Clinical handover of patients for specialized centre care from pre-hospital to in-hospital care – a narrative review

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Abstract. *Introduction:* During the last few years the role of non-technical skills including communication and cognitive aids is becoming more important and also influences pre-hospital care. This narrative review aims to summarize published articles on the information handover from pre-hospital to in-hospital care which is dominantly used in critically ill patients who need centre care (acute coronary syndromes, post resuscitation etc.).

Literature search strategy: We undertook a literature search in the Scopus, Cinahl, Ovid and Medline databases, with inclusion and exclusion criteria, to find all articles about clinical handover from pre-hospital to in-hospital care. We found 27 articles which match the inclusion criteria.

Results: We identified 12 different acronyms for information handover. The results were grouped into four main themes – the acronym used for handover, the shape of handover, complications during handover and training in handover.

Conclusion: The shape of handover varies but all these articles support the need for structured handover which might improve the safety of provided care by reducing the information loss. A few authors even encourage having a national guideline or standard for both givers and receivers of the handover. None of the articles tested the pre-notification phase of information handover which is also important in the cases of pre-hospital cardiac arrests or patients with acute coronary syndrome. Fig. 1, Annex 1, Tab. 2, Ref. 36, on-line full text (Free, PDF) www.cardiologyletters.sk

Key words: handover – standardisation – ambulance – pre-notification – handoff – review

Clinical handover is becoming more and more the centre of attention of all health care providers. During the last few years the role of non-technical skills including communication and cognitive aids is becoming more important (1 – 4).

Previous studies find that poor handovers resulted in adverse effects for the patient. (5). Failures in communication have been identified as one of the major preventable medical errors (6). Miscommunication and information loss during handover is acknowledged as a contributing factor to adverse events (5, 7 – 11). Patient safety can be improved by improving handover (9) and by standardisation of the process (5, 9). Communication failures have been identified as the main cause of over 60% of sentinel events reported by the Joint Commission in Accreditation of Healthcare Organizations (12). The rate of adverse events is unacceptably high in the inpatient setting and communication is one of the causal factors (12). Problems in communication during care transition or handover process may be responsible for 12% of patient safety incidents (13).

Most of the studies published focus on the shift changes of physicians and nurses, or handover between hospital departments or facilities (9). Few studies aimed at pre-hospital to in-hospital handover have been published (14) and these studies suggest that the quality of handover varies. The difference seems to be in handover method, language, level of education and expertise (5, 9, 15, 16). The handover from pre- to in-hospital care is especially susceptible to error (8 – 10). The last literature review in this field was made

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in the year 2015 (14) and from this year the situation in the health care system in almost all countries in the World has developed. The handover processing is becoming more and more important for patient safety, other studies already reported information loss during handover (5, 7, 8) and because of that we have undertaken a new literature review with focus on standardisation of patient handover and possible complications of the pre-hospital to in-hospital care including radio pre-notification, a topic which has not been included in the previous reviews. The importance of handover quality increases with the severity of the patient's condition. The most severe cases are directed to the special centres (e.g. the cardio centres).

Lingard et al. identified four types of communication failure: occasion failures (problem in the situation or context), content failures (insufficiency or inaccuracy in the transferred information), audience failure (gaps in audience composition) and purpose failures (unclear, not achieved or inappropriate purpose) (12).

The review will focus on the studies aiming to monitor or evaluate information handover between pre-hospital and in-hospital providers.

Literature search strategy

For the literature search in the Scopus, Cinahl, Ovid and Medline databases the key words were used: ambulance, handover, handoff, emergency department, emergency room, ER, communication and clinical handover and their combinations. The literature search strategy is shown on a **Figure 1** using the PRISMA 2009 Flow Diagram. Previous reviews by Wood et al. and Bost et al. were also included and their results and references screened (9, 14).

Inclusion criteria: the handover from pre-hospital care to in-hospital care was evaluated, described or monitored in clinical practice or in simulation.

Exclusion criteria: (1) reviews, letters to editor, editorials, trials; (2) theme of research not connected with pre-hospital care (e.g. handover between departments or shifts).

Some of the excluded articles were used for the introduction.

