the majority (45%) because of the diseases of musculoskeletal system, and the rest because of injuries (17%) and diseases of the nervous (16%) and cardiovascular (11%) system. Almost 500,000 persons were cared for in outpatient services. Of in-patients and outpatients, 16% were aged 65 or more (29), with 13.1% of persons older than 65 in the total population (30).

*Elements of process.* It is estimated that 1,200 amputations, 58% being above knee, are performed in the country annually (75% in men; mean age, 61 years), mostly because of diabetes (46%), peripheral vascular diseases (27%), and injuries (20%). Two hundred fifty patients after amputation are annually prosthetically rehabilitated at the National Referral Center in Zagreb, and smaller number of patients in university hospitals of Split and Osijek. The National Referral Center has 37 beds, employs 6 physicians (3 psychiatrists and 3 orthopedic surgeons), 22 physiotherapists, and 17 nurses, but there are no occupational therapists, social workers, or psychologists. Three weeks after the surgical intervention patients are transferred to a special hospital for medical rehabilitation for shaping of the stump, prevention of contracture, and walking exercises. After 14-18 weeks, they are referred to the center for prosthetic rehabilitation. At the Center, the average length of stay is 4-6 weeks for below knee amputees, and 6-8 weeks for above knee amputees (28,31,32).

The Unit for Traumatic Brain Injuries at Krapinske Toplice has 35 beds and annually admits 120 patients (84% men; mean age 30 years), mostly victims of traffic accidents. After spending 1-4 months at neurology or neurosurgery departments of a university hospital (33), patients are transferred to the Unit for Traumatic Brain Injuries. The Unit has access to computerized tomography, carotid and transcranial ultrasound, evoked potentials, and electroencephalography. Physiotherapy department has obtained Bobath beds, and occupational therapy has its own facility with model kitchen and flatlet. Barthel Index (BI) Rancho Los Amigos scale, Glasgow Outcome Scale, Rivermead Behavioral Memory Test, etc, are being used in the evaluation of patient's condition; introduction of Functional Independence Measure (FIM) during 2001 is also planned. Cognitive impairments are also assessed and treated.

The center for rehabilitation of patients with spinal cord injuries at Varazdinske Toplice uses beds at two general rehabilitation wards and admits 200 patients annually, half of them new cases mostly due to traffic accidents. During the war and its aftermath, additions to equipment, facilities, and practices were made. Today, there is a sufficient amount of disposables to enable the training of the patients with spinal cord injuries in intermittent catheterization. Antecubital cushions and self-propelling wheelchairs are available, and there is also a shop where patients can buy aids and appliances. Instruments for ultrasound examination of the urogenital system and densitometry have been installed, sexual counseling initiated, and hippotherapy and sport activities intro-

duced. Medical staff and physiotherapists have undergone repeated education and training in care of patients with spinal cord injuries, and the Center obtains assistance from occupational therapists, social workers, and psychologists of the hospital and involves them in its interdisciplinary team approach. Physicians specializing in physical medicine and rehabilitation have to spend a certain time of training in the center.

*Elements of outcome.* At the National Referral Center for persons with amputations, functional status and mobility are not measured on discharge; patients are provided with discharge letters (written by nurses at the Center for nurses in the community), giving a general description of the patient's status and advising on continuation of care. There is no follow-up and, consequently, no information regarding the extent of prosthesis use, general activities of rehabilitated persons (34), or mortality, which is known to range from 24% in Britain to 39% in Finland during the first year after surgical intervention (35).

At Krapinske Toplice, as mentioned above, various measurements are being used, but there is no follow-up and no information on intermediate and late outcomes (22,36,37).

At Varazdinske Toplice, Functional Independence Measurement has been introduced and the Spinal Cord Independence Measure is now being tested. There is no follow-up.

*Community.* The option of strengthening primary care with the outreach rehabilitation service (38) has been chosen for introducing a community-based approach. Thus, in 1996, a project of community-based rehabilitation at one of the large primary health centers in Zagreb has been started, with rehabilitation professionals coming from the *Holy Ghost* General Hospital in Zagreb (39). The project was proposed by the Expert Committee of the Ministry of Health and received support from the City of Zagreb and the World Health Organization. Its execution was possible due to the support of the Canadian International Development Agency and the active participation of the Center for the Advancement of Community-based Rehabilitation at the Queen's University in Kingston, Ontario. The project engages in clinical practice, propagation of the approach throughout the country, and educational activities for rehabilitation professionals, primary care teams, and persons with disability and their family members (39). Similar projects have been started in other parts of the country. The community-based rehabilitation approach was found to be more effective than institutional rehabilitation in patients with musculoskeletal impairments, particularly in respect of improvement in general health (40). Associations of disabled persons with similar problems have been established (such as "Head Up" of persons with traumatic brain injury and the Croatian Association of Paraplegics and Tetraplegics, "HUPT"). Members of the associations discuss their problems and give each other service, aid, and advice. The associations grow in strength, affirming new aspects and demands of persons with disabilities and creating new relationships

between those who need rehabilitation and those who have to organize and deliver it. Recently, "Head Up", HUPT, The Croatian Association of Medical and Biological Technology, and the Community-based Rehabilitation Project have opened a joint web site, which is supported by the Government. It encourages persons with disabilities to seek information on possibilities for their rehabilitation in the community.

