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Musculoskeletal Trauma Services in Serbia

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Abstract Serbia, a middle-income country, is located in southeastern Europe, with territory of 88,361 km^2 and 9,400,000 inhabitants. Average month salary is US$542 and the registered unemployment rate is 22%. The country is administratively divided into 30 districts (193 municipalities). The healthcare system is territorially organized. In the state capital there are five clinical hospitals with musculoskeletal traumatology departments, as well as one in each of the four university centers. In addition, there are orthopaedic departments in 40 smaller hospitals throughout the country and in three military hospitals, along with several pediatric surgical departments involved in managing musculoskeletal trauma. There are 524 orthopaedic trauma surgeons (1:18,000 people), with a minor number of additionally trained general and pediatric surgeons who care for musculoskeletal problems. Bonesetters are neither recognized nor included in the healthcare system. Orthopaedic traumatology services are well organized, with variable accessibility depending on the distance between injury site and nearest medical facility. Preventive strategies are well developed and mainly consider agricultural, industrial, and traffic injuries. Distribution of medical institutions is satisfactory. Future activities should include continuing medical education of specialists, exclusion of inappropriate specialists, improvement of preventive strategies and medical transport facilities, as well as standardization of medical equipment, diagnostics, and treatment protocols.

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Introduction

Traumatic injury has become the major cause of death and disability worldwide [16, 24]. Although emergency medical care is not a luxury for rich countries or rich individuals in poor countries, it often is in low- and middle-income countries and emergency care should be organized in a way to reduce overall mortality and disability in these areas [16, 17, 24, 27].

The Essential Trauma Care (EsTC) Project [23] represents an effort to set reasonable, affordable minimum standards for trauma services worldwide and to define the resources necessary to actually provide these services to every injured person, even in the countries with the lowest income. The project focuses on improving the organization and planning of services at minimal cost. A milestone of the project has been the release of Guidelines for Essential Trauma Care [23].

Bearing in mind these facts, as well as the goal of Bone and Joint Decade—to improve the health-related quality of life for people with musculoskeletal disorders worldwide—a transversal comprehensive study of the situation in low- and middle-income countries has been carried out, aiming to define and equalize the possibilities of improvement.

This review covers the geographic, political, and cultural characteristics of Serbia and a description of the healthcare system, orthopaedic and trauma services network, and medical staff training.

Geography, Government and Politics, Demographics, Economy

The Republic of Serbia is a landlocked country in Central Southeastern Europe, covering the southern part of the Pannonian Plain and the central part of the Balkan Peninsula. It borders Hungary on the north; Romania and Bulgaria on the east; Albania and Macedonia on the south; and Montenegro, Croatia, Bosnia and Herzegovina on the west. Its capital is Belgrade [14, 26, 28, 29].

Serbia is divided into five regions (29 districts plus the city of Belgrade).The districts and the city of Belgrade are further divided into 193 municipalities. Serbia has two autonomous provinces: Kosovo and Metohija in the south (five districts, 30 municipalities), and Vojvodina in the north (seven districts, 46 municipalities). (Kosovo is presently under the administration of the United Nations Interim Administration Mission in Kosovo; international negotiations began in 2006 to determine its final status.)

Serbia spreads across 88.361 km^2 with a population of 9,396,000 inhabitants (7,498,000 inhabitants excluding Kosovo and Metohija), according to the last official census data collected in 2002. Population density equals 115 inhabitants per square kilometer. Estimated population count in 2007 is 1,035,000 [15, 18, 25, 33].

Serbia is populated mostly by Serbs (83%). Significant minorities include Albanians (who are the majority in the province of Kosovo), Hungarians, Bosniaks, Roma, Croats, Slovaks, Montenegrins, Macedonians, Bulgarians, Romanians, etc. There are different religions in the country including Eastern Orthodoxy (84%), Roman Catholic (6%), Islam (5%), and Protestant (1%). Two provinces, Vojvodina and Kosovo, are ethnically and religiously diverse. Serbia had a large refugee population of 97,427 per 9,396,000 inhabitants at the end of October 2007 [1, 32]. The median age is 40.4 years (male, 39.1 years; female, 41.7 years) [5, 9, 26, 34]. Life expectancy at birth in the total population is 74 years (male, 71 years; female, 76 years) [5, 9, 26, 34]. Birth rate is 1.8 children born per woman [5, 9, 26, 34]. Infant mortality rate is 12 per 1000 live male births and 8.6 per 1000 live female births, and the 1 to 4 year mortality rate is 0.4 in both genders [35]. The literacy rate (defined as age 15 and over who can read and write) in the total population is 96% (male, 99%; female, 94%) [5, 9, 26, 34]. A computer is present in 34% of homes, and 26% have Internet connectivity.