All results were first screened for inclusion and exclusion criteria by two of the authors (DP and JP). Both authors compared and discussed their results. Eligibility was not evaluated as this is not a systematic review, all articles were included. Full text of the articles included was coded (similar approach as in grounded theory was used – coding by Corbin and Strauss). Three main themes were identified: shape of handover, complications during handover and training in handover. Another topic screened was the acronym used for handover. The coding was discussed and compared between three authors (DP, JP and PChC).

Results

The databases Scopus, Cinahl, Ovid and Medline provided us with 292, 95, 230 and 198 results respectively. We removed duplicates and searched the titles and summaries for inclusion criteria. We identified 211 articles for abstract screening and finally, after full text screening, we found 27 articles which match the inclusion criteria **(Annex 1)**. The codes were grouped into four main themes: first we identified the acronym used for handover, the other three topics are: the shape of handover, complications during handover and training in handover. A limitation of this narrative review is that it is not a systematic review and we did not assess the articles for eligibility.

Handover acronyms

We identified 12 acronyms used for patient handover **(table 1)**; 16 studies tested one or more of these acronyms. The authors had used different vocabulary for the acronyms, also mapped in the **table 1**. The acronyms BAUM, AMPLE and I-PASS were mentioned in just one article and one letter to an editor (17).

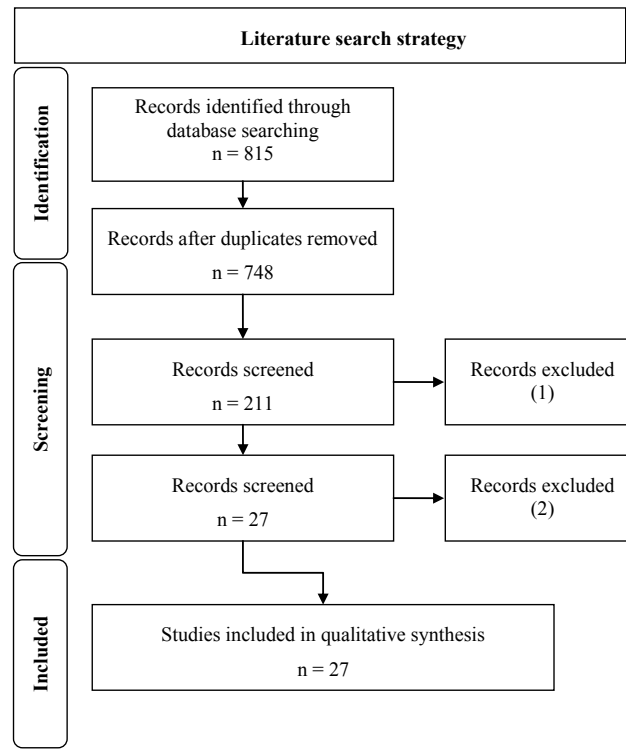

Figure 1 Literature search strategy

Annex 1 Results table – Key findings

Nr.	First author	Year	Key Findings by Wood (2015)	Key findings (citations)	Acronym
1	Walker	1995	Basic handover did not have enough information - detailed handover resulted in broader picture about the patient.		-
2	Thakore	2001	Not many hospital staff felt that they could engage in feedback with ambulance crews; most ambulance had not received handover training; medical staff thought ambulance crews were less good at handover in medical emergencies but were better at handing over paeds than the ambulance crew believed; ambulance crew do not feel listened to, they think nurses are too distracted with the patient.	Medical staff conveyed their belief that handovers were very variable between crews and that they did not feel radio reports were well structured.	-
3	Scott	2003	Low percentage of doctors accurately recalled verbal handover; paramedics are not given handover training, factors compromising handover are paramedic lack of confidence, delivery of handovers that are not memorable, atmosphere in the trauma room, doctors who stop listening.	Physicians successfully recalled approximately one third of paramedic verbal reports during the handover of trauma patients. On the other hand, physicians were more likely to recall information about the crash scene than information about the patient's health status or care delivered prior to arrival at the hospital.	-
4	Suserud	2003	Patients with clear care needs are easier to handover; positive handover: trust and confidence between patients and ambulance nurses; negative handover: difficulties describing whole sequences of illness; handover compromised by lack of resources and receiving personnel behaving unprofessionally.		-
5	Bruce	2005	Effective handover requires physical handover of the patient, verbal handover and written documentation; confusion arises from diverse roles receiving handover; patients with clear medical problems are easy to handover and difficulties were encountered handing over patients with ambiguous problems.	The findings of this study show that the actual handover from the ambulance was executed over a very short period of time and was often carried out under stressful conditions. To improve efficiency and still maintain high-quality handovers in all cases, the brief care consultation session surrounding the handover process needs to be structured and made uniform.	-
6	Budd	2007	High percentage of UK ambulance personnel were familiar with handover mnemonic ASHICE; high percentage of paramedics would like more handover training; lack of structure in handover.	The criteria that indicate involvement of the trauma team for resuscitation of severely injured patients remain highly variable across England and Wales, and valuable information from scene may fail to reach the hospital resuscitation team because of inadequate collection, loss through third-party transmission and incomplete handover. This should aim to implement appropriate alerting protocols and devise a communication pathway through which vital information is rapidly collected and transmitted from scene, and presented to resuscitation team members in a practised standardised handover format.	MIST, ASHICE

