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## Brief Report

# Maintenance and Development of Paramedics' Competence on Joint Emergency Medical Service and Helicopter Emergency Medical Service Missions

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## A B S T R A C T

**Objective:** In health care, learning and collaboration between professions are crucial in providing patient-centered, responsive, and high-quality care. Given that interprofessional learning can occur indirectly while working but is scarcely studied in the context of prehospital emergency care, we examined the maintenance and development of paramedic competence on joint emergency medical service (EMS) and helicopter emergency medical service (HEMS) missions.

**Methods:** Qualitative methodology was chosen. Sixty-one Finnish paramedics and EMS field supervisors answered a single open-ended survey question. Inductive content analysis was used to analyze the data.

**Results:** The maintenance and development of paramedics' competence on joint EMS and HEMS missions formed 2 main categories: the transfer of professional skills and interactive competence development. The transfer of skills was formed by 3 upper categories: practicing working as part of the team, transmission of tacit knowledge, and deepening of clinical knowledge. Interactive competence development was formed by 2 upper categories: ensuring one's own competence and educational working model as built-in. All the upper categories had several subcategories.

**Conclusion:** EMS and HEMS joint missions provide an additional learning opportunity for paramedics. The expertise, examples, and educational attitudes shared by the HEMS are valued. The results reveal the need for further research on this subject.

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Interprofessional learning occurs when professionals from different fields learn from and with others.<sup>1</sup> In health care, learning and collaboration between professions are crucial in providing patient-centered, responsive, and high-quality care.<sup>2,3</sup> Interprofessional learning can occur as a result of vocational training, spontaneously in the educational environment,<sup>4</sup> or indirectly during work.<sup>3,5</sup> For example, indirect learning occurs during challenging situations and

cooperation.<sup>5</sup> Interprofessional learning can also occur alongside constructive feedback.<sup>3</sup>

Prehospital emergency medical service (EMS) work uses multiprofessional cooperation for the benefit of patients. Such cooperation is performed while maintaining one's own professional boundaries and roles. Furthermore, it can turn into interactive cooperation and lead to interprofessional learning.<sup>1</sup> This kind of interaction involves respect, reciprocity, and professional recognition. The recognition of other roles and common practices facilitates cooperation. Active and positive individual contributions and the desire to share knowledge and skills improve cooperation, and effective communication can break hierarchies.<sup>4</sup>

Finland is a Nordic country with approximately 5.5 million inhabitants, 780,000 EMS missions,<sup>6</sup> and 3,600 patient encounters for helicopter emergency medical services (HEMS) yearly.<sup>7</sup> Cooperation with EMS and HEMS is under constant interest in Finland. Finnish EMS is organized mainly by ground-based EMS with highly competent paramedics with either a bachelor's degree or a vocational upper secondary qualification depending on the unit level.<sup>8</sup> Finnish HEMS joins the most critical missions whenever temporally and spatially possible.<sup>9</sup> The occurrence of interprofessional learning in such challenging situations was of interest in this study. The research question was as follows: What kind of maintenance and development of paramedics' competence

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happens on joint EMS and HEMS missions?

## Methods

This was a qualitative survey study that was part of a large-scale research project that examined the current state and cost-effectiveness of HEMS operations in Finland.<sup>10</sup> The indirect effects of the Finnish HEMS on prehospital emergency care were examined via a survey study in February 2022. The target group of the survey study was composed of paramedics and EMS field supervisors.

A cover letter explaining the study aims and links to the data protection statement and the Webropol survey (Webropol Ltd., Helsinki, Finland) was published on a social media group with nationwide members of Finnish EMS personnel (approximately 4,800 members) on February 8, 2022. The survey was open for 2 weeks, and 200 members of the target group gave their informed consent for participating in the study and responded to the survey. Among them, 61 responded to the following open-ended question: What kind of maintenance and development of your competence happens on joint EMS and HEMS missions? The occupations and work experience years are presented in Table 1. Qualitative responses were analyzed with inductive content analysis.<sup>11</sup> First, the words and sentences addressing the research question were marked and condensed. Second, the subcategories were created based on the condensed data by grouping similar content together and named accordingly. Third, the subcategories were grouped into upper categories and named. Finally, the main categories were created by grouping together the upper categories.