With an estimated GDP for 2007 of US$ 54,547 billion (US$ 7,265 per capita), and a nominal Purchasing Power Parity (PPP) of US$ 5,397, the Republic of Serbia is considered an upper-middle income economy by the World Bank [36]. The GDP growth rate in 2006 was 5.8% [23] and growth in 2005 was 6.3% [10]. FDI (Foreign Direct Investment) in 2006 was US$ 5.85 billion or € 4.5 billion. FDI for 2007 is currently estimated at around US$ 2.5 billion, while nominal PPP figures are estimated to have reached US$ 5,600 by October 2007 [11].

Serbia has an economy based mostly on services, industry, and agriculture. The main economic problems include high unemployment rate (overall unemployment rate is 20.9%, rising to 21.6% in age group of 15–64) and an insufficient number of economic reforms. Serbia suffers from a high export/import trade deficit and considerable national debt [1, 6, 7, 10, 11, 18, 32, 33, 36]. The average gross monthly salary in November 2007 was US$ 756 with a net salary of US$ 542 (in the industrial sector it was US$ 706 gross and US$ 507 net amount). Average monthly consumption of households in the third quarter of 2007 was US$ 629 [8].

Healthcare System

The healthcare system in Serbia had four major reorganizations since World War II. It is practically a Bismarck model, based on mandatory health insurance with almost total population coverage (almost 96%), and dominant governmental control over medical facilities and equipment. It is primarily financed by contributions of employees and others (91%), followed by government budget donations (7%), fund reimbursement (1%), and miscellaneous income (1%) [2, 3, 22, 30].

The healthcare system is organized in several levels: (1) self-care (individual and family level); (2) primary healthcare (local community level, for the intended population range of 2000–50,000 inhabitants); (3) secondary healthcare (district level, for the intended population range of 100,000–500,000 inhabitants; specialist, hospital-type care); and (4) tertiary healthcare (country level, for intended population range of 500,000–5,000,000 inhabitants with subspecialist, hospital-type care including scientific research). Tertiary medical institutions are affiliated with university centers. Highly specialized services are available for the population of several districts at these centers and secondary healthcare level service is provided for the local population [2, 3, 22, 30].

The number, structure, capacity and spatial distribution of health institutions is defined by the Plan for Health Care Institutions Network in Republic of Serbia [13, 15, 21, 36]. It specifies 37,500 hospital beds (not counting daily hospital and neonatal capacity, including beds for accompanying persons), or five hospital beds per 1000 inhabitants. Thirty-thousand beds are reserved for short-term hospitalization of acute diseases and injuries: 24,000 at the secondary level (3.2 per 1000 inhabitants) and 6000 at tertiary-level institutions (0.8 beds per 1000 inhabitants). Another 7500 beds are reserved for prolonged

hospitalization of which 3500 beds (0.47 beds per 1000 inhabitants) are for psychiatric patients, 1000 (0.13 beds per 1000 inhabitants) for chronic diseases, and 3000 (0.4 beds per 1000 inhabitants) for hospital rehabilitation and physical therapy. The specified number of beds represents a substantial reduction compared to the previous year's total of 43,115 beds, which increased the number of inhabitants per hospital bed from the 172 calculated in 2006.

Secondary-level hospital capacity for acute diseases and injury treatment is presented by bed count per 1,000 inhabitants for the corresponding district in each medical category, with overall average hospitalization of 8.5 days. In the Belgrade district an average orthopaedic and trauma capacity is 0.16 beds per 1000 inhabitants (range, 0.10–0.20 beds) and divided between several hospitals that provide secondary-level healthcare according to the size of the gravitating population as well as infrastructural hospital capabilities (size, number of beds, medical staff structure).