Annex 1 Results table – Key findings (continue)

Nr.	First author	Year	Key Findings by Wood (2015)	Key findings (citations)	Acronym
7	Jenkin	2007	Lack of active listening causes frustrations for ambulance crews; repetition of information by ambulance crews is necessary; efficiency and brevity of handover is essential; paper documentation has problems associated with illegibility; handover content depends on experience and knowledge of ambulance crews; patient safety is directly associated with a good handover; poor handovers result in adverse effects for the patient.	We also suggest that there is a need for national standards and guidelines in relation to both the givers and receivers of ED handovers, and that thisshould focus on content and processes.Handovers for critically ill patients should be delivered in two phases,with essential information given immediately and to give furtherinformation when initial treatment has been undertaken.	Key data elements
8	Talbot	2007	Low percentage of handover information accurately retained by ED staff; structured handover (eg mnemonics) might have advantages but does not seem to impact on ED staff recall.	Communications training, clinical team leadership and team discipline must support the communication process between ambulance crews and the ED team to ensure that important pre-hospital information is not lost or misinterpreted.	SOAP, DeMIST
9	Yong	2008	Verbal handover preceded completion of ambulance documentation; emergency staff found handover from paramedics relevant; most were satisfied with handover quality; a large proportion of handovers occurred with minor or no interruptions; handover in trauma was reported as inefficient in transmitting the right information; ambulance crew had to repeat the information twice or even three times; a low percentage of information was remembered accurately by doctors; only half of ED staff reported referring to the ambulance sheets for patient care; ambulance sheets were found to be useful and legible.	Although there is satisfaction in paramedic handover, prehospital notification and emergency physician contact with paramedics is uncommon for low acuity patients, who constitute the majority of ambulance attendances and hospital admissions. Scope for improved direct doctor–paramedic communication exists.	-
10	Al Mahmud	2009	Lack of handover structure leads to miscommunication; there is a lack of feedback from personnel receiving handover; receiving personnel discard pre-hospital documentation without reading it.	The paramedics valued that the structured concept urge them to go through every step. This newly created information chain (intelligent table DACCORD) would result in a faster and quality enhanced patient treatment and prevention of miscommunication and information loss which could be detrimental to the patients' health.	MIST
11	Carter	2009	Significant percentage of handover elements not documented by receiving personnel.	Even in the controlled setting of a single-patient handover with direct verbal contact between health care providers, only 72.9% of the key prehospital data points that might affect patient outcome and were provided by EMS personnel were documented by the receiving trauma team.	Key data elements
12	Owen	2009	Problems in handover included: number of hands that the patient passes, stressful and chaotic environment, short handover period, lack of formal training; frustration in how to structure their report so that staff would understand.	We recommend that paramedics and emergency receiving staff should consider the adoption of a standardized approach to handover.	-

Annex 1 Results table – Key findings (continue)

