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# Prehospital medical management in Swedish road tunnel incidents

**Johan Hylander**

## Akademisk avhandling

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Fakultetsopponent: Professor Stephen Sollid,  
Institute of clinical medicine  
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**Author**

Johan Hylander

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**Abstract**

**Background:** The complexity of modern road tunnel systems may delay an efficient rescue effort. Capable decision-making is needed to limit time to care. The Swedish ambulance commander, responsible for the on-scene ambulance personnel, may lack education and experience from managing road tunnel incidents. Their competence is sometimes questioned by fellow emergency services commanders. Such marginalization may obscure the medical focus and give the ambulance commander a subservient role. The ambulance commander's role and lack of knowledge need to be explored and addressed to potentially improve their competence in managing road tunnel incidents.

**Aim:** The overall aim of this thesis was to explore the possibilities of strengthening the decision-making ability of ambulance commanders to create more efficient rescue efforts in road tunnel incidents.

**Methods:** In studies I and II, interviews were conducted with ambulance commanders (n=18) in Norway and Sweden concerning their experience in managing real and simulated road tunnel incidents. In study III, interviews were conducted with participants (n=19) from organizations that collaborates with the Swedish ambulance services in road tunnel incidents, about their opinions on how the ambulance commanders can improve their incident management. In study IV, an e-learning course was created based on the findings of studies I–III. The course influence on the ambulance commander's ability to make decisions in road tunnel incidents was tested through an intervention study (n=20) which contained two simulations of major road tunnel incidents.

**Results:** In study I, the requirement of familiarity with the tunnel system and involved organizations tasks were highlighted as important for the Norwegian ambulance commanders in their leadership role. In study II, the Swedish ambulance commanders described their leadership role as greater than that at the incident site, e.g., caring for their colleagues and being proactive, although having limited time allocated for these tasks. Findings from study III highlighted the importance of risk management and a shared terminology when responding to road tunnel incidents to avoid time-consuming misunderstandings. In study IV, the main finding was that none of the participants entered the dual-tube road tunnel correctly at the early stage of an incident. Secondly, the e-learning course did not significantly impact the ambulance commanders decision-making capabilities.

**Conclusion:** The resilience of ambulance services to road tunnel incidents requires a knowledgeable and decisive ambulance commander. Inter- and intraorganizational obstacles limit the ambulance commander to become familiar with the tunnel environment, generating ambiguous decision-making. Tailored assessment methods and educational material may improve the ambulance commander situational awareness. Findings also indicate that the ambulance services command structure may be less than optimal in its current form. A senior ambulance commander, hierarchically equal to corresponding emergency services command structures, could possibly strengthen prehospital medical management in unfamiliar and complex settings such as the currently studied.

**Keywords**

Road tunnel, incident management, disaster medicine, emergency medical services, e-learning, education, ambulance commander

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