The capacity of tertiary-level institutions (clinical hospital centers, clinics, institutes and clinical centers with total of 6000 beds, or 0.8 beds per 1000 inhabitants) is determined by the same criteria—estimation of the gravitating population needs for complex medical care in reflection to infrastructural capabilities.

In 2006 there were 20,157 physicians (15,317 specialists) involved in the healthcare system in Serbia (1:368 inhabitants) [21]. In hospital facilities there were 7381 physicians, mostly specialists (6372). In addition, there were 2542 general dental practitioners, 1888 graduated pharmacists, 57,949 medical workers with secondary and higher education, and 531 medical workers with lower education [4, 15, 19, 21, 31].

Orthopaedic Trauma Services

Musculoskeletal trauma management is covered at all three healthcare levels, according to actual capabilities. Only physicians are permitted to provide diagnostic and therapeutic healthcare activities. Alternative medicine is recognized in legislation, but restricted to the fields of chiropractics, acupuncture, and herbal medicine, and can be practiced only by medical doctors. Paramedics and nonmedical staff are neither recognized nor included in the healthcare system. Treatment by bonesetters is marginal, not a tradition in the country, and in fact forbidden by law.

At the primary level, trauma response is the responsibility of a general practice physician or urgent medicine specialist. In trauma management they act as first responders and are trained in wound dressing, provisional immobilization, antitetanus prophylaxis, administration of antibiotics, and circulatory volume correction. At the secondary level, most patients with musculoskeletal trauma are treated by orthopaedic and trauma surgeons, and only in rare situations by general surgeons or pediatric surgeons. Appropriate laboratory, ultrasound, and radiographic diagnostic tests are fully provided at this level. At the tertiary healthcare level orthopaedic trauma is exclusively managed by orthopaedic and traumatology specialists. In patients with polytrauma, other specialists are available if required.

The network among orthopaedic departments is quite good, with territorial organization and a rather balanced distribution. Leading orthopaedic institutions are located in regional centers: Belgrade (five clinical hospitals with orthopedic traumatology departments), Novi Sad, Kragujevac, Niš, and Priština. There are additional orthopaedic traumatology departments in 40 other hospitals across the country, as well as in three military hospitals (Belgrade, Novi Sad, and Niš).

There are 524 specialists of orthopaedic surgery and traumatology in Serbia. Given the relatively small area, well-defined health institution network, and relatively good road infrastructure, the availability of orthopaedic trauma service is considered very good. The time interval for the injured to access the nearest orthopaedic trauma surgeon is variable, but never exceeds 3 hours.

Training of Orthopaedists and Nonorthopaedists

Basic medical education for medical doctors is acquired at five public medical universities (Belgrade, Novi Sad, Kragujevac, Niš, and Priština). The first private medical university opened in 2005. Orthopaedics and traumatology is part of the surgery course, with 60 hours of instruction. All higher education institutions have just begun an accreditation process.

Physician licensing is being introduced to our practice as obligatory from January 1, 2008. The criteria for license renewal and the role of continuing medical education in that procedure have not been precisely defined yet.

Orthopaedic and traumatology specialty training lasts 5 years and includes 100 hours of orthopaedics and 100 hours of traumatology. It also involves practical skills training based on the "watch-assist-do" principle with mentor supervision and department rotations on orthopaedics and traumatology (48 months) as well as other disciplines: pediatric surgery, general surgery, neurology and neurosurgery, resuscitation and intensive care, plastic and reconstructive surgery, vascular surgery, urology, radiological diagnostics, physical therapy, rehabilitation, and prosthetics (total, 12 months) [20].

For the official final exam there are two textbooks: General Orthopaedics [37] and Special Orthopaedics [38],

along with numerous monographs and manuals in Serbian, and relevant international literature (mostly English).

Candidate evaluation consists of 10 mandatory tests throughout the specialization, covering various fields: (1) musculoskeletal examination and surgical approaches; (2) pediatric orthopaedics; (3) neuroorthopaedics; (4) musculoskeletal oncology; (5) diseases and injuries of the spine; (6) diseases and injuries of upper limb (including hand and reconstructive microsurgery); (7) diseases and injuries of the pelvis, hip and thigh; (8) diseases and injuries of the knee; (9) diseases and injuries of the calf, foot and ankle; and (10) pseudarthroses, bone defects, transplantation, and bone bank.