Nr.	First author	Year	Key Findings by Wood (2015)	Key findings (citations)	Acronym
13	Sarcevic	2009	Information handover occurred at two locations and was sometimes given by more than one crew member; there were more difficulties in accuracy of information when the reports were second hand; divided attention and information between team and recorder causes confusion; EMS used notes written on a scrap of paper to recall their notes.	The results of our study showed that prehospital reports were often incomplete and were followed by many questions from trauma teams. EMScrewmembers mostly relied on mental recall while providing verbal reports, which was occasionally accompanied by handwritten notes to retain specific information from the field.	D-MIPT
14	Evans	2010	Effective handover requires: experience, active listening; ineffective handover entails: communication of extraneous information, interruptions (caused by noise, dismissive attitudes); barriers to paramedic collection of data: impracticalities of using gloves for documentation, time constraints, difficulty of using unharnesses computer in transit.	Multiple strategies are needed to improve handover. Paramedics should be taught how to provide a succinct handover focusing on critical elements; trauma team members should learn effective listening. Where a handover template has been introduced by paramedics without accompanying training and education, it had no positive impact on improving information retained by those receiving the handover. It is not uncommon for important details to be missed when providing handover, especially in a pressured environment.	MIST
15	Evans	2010	Most information verbally handed over was accurately documented; small percentage of data items were not recorded at all; information recorded on gloves is lost when the gloves are discarded; completion of documentation away from the patient increases risk of forgetting details.	We have identified that information loss and discordance occur infrequently when handover occurs between paramedics and trauma team members, and yet have potentially major consequences. A more effective solution would be to, where possible, capture data elements automatically using the tablet computers carried by paramedics and transmit these to the receiving hospital for display in the trauma bays.	MIST
16	Manser	2010	Key components of safe and effective patient handover were information transfer, shared understanding and working atmosphere.	standards for safe and efficient patient handoff should go beyond structured information transfer and include elements of teamwork allowing for adaptation and flexibility	-
17	Bost	2012	Repetition occurs for clarification and for the arrival of appropriate personnel; paramedics learn handover through experience; factors compromising handover are interruptions, workload and lack of clarity.	Interprofessional education may be one strategy to assist in the development of strong communication and teamwork skills that will enhance the clinical handover process between ambulance and ED personnel.	MIST
18	Iedema	2012	After the introduction of the handover mnemonic IMIST-AMBO, handovers improved in consistency of information ordering, frequency of necessary information and reduction of repetition and in questions asked.	Standardisation of the paramedic-ED staff communication interface led to improvements in how information was relayed by the paramedic, the amount of information that was relayed, the time it took to relay the information, the number and type of questions asked about the information handed over, and ED clinicians' perception of paramedics' IMIST-AMBO.	IMIST-AMBO

Annex 1 Results table – Key findings (continue)

Nr.	First author	Year	Key Findings by Wood (2015)	Key findings (citations)	Acronym
19	Murray	2012	Information discordance between pre-hospital and hospital patient records could increase risk to patients.	This investigation has highlighted that in notes of patients seen in the resuscitation room, 26% either omit information reported by the ambulance crews or transfer it with changes.	-
20	Di Delupis	2013	Absence of standardisation in handover and agreement by pre-hospital and ED personnel that standardisation of handover is required. Perception by ED personnel that pre-hospital providers do not transfer responsibility of care. Perception of pre-hospital providers that ED nurses disregard information communicated during handover. Significant increase in elements communicated during handover after training in the use of a standardised handover tool.	There was disagreement, however, on the contents to include in the handover, particularly pre-hospital vital signs. The nurses we surveyed reported that they were not interested in pre-hospital vital signs from the volunteer rescuers, mainly because they thought the measurements were unreliable and likely unnecessary for lower acuity patients. In the debriefings, however, vital signs were widely regarded as an essential element of communication.	ISBAR
21	Knutsen	2013	Less than half of information was transferred from pre-hospital patient report form to in-hospital records; registrars preferred a verbal handover with hand-written pre-hospital reports as combined source of information; scanned report forms were infrequently used; information from other doctors was perceived as more important than information from ambulance crews.	Less than half of potentially important information documented in available pre-hospital notes is transferred to the hospital records, and we believe this represents a risk for discontinuity in care.	-
22	Sujan	2015		Standardisation of handover needs to accommodate collaborative aspects and should incorporate communication of information relevant to the patient's social and psychological needs to establish appropriate care arrangements at the earliest opportunity.	ATMIST
23	Meisel	2015		These exploratory findings suggest that the effect of increasing EMS interactions with emergency physicians, standardizing handoff processes, and fostering interprofessional learning represent opportunities for future study and may serve as potential solutions for the high-risk EMS-ED patient transition.	-
24	Sujan	2015		Sustainable improvement in handover across boundaries in emergency care might require commitment by leaders from all parts of the local health economy to work as partners and establish a culture of integrated, patient-centred care.	SBAR, ATMIST
25	Ebben	2015		This pre-test post-test study found no effect of a tailored e-learning program on adherence to a handover guideline. The results suggest that e-learning alone does not improve adherence.	DeMIST