## Discussion

At the outbreak of war, there were sufficient rehabilitation facilities, beds, and professionals to provide treatment of adequate effectiveness and quality. The entire health system became geared to the needs of war victims, with remarkable success in trauma care (41,42). Within this context, great efforts were made by all concerned parties to provide appropriate rehabilitation care to the casualties.

Unfortunately, certain elements of structure and process of rehabilitation showed weaknesses, which hindered provision of optimal care.

There was only one well-established institution for rehabilitation of persons with complex impairments – the one for patients after recent amputation. Units for rehabilitation of the patients with spinal cord and traumatic brain injuries were of recent origin, small, and lacked sufficient specific equipment and appropriately trained therapists.

The rehabilitation staff in the country consisted only of psychiatrists, nurses, and physiotherapists. There was a severe shortage in speech and occupational therapists, social workers, and psychologists. Speech therapy is important for treating difficulties in communication and swallowing, but is not needed when such disorders are not present. On the other hand, occupational therapy touches on every aspect of rehabilitation (physical, psychological, social) and is essential in rehabilitation of patients with all kinds of impairment (from orthopedic to cognitive). It contributes greatly to the rehabilitation effort (43) and should be represented on all rehabilitation teams. Psychological reactions accompanying disability require special attention. They may impede physical rehabilitation, and their neglect may have long-term consequences. It is, therefore, important to include psychologists and social workers in rehabilitation process.

Interdisciplinary teamwork is essential for effective delivery of rehabilitation care; it is crucial to practice the interdisciplinary approach and to have all mentioned professionals participating (44). However, that was not the case in all settings.

The generally accepted principle of initiating rehabilitation as early as possible was not practiced in all instances. Prosthetic rehabilitation usually started many weeks after trauma. It is known that a long period between the trauma and rehabilitation and late fitting of prosthesis affect unfavorably the mobility of rehabilitated persons (45) and their return to work (46). Many patients with traumatic brain injuries had spent many weeks in acute care hospitals before they were transferred to the specialized units, although it is

known that the sooner rehabilitation of the patients with traumatic brain injuries is initiated, the more effective it is (10), because the therapeutic enhancement of neurological recovery is most beneficial in the period early after injury (47). Patients who began their rehabilitation at a traumatic brain injury unit within less than 35 days after injury had better outcomes than those who started it later on (48). As for the spinal cord injuries, Guttman's rule that "the patients with spinal cord injuries should be transferred to a specialized spinal injury unit as soon as possible" has remained valid until today (49) and has largely been practiced in Varazdinske Toplice.

Changes in patients' functional status at discharge from an in-patient rehabilitation institution were not measured in all cases, and follow-up after discharge was not practiced. Hence, outcomes were not determined. Subsequently, effectiveness of rehabilitation during the war and after it can not be assessed (6,33,50,51), and the lack of data on outcomes is a serious limitation to this study.

When quality of rehabilitation care, aiming at continuous improvement, is assessed prospectively, the process and the outcome should be monitored simultaneously. The elements of process serve as valid indicators when linked to relevant outcomes, whereas outcomes are directly related to the process of care that can be modified to favorably affect the outcomes (7). However, process elements without outcomes may be used when the quality is assessed retrospectively, ie, by comparing periods, programs, or systems (52). Thus, by analyzing elements of structure and by comparing the situation in 1991 with that of today, it is possible to infer that the quality of rehabilitation care has considerably improved.

The institute for rehabilitation of amputees has gained further experience and has been strengthened. The specialized units for treating spinal cord and traumatic brain injuries are now adequately equipped and staffed by appropriately trained professionals. Due to the experience in intensive care of overwhelming numbers of wounded, departments of physical medicine and rehabilitation at university hospitals have also been strengthened (53,54). Some special hospitals for medical rehabilitation during the war have directed all their potentials to the long-term care of large numbers of casualties. They have gained confidence in their abilities, have been given extensive educational opportunities in rehabilitation principles and practice, and have undergone significant, upgrading changes in their organization and professional activities (37,55).

Foundations for community-based rehabilitation have been laid and its activities initiated. Today, post-graduate students at the Zagreb University School of Medicine may take a course in community-based rehabilitation within their studies for the MS degree.

Team approach has been introduced in most rehabilitation settings. The number of occupational therapists working in these settings has slightly increased, and social workers and psychologists have joined the field, although in small numbers.

Thus, comparing the situation at the beginning of 1991 with the situation today, we can conclude that considerable advances have occurred in the medical rehabilitation system in the country.

Several major factors may have played a role in this progress.