The final specialist examination consists of several parts: (1) multiple choice test (100 questions, with an equal number of questions concerning both orthopaedics and traumatology); (2) practical patient examination and diagnostics; (3) surgical treatment; and (4) an oral exam (administered by a panel of five professors, five questions from the orthopaedic field of knowledge and five questions concerning traumatology).

Some musculoskeletal trauma training is provided for specialty residents in general surgery, pediatric surgery, plastic and reconstructive surgery, sports medicine and physical therapy and rehabilitation (mostly within 1–3 months of supervised "watch-assist" involvement at an orthopaedic institution).

Although continuing medical education has been systemically introduced within the past few years, it remains incompatible with the international CME framework and is unfortunately on a voluntary basis at least until the medical license renewal legislation and procedure takes effect. Physicians have mostly participated according to their personal interest by attending various national and international scientific meetings and by scientific literature correspondence (paper and electronic).

Discussion

Where Are We Now?

Although it is a middle-income country, Serbia has a very well-developed healthcare system. Musculoskeletal trauma management is covered at all three healthcare levels, according to actual capabilities. Only physicians provide diagnostic and therapeutic healthcare services. Alternative medicine is recognized in legislation, but is restricted to the fields of chiropractic, acupuncture, and herbal medicine, and may be practiced only by medical doctors. Paramedics and nonmedical personnel are neither recognized nor included in the healthcare system. Treatment by bonesetters is marginal, not a tradition in the country, and is in fact forbidden by law.

There are 524 specialists of orthopaedic surgery and traumatology in Serbia (56 specialized departments). Given the relatively small area, well-defined health institution network, and relatively good road infrastructure, the availability of orthopaedic trauma service is considered as very good. The time interval for the injured to access nearest orthopaedic trauma surgeon is variable, but never exceeds 3 hours.

Where Do We Need To Go and How Do We Get There?

The training process is satisfactory. Nevertheless, there are elements that should be addressed to in order to strengthen the delivery of musculoskeletal trauma services and the healthcare system. It is important to establish appropriate trauma centers throughout the country providing the needed staff and staff development resources; appropriate space, services, equipment, and supplies; good prehospital care and transport; improved preventive strategies; and stronger communication between healthcare providers and government organizations.

Orthopaedic surgeons must be specially educated to care for trauma patients. Supporting staff in operating rooms, wards, and clinics must also be specially educated. Special medical care is required for anesthesia/pain management, trauma surgery, neurosurgery, critical care, plastic surgery, nutrition, rehabilitation, neurology, infectious diseases, internal medicine, pediatrics, etc. Involvement of those individuals with less training in trauma (eg, general and pediatric surgeons) should be limited to first responder activities.

Continuing medical education for orthopaedic trauma specialists should be improved and organized on a regular basis. Unfortunately, the national orthopaedic society is not very active, and is currently in the process of reestablishing itself after several years' pause. Orthopaedic surgeons rarely participate in the EPOS (only one member), EFORT (the national society is not a member anymore), and SICOT (15 members) activities.

An accessible operating room, 24 hours a day, 7 days a week, with anesthesia, nurses, and technologists familiar with orthopaedic trauma care procedures, must be provided. Also, a well-equipped and staffed emergency department and a cast room on the inpatient wards should be established. Classic radiology, CT, MRI, and ultrasound should be provided 24 hours a day, 7 days a week, in all orthopaedic traumatology services.

Modern orthopaedic beds with frames for mobility aids, support/suspension and traction, and modern

instrumentation devices should be provided in all orthopaedic traumatology services. Medical equipment should be standardized throughout healthcare levels, and diagnostic and therapeutic protocols should be optimized for usefulness and applicability.

Fracture fixation implants, joint replacement prostheses, disposable equipment, bone cement, and bone graft substitutes also should be available in all orthopaedic traumatology services.

Providing the appropriate level of care while transporting the injured should be improved. Interinstitutional transfer at an appropriate time after initial stabilization for definitive care of certain types of tertiary orthopaedic trauma care (limb replantation, spine injuries) should also be provided.

Preventive strategies for traffic, industrial and agriculture injuries should be improved.

Special attention should be paid to the communication between healthcare providers and the government, as well as different nongovernmental organizations.

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