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ORIGINAL RESEARCH

# Helicopter Mountain Rescue in Slovenia from 2011 to 2015

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**Introduction**—The popularity of adventure recreation in wilderness areas across the world continues to increase. Nevertheless, the risk of injury and illness remains significant. The purpose of this study is to analyze the mountain rescue operations performed in Slovenia between 2011 and 2015.

**Methods**—This retrospective study reports mountain rescue operations documented by the Slovenian National Mountain Rescue Association. The annual number of ground-based and helicopter-based rescues were identified and compared. For 2015, the indication for rescue and the severity of injury were also analyzed, specifically for interventions requiring the use of a helicopter.

**Results**—From 2011 through 2015, the number of rescues remained consistent with an annual average of 413 (SD ±15; range, 393–434) rescues. However, the percentage of ground-based rescues varied significantly year by year ($P$=0.016), with highest rate in 2014 (68%) and the lowest in 2015 (56%). In 2015, 434 mountain rescue operations were reported in Slovenia. Injury accounted for 44%, illness for 10%, and fatality for 9% of the rescues. In 37%, no illness or injury was reported. Helicopter rescue was used in 190 (44%) of all interventions. Among the 190 helicopter rescues, 49% of patients had nonfatal injuries, 29% required no medical treatment, 15% had illness, and 7% had fatal injuries.

**Conclusions**—A significant number of mountain rescue operations were conducted in Slovenia from 2011 through 2015. Most of these were needed for injured, ill, or deceased persons. A notable number of rescues in 2015 required a helicopter.

*Keywords:* Slovenia, HEMS, search and rescue, NACA

## Introduction

The outcome of patients in a mountain environment can be dramatically improved by rapid evacuation and treatment.[1,2] In Slovenia, this is facilitated by ground-based mountain rescue teams working in close collaboration with helicopter-based medical services. Slovenia's mountain rescue system has been established for more than 100 years. However, it was not until 1968 that a helicopter-based mountain rescue took place. In 2003, the first major professional helicopter rescue service in the country since Slovenia's independence from Yugoslavia was introduced as a pilot project. In 2006, the first helicopter emergency medical service (HEMS) was established and registered as Helikopterska Nujna Medicinska Pomoc (HNMP).

In Slovenia, 2 different types of HEMS provide rapid medical care and transport in either urban or remote areas. The first, Slovenian HEMS, mostly handles incidents away from the mountainous areas and covers the majority of secondary transports with teams that include a physician and an emergency paramedic. The second, Slovenian Mountain Rescue Service HEMS, is associated with Slovenian Mountain Rescue Service (Gorska Resevalna Zveza Slovenije [GRZS]) and covers mountainous terrain; special skills and equipment are required to navigate these difficult areas.

GRZS was established in 1912 and is organized as a federation of partly independent and geographically determined voluntary nonprofit units carrying out the humanitarian task of public interest. Its mission is to protect, rescue, and aid people having emergencies in difficult, remote terrains. Members of GRZS include mountain climbers, mountain guides, and specially

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skilled members such as doctors, paramedics, and rescue dog guides. The GRZS teams are composed of mountain rescuers and a physician; however, they do not include an emergency paramedic. GRZS provides its members with education and training in first aid and specialized rescue techniques. Becoming a mountain rescuer with GRZS requires 3 years of training followed by a final examination and licensing. To maintain a license, all helicopter mountain rescuers and doctors are required to complete a training program and medical examination. The training program content is regulated by government agencies. The GRZS's Commission for Helicopter Mountain Rescue follows strict guidelines to keep the technical knowledge and equipment standards high. The main safety criteria are appropriate mountain rescue and flight training, competence of air and ground crews, and adequate means of communication between the air and ground crews.

Until recently, HNMP covered the entire country from an airport situated near the country's capital city of Ljubljana. In November 2016, a second HNMP center was established at the airport in Maribor, situated in the east of the country. The division of service between the 2 HNMP units is based on proximity of the site where the service is needed (Figure 1A).

HNMP HEMS teams work in tandem with ground-based GRZS teams dispatched to a rescue scene. Slovenian helicopter mountain rescue operations are performed using both police (Figure 1B) and military (Figure 1C) helicopters and are crewed by HNMP HEMS teams. There are 2 professional helicopter teams that have pilots and winch operators specially trained and equipped for mountain rescue. Both are located at Slovenia's main airport near Ljubljana. Military and police helicopter teams are not trained or equipped for search and rescue operations in the mountains; thus, the country relies on the specially trained HNMP teams for all mountain rescues. The responsible authorities in Slovenia are currently working on further integrating the 2 services and providing specially equipped medical and rescue helicopters that would be specifically used for mountain rescue operations.

Slovenia is a small and geographically diverse country covering 20,273 $km^2$. The Julian Alps, situated in the northwest of the country, attract a considerable number of visitors each year, which has led to the development of an extensive trail system connecting large numbers of mountain huts. Heliports established along much of this trail system can be used by HNMP for extrication. The main tourist season extends from June to October. During this time, 3 emergency helicopter teams are available, with 1 dedicated solely to mountain rescue. This is reduced to 2 teams for all services during the rest of the year. When an accident is reported, a dispatcher activates the nearest ground-based GRZS mountain rescue team. There are 17 local GRZS groups in the country, each headed by a chief rescuer. Helicopter assistance can only be requested by a chief rescuer provided that there is a suitable medical indication and favorable flying conditions. Once a flight has been approved, a police officer, a helicopter mountain rescuer, and a doctor are dispatched. The majority of patients evacuated from the Julian Alps are transported to the General Hospital in Jesenice, located close to Triglav National Park. Patients with more severe injuries or illnesses are transported to the University Medical Centre in Ljubljana.

This study documents the mountain rescue operations performed in Slovenia from 2011 to 2015. For 2015, the indication for rescue and the severity of injury was also analyzed. The aim of this study was to identify causes of accidents requiring rescue and to stratify the severity of injuries assessed in the field as requiring evacuation by helicopter.

## Methods

This study is a retrospective data analysis detailing rescue and recovery operations from the Slovenian National Mountain Rescue Association combined with those of police and military helicopter operators. Incident data were gathered from standardized report forms generated by medical and rescue personnel on the scene.

The numbers of ground-based and helicopter-supported rescue operations from 2011 to 2015 were compared. A more detailed analysis of rescue interventions was performed for 2015. This examined the indication for activation of the search and rescue operations and aimed to determine specifically which interventions required the use of a helicopter. Indications for intervention were divided into 4 groups: injury, illness, death, and no medical indication. The severity and epidemiology of injuries requiring evacuation in 2015 were also studied. The 7-level National Advisory Committee of Aeronautics (NACA) scoring system of patients was used for stratifying incident severity and determining the necessity for air transport (Table 1). NACA scoring is a risk stratification tool widely used in helicopter rescue that provides a reliable prediction of morbidity for patients who might require helicopter transport.[3] NACA scores were assigned to patients by the team physician to assess the severity of their clinical state.

Data are presented as mean±SD with range, as appropriate. Statistical analysis included $\chi^2$ tests, which