## Ethics

Participation in this survey study was based on informed consent. The target group was adults who participate in active working life, and the subject of the study was not emotionally disturbing; thus, ethics committee review was waived according to Finnish guidelines.<sup>12</sup>

## Results

The maintenance and development of paramedics' competence on joint EMS and HEMS missions consisted of 16 subcategories, forming 5 upper categories and leading to 2 main categories: the transfer of professional skills and interactive competence development. The hierarchy of the formed categories and the content of the subcategories are presented in Table 2.

## Discussion

This qualitative study examined the maintenance and development of paramedic competence on joint EMS and HEMS missions. The results showed that paramedics recognize that joint missions impact their competence in several ways and contain many different learning contents.

Although the amount of EMS missions are increasing globally, ground-based EMS tends to encounter emergency patients less frequently than before.<sup>13,14</sup> In contrast, HEMS concentrates on the most critical missions and encounters emergency patients daily.<sup>9</sup> According to our results, the joint missions, which are critical in nature, bring experiences of emergency patients to paramedics and allow them to use technical skills learned in education<sup>15</sup> but perhaps not used often in practice, such as treating intubated patients.<sup>16–20</sup> In addition, competence maintenance and development in treating trauma patients,<sup>15,21</sup> examining neurologic or circulatory symptoms,<sup>15</sup> and interpreting electrocardiograms<sup>15,22</sup> were brought up in the current study, although, according to previous evidence, Finnish paramedics are quite confident with most of these patients.<sup>23</sup> In critical situations, it can be considered natural that the presence and guidance of the HEMS team are felt as reassuring and educational and allow for the updating and absorption of knowledge<sup>24</sup> and rehearsing structured performance, such as ABCDE (Airway, Breathing, Circulation, Disability, and Exposure) and the use of checklists.<sup>25</sup> Based on the findings, simulating critical joint missions and training together could benefit competence maintenance and development.<sup>24,26,27</sup> There is

evidence that EMS could learn from the training frequency of HEMS, including learning nontechnical skills<sup>28</sup> and safety<sup>27</sup>; both of these learning outcomes were mentioned in the current results.

Interprofessional conversation<sup>1,29–31</sup> and feedback<sup>31,32</sup> are key elements in workplace learning.<sup>3,5</sup> In the current study, the paramedics described several forms of educative learning opportunities, such as discussing the cause and effects of treatment instructions, care chains, and newest scientific evidence or the explanations offered by the HEMS physicians in addition to the reflective competence discussions and different kinds of feedback opportunities with the HEMS physicians. According to Lloyd et al<sup>29</sup> and Wallin et al,<sup>30</sup> professionalism can also be learned by observing others. For example, in this study, the paramedics described that they had learned and received tacit knowledge by observing the calm and humane functioning of HEMS physicians and the structured performance of the HEMS team. The findings have several similarities with needed essential nontechnical cognitive skills.<sup>33</sup> Altogether these kinds of learning opportunities occur on the side of real actions in EMS and HEMS joint missions.

In summary, the paramedics in this study described the connections between respective and friendly attitudes, an open atmosphere, and learning. The results are in line with previous evidence in which reciprocity and respect,<sup>4</sup> familiarity,<sup>34</sup> trust,<sup>30</sup> and a good attitude were seen as key motivational factors for learning.<sup>1,29</sup> Interestingly, similar aspects have been identified as being important in paramedics' nontechnical skills<sup>35</sup> and effective EMS team processes.<sup>36</sup> In addition, the quality of interprofessional relationships has also been identified as an important part of quality patient care.<sup>3</sup> For example, in this study, the element of patient care quality could be seen in the many forms, ways, and opportunities of clinical knowledge learned in the joint missions.

## Methodological Considerations

The qualitative methodology was chosen because the aim was to emphasize depth

**Table 1**  
Occupations and Work Experiences of the Participants (n = 61)

		n	%
Occupation	Paramedic, basic level	5	8
	Paramedic, advanced level	50	82
	EMS field supervisor	6	10
Work experience in prehospital emergency care, years	Less than 2	—	—
	2–4	8	13
	5–9	25	41
	10–14	16	26
	15–19	5	8
	20 or more	7	12

EMS = emergency medical service.

