

## ORIGINAL RESEARCH

# Static Rope Evacuation by Helicopter Emergency Medical Services in Rescue Operations in Southeast Norway

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**Introduction**—Physician-staffed helicopter emergency medical services (HEMS) in Norway are an adjunct to existing search and rescue services. Our aims were to study the epidemiological, operational, and medical aspects of HEMS daylight static rope operations performed in the southeastern part of the country and to examine several quality dimensions that are characteristic of this service.

**Methods**—We reviewed the static rope operations performed at 3 HEMS bases during a 3-y period and applied a set of quality indicators designed for physician-staffed emergency medical services to evaluate the quality of care. Data are presented as medians with quartiles, except National Advisory Committee for Aeronautics (NACA) scores, which are presented as mean (SD).

**Results**—Fifty-nine static rope operations were identified, involving 60 patients. Median (quartiles) age was 43 (27–55) y. Median (quartiles) take-off time was 9 (5–13) min. Trauma-related injuries were found in 48 patients. The main conditions were lower limb injuries, found in 32 patients. Ten patients experienced medical conditions. Mean (SD) NACA score was 3.3 (1.3). A potential or actual life-threatening diagnosis (NACA score: 4–6) was reported among 15 patients. The main interventions were intravenous lines (19 patients), analgesics (17), and oxygen treatment (14). Four patients were intubated, and 1 thoracostomy was performed.

**Conclusions**—Static rope operations are rarely performed. The quality indicators suggest that the service is safe, available, and equitable. Its main benefit seems to be evacuation and the maintenance of readiness before rapid transport of the physician to the scene or the patient to the hospital.

*Keywords:* air ambulances, rescue work, quality indicators, healthcare

## Introduction

Helicopter emergency medical services (HEMS) have the capacity to offer advanced emergency medical treatment on scene and the rapid transport of patients to the correct level of care. When accidents or medical emergencies occur at scenes that are not easily accessible for ground emergency medical service (GEMS) personnel or other rescue units, HEMS static rope operations can be performed regardless of the severity of the patient's condition. In Norway, HEMS perform static rope evacuations

of patients from the ground and water. Hoist operations are not performed by Norwegian HEMS, in contrast to practices in other countries.<sup>1–4</sup> This policy was made by the National Air Ambulance Services of Norway, the operational authority for the air ambulance services, based on the existing crew-concept and the low incidence of rescue operations. Compared with GEMS in Norway, HEMS enables the rapid transport of an anesthetist to the scene, thereby reducing the time to advanced medical care.<sup>5</sup> The security of both the crew and the patient is essential; HEMS operations have a higher accident and fatality rate than other helicopter operations.<sup>6,7</sup> Ordinary medical missions are performed 24 h a day, 7 d a week; in contrast, HEMS static rope operations in Norway are only performed during daylight hours to reduce risk.

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Data regarding static rope operations are very limited in the medical literature.<sup>8</sup> A few studies about winching operations are available, and to our knowledge, the largest published study included 921 patients.<sup>1</sup>

We aimed to describe the HEMS static rope operations performed by 3 HEMS bases in southeast Norway and applied a selection of quality indicators (QIs) specifically designed for physician-staffed emergency medical services (P-EMS) to evaluate current practices.<sup>9</sup>

## OPERATIONAL SETTING

Norwegian search and rescue (SAR) operations can be performed by helicopters operated by the Royal Norwegian Air Force (state funded, responsibility of the Ministry of Justice and Public Security) and by HEMS (state funded, responsibility of the Ministry of Health and Care Services). The HEMS units are dispatched by the local emergency medical communications center (EMCC), while the SAR units are dispatched by 1 of 2 joint rescue coordination centers (JRCC). Depending on the nature of the mission, EMCC or JRCC will have the main responsibility for resource coordination. Medical staffing is similar at both HEMS and SAR.<sup>10</sup>

HEMS Lørenskog, HEMS Ål, and HEMS Arendal are located 14, 142, and 199 km air distance, respectively, from the regional trauma center at Oslo University Hospital (OUH). All bases undertake primary and secondary operations, responding to both injuries and medical emergencies. A primary operation implies transporting medical personnel and equipment to the scene for a patient located outside of the hospital.

HEMS Lørenskog utilizes 2 aircraft, a Eurocopter (EC) 135 P2+ and an EC 145, and completes approximately 1050 primary operations annually. HEMS Ål is a mountain base located northwest of Oslo. It utilizes 1 EC 135 P2+ and completes approximately 360 primary operations annually. HEMS Arendal, located on the coast southwest of Oslo, utilizes 1 EC 135 P2+, and completes approximately 430 primary operations annually. The 3 bases cover a population of approximately 3 million people. The HEMS crews consist of a pilot, a HEMS rescue member (HCM), and an anesthetist.

## HEMS STATIC ROPE OPERATIONS

When dispatched to a static rope operation above land, the HEMS crew surveys the scene from the air and locates a suitable landing site to rig for static rope rescue (Figure 1). From the rig site, the HCM is transported underslung to the scene on a fixed 20- to 60-m rope. The HCM brings the appropriate evacuation device (rescue-bag, harness, or sling; Figure 2), together with medications and other needed equipment, depending on

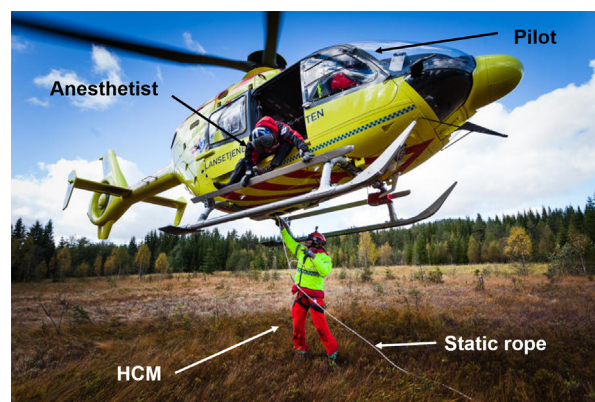
the presumed severity of the situation. From the cockpit, the pilot cannot see the HCM on the rope underneath the helicopter or the patient on the ground. Therefore, the anesthetist operates as a doorman, guiding the pilot toward the scene by radio communication, based on his or her observations and sign language from the HCM. Soon after ground contact, the HCM unleashes from the static rope. The helicopter then leaves the scene, with the static rope hanging underneath, and hovers at a suitable distance, normally in sight of the scene. This also enhances on-scene communication between the patient and the HCM as the helicopter noise diminishes. After necessary stabilization and immobilization of the patient, the helicopter returns to the scene. The HCM reconnects himself and the patient to the rope, and both are evacuated underslung by the helicopter to the rig site, where further treatment can be provided by the anesthetist. Finally, the patient is loaded into the helicopter if air transport to the hospital is indicated. If there is no indication for advanced medical treatment or fast transport, further care can be provided by GEMS or other rescue units.

In static rope operations over water, the HCM relocates to the cabin and attaches the rope to the roof of the helicopter. On arrival at the scene, the HCM jumps into the water and secures the patient in a sling while the helicopter hovers. Both are then evacuated underslung back to a safe site for patient treatment.

Each crew member is required to perform at least 5 static rope rescues every third month, either from ordinary operations or training.

## Methods

The HEMS operational database NOLAS (a proprietary database management system; FileMaker Inc, Santa



**Figure 1.** HEMS (state funded) static rope rescue. Setup with EC 135 P2+ (photograph from training, courtesy of Norwegian Air Ambulance).

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