Until 1991, Croatia had been a part of former Yugoslavia, in which, like in other socialist countries of Eastern Europe, the health infrastructure was impressive in terms of the number of beds, facilities, and professionals. However, the quality of the health system (technology, effectiveness, quality of care, and patient satisfaction) was less impressive. There were medical centers that were able to follow advances in medical research and practice, but were not accessible to many professionals and did not cover many disciplines (56). Medical rehabilitation was one of the neglected fields, and when Croatia gained independence, it could not but develop.

The need for medical rehabilitation is growing. The population is growing old, and consequently, there is an increase in incidence of diseases resulting in impairments. The proportion of young persons with disability is also increasing: the number of working-age adults with disabilities increased by 3.1 million in the USA between 1990 and 1994, and the number of children with disabilities by 1.5 million (57). There is a similar trend in the countries of the European Union, which Croatia is striving to join, and awareness of the need for medical rehabilitation and of its prestige is increasing. The same trend is felt in Croatia.

While part of former Yugoslavia, Croatia relied on the availability of rehabilitation institutions in other regions, particularly those in neighboring Slovenia, and did not develop its own. In some instances, development was not permitted by authorities that were intent on retaining the monopoly over the existing institutions.

We believe, however, that the 1991-1995 war was the primary and strongest impetus for the development of medical rehabilitation. The need to rehabilitate overwhelming numbers of casualties disclosed the existing weaknesses that hindered the delivery of appropriate care. The causes of that situation began to be studied and identified, and the results of investigations pointed to the possible solutions, which were largely implemented during and immediately after the war.

Principles and practice of rehabilitation acquired while caring for war casualties under difficult conditions have been absorbed. Hastily established, converted, or expanded and strengthened units have become the nuclei of permanent rehabilitation settings. Thus, the medical rehabilitation system in the country has developed new capacities for better care of the patients with non-war related impairments.

There is, however, no room for complacency and there is still much to be done to strengthen the advances reached and to improve medical rehabilitation in Croatia. Structure elements for rehabilitation are impressive. The country has the highest ratio of

physiatrists per population in Europe. There are 0.56 rehabilitation beds per 1,000 population, well above the minimum standard of 0.10 (for comparison, Sweden has 0.13, Netherlands 0.12). However, elements of process and outcome of rehabilitation still have to be improved and there are efforts made in that direction.

The principle of transferring patients with complex impairments to specialized rehabilitation units as soon as possible should be adhered to. In prosthetic rehabilitation of the patients with amputation, there is determination to initiate it even earlier; Rivermeade Mobility Index or Walking Activity Index could be introduced to complete the functional data obtained through Functional Independence Measurement, planned to be introduced in 2001. Patients with traumatic brain injuries have to reach the traumatic brain injury rehabilitation unit as soon after the injury as possible; this unit is also planning to introduce Functional Independence Measurement in 2001, and the Spinal Cord Injuries Center, which has been using Functional Independence Measurement, has now started to test the Spinal Cord Independence Measurement.

Patients with amputations, traumatic brain injuries, and spinal cord injuries need specific expertise and coordinated controlled referral to the institutions able to provide them with care required. The traumatic brain injury department in Krapinske Toplice and the Spinal Cord Injury Center in Varazdinske Toplice have remarkably developed and established themselves, and should be nominated national referral centers, like the one for rehabilitation of amputees. With their capacities, they could monitor the effectiveness and quality of care, develop registries, and obtain much needed epidemiological knowledge on trauma brain injuries and spinal cord injuries in the country.

Follow-up after discharge from an in-patient rehabilitation facility has to be instituted to enable assessment of long-term outcomes. The follow-up could be practiced through outpatient services, primary care teams, postal questionnaires, or telephone interviews. Indeed, it has been shown that a trained nurse can obtain reasonable follow-up information on functional, neuropsychological, and social outcomes in trauma brain injury survivors over a 20-30 min long telephone conversation (58).

The number of occupational therapists has to be increased, so that there would be one occupational therapist per 16 beds in a neurological rehabilitation department (the same ratio as for physiotherapists) and one per 32 beds in departments dealing with other types of impairment. We are pleased to note that in 1993 the School of Occupational Therapy adjusted and improved its educational program and has been enrolling sufficient number of students since. Positions should be created for employing graduates in rehabilitation settings. The Second Croatian Congress of Physical Medicine and Rehabilitation held in May, 2000, passed a motion deciding to work toward better inclusion of occupational therapists into rehabilitation.

In view of the high incidence of traffic accidents and aging of the population, the number of beds in the three institutions rehabilitating complex impairments should be increased. All university and general hospitals should have departments (not necessarily beds) of Physical Medicine and Rehabilitation (59): this would allow adequate initial rehabilitation in surgical and medical wards and provide support for further development of community-based rehabilitation. Indeed, the community-based rehabilitation strategy should be brought further into focus, and the rising cost of institutional care stresses community-based rehabilitation even more as the strategy of choice for most persons in need of rehabilitation.

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