**Table 2**

Maintenance and Development of Paramedics' Competence During Joint Emergency Medical Service (EMS) and Helicopter Emergency Medical Service (HEMS) Missions

Main Category	Upper Category	Subcategory	Content of the Subcategory Explained	
Transfer of professional skills	Practicing working as part of the team	Shared situational awareness	Training through the experience as the entire emergency scene situation is well managed and communication between all team members is clear and concise.	
		Internalizing a structured way of practice	The paramedics described that HEMS teams were exemplary in structured practice and that participating in joint missions resulted in rehearsal and team-based experiences of such practices. The use of the ABCDE approach, the ISBAR protocol, and checklists were specifically mentioned.	
		Emphasizing safety	Safety aspects were felt to be the first priority and present in all of the team actions, (eg, in locating ambulances when a helicopter was landing and overall occupational safety when working near the helicopter).	
		Appreciating of every role	The joint mission experiences were connected to the maintenance and development of competence by being a part of the team with good performance and shared outcomes.	
	Transmitting tacit knowledge	Learning a model of calm professionalism	Learning a model of calm professionalism	Opportunity to learn calm professionalism by observing experienced HEMS physicians during joint missions. The paramedics described that they could absorb the sense of calm, which allowed them to focus on their own performance.
			Developing skills for encountering emergency patients	The paramedics described that encountering truly acute emergency patients was not a day-to-day experience for them and saw that observing how the EMS physician/team approaches patients humanly despite the acute situation was educational.
			Learning to focus on essentials	Working with an HEMS physician was experienced as transmitting nonverbal knowledge of what was essential and how to pay attention to the right things, such as assessing the patient's condition using the clinical status and measurement results.
		Deepening clinical knowledge	Experiencing rare emergency patients	HEMS teams encounter truly acute emergency patients daily, but paramedics rarely do. They felt that every joint mission led to absorbing clinical knowledge by participating in the treatment process as a part of a team.
			Using different technical skills	This was connected to the opportunity to perform demanding examinations and measures under a physician's guidance, which was seen as educational. The paramedics felt that such experiences increased the quality of care when they later operated independently. The examination of neurologic symptoms or circulatory deficiency, the interpretation of the ECG, and the treatment of intubated patients and trauma patients were especially mentioned.
	Interactive competence development	Ensuring one's own competence	Learning from cause-and-effect descriptions of the treatment instructions	Clinical and medical knowledge was described as learned by asking and discussing with the HEMS physician during and after the joint mission. They also added that the atmosphere needed to be open enough and that the timing needed to allow such discussion.
			Understanding the entire treatment process	The paramedics felt that they were more able to understand the entire chain of care of a patient when they could receive information on the diagnosis and continuation of medical care in the hospital from an HEMS physician. They felt that this information further taught them about the actions during the mission and to develop their own abilities to evaluate the need for treatment in upcoming missions.
		Educational working model as built-in	Updating evidence-based information	The paramedics described that working with the HEMS physician allowed them to receive information regarding new medicines, treatment options, or recommendations suitable for the patient's condition.
			Having confidence to act	The paramedics felt that the support of HEMS made decision making easier and that their encouragement helped them perform rare procedures. This was recognized especially in the case of critical situations that the paramedic had not experienced before.
Interactive competence development	Educational working model as built-in	Reflecting on one's own competence	The paramedics described that the open and self-critical discussion with the HEMS physician regarding their actions and thoughts about the mission in question strengthened their professional competence.	
		Having the physician include and explain	The paramedics described that the HEMS physicians included the paramedics when thinking about a situation and that the physicians explained the actions needed or made, which was felt as being intentionally educational. Receiving responsibility for carrying out the treatment was felt as this kind of educational inclusion. The physician's thinking their own reasoning aloud was also described as a meaningful opportunity to learn.	
Interactive competence development	Educational working model as built-in	Receiving feedback on performance	Educative feedback was described as friendly toned, informative, including development suggestions, and being initiated by the HEMS physician.	

ABCDE = Airway, Breathing, Circulation, Disability, and Exposure; ECG = electrocardiogram; ISBAR = Identify, Situation, Background, Assessment, and Recommendation.

and not the frequency of the subject. Given the large number but relatively small size of Finnish EMS organizations, paramedics across Finland were informed about the study via social media. Thus, we could reach only those using the selected social media group, and probably only those with a special interest in the topic answered the open-ended question used for collecting the data. Written answers may be superficial and not ideal for qualitative studies, but this study revealed important results that highlight the need for further studies around this subject, both qualitative and quantitative. Further studies could focus on individual learning possibilities in joint missions because the frequency of such missions is usually low; thus, individual learning outcomes are probably not as wide as the results describe. Moreover, because this study focused on the joint missions' positive effects on competence, the possible negative aspects and barriers to such effects should be included in further studies.