Annex 1 Results table – Key findings (continue)

Nr.	First author	Year	Key Findings by Wood (2015)	Key findings (citations)	Acronym
26	Campbell	2017		Transfer documentation from Residential Aged Care nurses, paramedics and ED triage nurses do not contain comprehensive information of older persons complex conditions. Better communication between non-affiliated organisations is needed to improve timely appropriate care for RACF residents.	SBAR
27	Fahim	2017		Findings demonstrate that patient handover in the ED did not initially follow the ISBAR standard guideline. After providing education as pamphlets and lectures to EMS staff and EMAs, a high percentage of patient handovers were conducted in accordance with the ISBAR instructions.	ISBAR

13 studies did not use a specific acronym for testing, but two studies did use "key data elements" for the handover **(table 2)**.

Shape of handover

Basic – verbal – handover does not have enough information (18) and its delivery is not memorable for the receiver (19, 20).

The handover communication varies between crews and both handover and radio pre-notification lack structure (21 – 23) and depend on the experience and knowledge of the ambulance crews (5). The paramedics valued a structure which leads them through every step (20).

Low acuity patients (not directed to special centres – e.g. cardio centres) are easier to handle, because the medical problem is clear and it is easier to describe (24, 25). For the critically ill patients the handover should be delivered in two phases with the most important vital information first, and further information when the critical treatment is performed (5).

The handover process and communication need to be structured and standardised (16, 22, 26, 27), because lack of structure leads to miscommunication (19). If the standardised handover is used, then it is needed to be used by both

Table 1 Acronyms and meanings

Acronym	n	Meaning
ASHICE	1	(1) Age, Sex, History, Injuries, Condition, Expected time of arrival
ATMIST	2	(1) Age, Time, Mechanism, Injuries, Signs, Treatment
DeMIST	2	(1) Demographic, Mechanism of Injury/Illness, Injury/Illness, Signs, Treatment given (2) Demographics, Mechanism of Injury/Illness, Injuries, Signs including observation and monitoring, Treatment given
D-MIPT	0	(1) Demographics, Mechanism of injury, Injuries, Physical findings and vital signs, Treatment given
IMIST-AMBO	1	(1) Indentification of the patient, Mechanism/medical complaint, Injuries/information relative to the complaint, Signs, vitals and GCS, Treatment and trends/response to treatment, Allergies, Medications, Background history and Other (social) information
ISBAR	2	(1) Identification, Situation, Background, Assessment, Recommendation
MIST	5	(1) Measurements, Injuries, Signs, Treatment (2) Mechanism of Injury/Illness, Injury (sustained or suspected), Signs including observation and monitoring, Treatment given (3) Mechanism, Injury/ies, Signs/Symptoms, Treatment (4) Mechanism of injury, Injuries sustained, Symptoms and signs, Treatments given
SBAR	2	(1) Situation, Background, Assessment, Recommendation
SOAP	1	(1) Subjective data, Objective data, Assessment, Plan for patient management
AMPLE	1	(1) Allergies, Medications, Past illnesses, Last meal, Events
BAUM	1	(1) 'Bestand' (inventory), 'Anamnese' (medical history), 'Klinische Untersuchungsergebnisse' (clinical findings), 'Massnahmen' (actions)
I-PASS	1	(1) Illness severity, Patient summary, Action list, Situation awareness and contingency plans, Synthesis by receiver