## Conclusions

The paramedics recognized that EMS and HEMS joint missions provide an additional learning opportunity that maintains and develops their competence. The paramedics value the expertise, example, and educational attitude shared by the HEMS physicians and teams. More comprehensive attention to the educational possibilities of the joint missions, training together, and promoting the importance of educational attitude can provide several benefits for the entire EMS system.

## References

- Mulholland P, Barnett T, Spencer J. Interprofessional learning and rural paramedic care. *Rural Remote Health*. 2014;14:2821.
- Guraya SY, Barr H. The effectiveness of interprofessional education in healthcare: a systematic review and meta-analysis. *Kaohsiung J Med Sci*. 2018;34:160–165.
- Pype P, Wens J, Stes A, Grypdonck M, Vanden Eynden B, Deveugele M. Patients' nursing records revealing opportunities for interprofessional workplace learning in primary care: a chart review study. *Educ Health (Abingdon)*. 2014;27:89–92.
- Mulholland P, Barnett T, Woodroffe J. A grounded theory of interprofessional learning and paramedic care. *J Interprof Care*. 2020;34:66–75.
- Rees EC, Crampton P, Kent F, et al. Understanding students' and clinicians' experiences of informal interprofessional workplace learning: an Australian qualitative study. *BMJ Open*. 2018;8:e021238.
- Finnish Institute for Health and Welfare. Sotkanet.fi, Statistical information on welfare and health in Finland. Pre-hospital emergency medical care missions /1 000 inhabitants. Available at: <https://sotkanet.fi/sotkanet/en/taulukko/?indicator=szbMzAEA&region=s07MBAA&year=sy5zAgA=&gender=t&abs=f&color=f&buildVersion=3.1.1&buildTimestamp=202211091024>. Accessed October 13, 2022.
- FinnHEMS Oy. 2022. Vuosikertomus 2021. Finnish Helicopter Emergency Medical Service, annual report 2021 (in Finnish). Available at: <https://www.virtualmagnet.eu/pub/75/FinnHEMS-vuosikertomus-2021/#p=17>. Accessed October 13, 2022.
- Duason S, Ericsson C, Jónsdóttir HL, Andersen JV, Andersen TL. European paramedic curriculum—a call for unity in paramedic education on a European level. *Scand J Trauma Resusc Emerg Med*. 2021;29:72.
- Saviluoto A, Björkman J, Olkinuora A, et al. The first seven years of nationally organized helicopter emergency medical services in Finland – The data from quality registry. *Scand J Trauma Resusc Emerg Med*. 2020;28:46.
- Nurmi J, Nordquist H, Pappinen J, Torkki P, Ackermann A, Mannila S, Mäkelä S, Saviluoto A. Effectiveness of helicopter emergency medical services and improving the cost efficiency (in Finnish). Publications of the government's analysis, assessment and research activities. Publisher Prime Minister's Office; 2022 <https://urn.fi/URN:ISBN:978-952-383-137-7>.
- Elo S, Kyngäs H. The qualitative content analysis process. *J Adv Nurs*. 2008;62:107–115.
- Finnish National Board on Research Integrity TENK. The ethical principles of research with human participants and ethical review in the human sciences in Finland. Available at: [https://tenk.fi/sites/default/files/2021-01/Ethical\\_review\\_in\\_human\\_sciences\\_2020.pdf](https://tenk.fi/sites/default/files/2021-01/Ethical_review_in_human_sciences_2020.pdf). Accessed January 5, 2023.
- Vuilleumier S, Fiorentino A, Dénéreaz S, Spichiger T. Identification of new demands regarding prehospital care based on 35,188 missions in 2018. *BMC Emerg Med*. 2021;21:63.
- Andrew E, Nehme Z, Cameron P, Smith K. Drivers of increasing emergency ambulance demand. *Prehosp Emerg Care*. 2020;24:385.
- LAB University of Applied Sciences. Bachelor's degree programme in paramedic, Bachelor of Health Care: 240 ECTS. Available at: <https://opintopas.lab.fi/en/68177/en/158334>. Accessed January 5, 2023.
- Raatinen L, Länkimäki S, Martikainen M. Pre-hospital airway management by non-physicians in Northern Finland – a cross-sectional survey. *Acta Anaesthesiol Scand*. 2013;57:654–659.
- Dyson K, Bray JE, Smith K, et al. Paramedic intubation experience is associated with successful tube placement but not cardiac arrest survival. *Ann Emerg Med*. 2017;70:382–390. e1.
- Crowdson K, Lockey DJ, Røislien J, Lossius HM, Rehn M. The success of pre-hospital tracheal intubation by different pre-hospital providers: a systematic literature review and meta-analysis. *Crit Care*. 2017;21:31.
- Peters J, van Wageningen B, Hendriks I, et al. First-pass intubation success rate during rapid sequence induction of prehospital anaesthesia by physicians versus paramedics. *Eur J Emerg Med*. 2015;22:391–394.
- Hiltunen P, Jäntti H, Silfvast T, Kuisma M, Kurolo J. Prehospital Study Group FINNRESUSCI. Airway management in out-of-hospital cardiac arrest in Finland: current practices and outcomes. *Scand J Trauma Resusc Emerg Med*. 2016;24:49.
- Leemeyer AR, Van Lieshout EMM, Bouwens M, Bree-man W, Verhofstad MHJ, Van Vledder MG. Decision making in prehospital traumatic cardiac arrest; a qualitative study. *Injury*. 2020;51:1196–1202.
- Anroedh SS, Kardys I, Akkerhuis KM, et al. e-Transmission of ECGs for expert consultation results in improved triage and treatment of patients with acute ischaemic chest pain by ambulance paramedics. *Neth Heart J*. 2018;26:562–571.
- Koivulahti O, Tommila M, Haavisto E. The accuracy of preliminary diagnoses made by paramedics – a cross-sectional comparative study. *Scand J Trauma Resusc Emerg Med*. 2020;28:70.
- Bredmose PP, Hagemo J, Østergaard D, Sollid S. Combining in-situ simulation and live HEMS mission facilitator observation: a flexible learning concept. *BMC Med Educ*. 2021;21:579.
- Kerner T, Schmidbauer W, Tietz M, Marung H, Genzwuerker HV. Use of checklists improves the quality and safety of prehospital emergency care. *Eur J Emerg Med*. 2017;24:114–119.
- Kiessling A, Amiri C, Arhammar J, et al. Interprofessional simulation-based team-training and self-efficacy in emergency medicine situations. *J Interprof Care*. 2022;36:873–881.
- Pietsch U, Knapp J, Ney L, Berner A, Lischke V. Simulation-based training in mountain helicopter emergency medical service: a multidisciplinary team training concept. *Air Med J*. 2016;35:301–304.
- Langdalen H, Abrahamsen EB, Sollid SJM, Sørskår LIK, Abrahamsen HB. A comparative study on the frequency of simulation-based training and assessment of non-technical skills in the Norwegian ground ambulance services and helicopter emergency medical services. *BMC Health Serv Res*. 2018;18:509.
- Lloyd B, Pfeiffer D, Dominish J, Heading G, Schmidt D, McCluskey A. The New South Wales allied health workplace learning study: Barriers and enablers to learning in the workplace. *BMC Health Serv Res*. 2014;14:134.
- Wallin K, Werkander Harstäde C, Bremer A, Hörberg U. Nurse preceptors' experience-based strategies for supporting learning in the ambulance service—a combined focus group and dyadic interview study. *J Adv Nurs*. 2022;78:1704–1717.
- Steiner I, Balsiger A, Goldszmidt M, Huwendiek S. Innovating pediatric emergency care and learning through interprofessional briefing and workplace-based assessment: a qualitative study. *Pediatr Emerg Care*. 2020;36:575–581.
- Kittel AFD, Kunz RAC, Seufert T. Self-regulation in informal workplace learning: influence of organizational learning culture and job characteristics. *Front Psychol*. 2021;12:643748.
- Sedlár M. Cognitive skills of emergency medical services crew members: a literature review. *BMC Emerg Med*. 2020;20:44.
- Gum LF, Sweet L, Greenhill J, Prideaux D. Exploring interprofessional education and collaborative practice in Australian rural health services. *J Interprof Care*. 2020;34:173–183.
- Bennett R, Mehmed N, Williams B. Non-technical skills in paramedicine: a scoping review. *Nurs Health Sci*. 2021;23:40–52.
- Fernandez WG, Benzer JK, Charns MP, Burgess JF. Applying a model of teamwork processes to emergency medical services. *West J Emerg Med*. 2020;21:264–271.