Table 2 Key data elements

Author	n	Key data elements
Jenkin (2007)	1	Reason for attendance, history of events, problems requiring immediate intervention, treatment carried out since onset, any significant / relevant medical history
Carter (2009)	1	Prehospital hypotension, GCS, Age, ETCO2, Pulse rate, RR, SPO2, Blood loss, Death of occupant, Mechanism of injury, Intrusion, Extrication time, Estimated crash speed, Anatomic location injury, Pre-existing disease, Prehospital intubation

givers and receivers of the information (16), because effective handover needs experience, active listening and common language (16, 28). Though the standardised handover has advantages it does not support the recall of information by the receiving staff (26). Sometimes it is necessary to repeat the information (5), but the interruptions can contribute to ineffective handover (28). Effective handover needs three elements: physical handover of the patient, verbal handover and written documentation (25). For information transfer a working atmosphere and shared understanding are also needed (29). The ambulance sheet seems to be useful for the handover (15), but an electronic patient reporting system that can transmit clinical information from the scene to the hospital may improve the accuracy and retention of information provided (8, 22, 26), because if the information is not recorded the retention of information by the receivers is low (8, 26). As Manser et al. outlined *standards for safe and efficient handoff should go beyond structured information transfer and include elements of teamwork allowing for adaptation and flexibility* (29).

If the standardised handover is implemented by way of a mnemonic the handover improves in the consistency of information order, frequency of necessary information, reduction of questions asked and time taken (30).

Content of the standardised handover mnemonic varies. Vital signs were found to be essential elements of handoff (6). The social and psychological needs should be incorporated in the handovers (31) and also the complex conditions of elderly patients (32).

The handoff process can be improved in four key potential ways: to communicate directly with the provider who is in charge of the care for the patient; by increasing interdisciplinary feedback and shared understanding between pre-hospital and in-hospital care; by standardisation of some aspects of handover and by implementation of technologies to support the information exchange (27). The improvement needs support from leaders from all parts of the local health care system to establish a culture of patient-centred care (33) and involvement of all key people (nurses, physicians, paramedics etc.) (34).

Complications during handover

Ambulance crews feel that the hospital personnel do not listen to their handover (19, 21). This may be due to lack of confidence or resources on the paramedic side (19, 24) or because the receiving personnel behave unprofessionally (24). The lack of active listening causes frustration for paramedics (5). The hospital personnel then cannot recall the information from the handoff (19). It is interesting that structured handover does not seem to impact the staff recall (26).

Problems are most often encountered with patients with severe or multiple problems, as handovers are made often in a very short period and under stressful conditions (25). Valuable information can then be lost because of inadequate collection, loss through third-party (e.g. medical dispatch centre or hospital dispatch centre etc.), incomplete, or lack of structure in, handover (15, 22, 28). For the low acuity patient the pre-hospital notification and the paramedic-physician contact is not common (15).

Even though the paramedic's sheets have been identified as useful (15), receiving personnel often discard them without reading them (20). Because of this the information from the pre-hospital documentation is not transferred to, or documented in, the hospital sheets with changes (7, 10, 11). The hospital physicians valued the information from other physicians more than the information provided by paramedics (11).

Owen et al. identified problems in handover as the number of people in the communication chain, stressful and chaotic environment, lack of time for handover, lack of training and frustration in how to provide an understandable handover (16). Ineffective handover can be caused also by communication of in essential information, interruptions, barriers in data collection, time constraints, difficulties with using technology during patient transfer or because of high workload and lack of clarity (9, 28). Problems in information exchange can be also caused by providing handover by more than one crew member or in two places (35). Incomplete handovers are often followed by many questions which prolong the handoff (35).

Training in handover

A basic problem is that ambulance and hospital personnel have no training in providing efficient handover (15, 19, 21), and the paramedics would appreciate this education (22). Paramedics learn the handoff often through experience (9). Jenkin et al. found out that handover content also depends on the experience and knowledge of the medical personnel (5).

Training in communication, clinical leadership and team discipline support the communication process during handover (26). Because of this the paramedics should be taught how to provide the handoff and the hospital team should be taught how to listen (28). Bost et al. reached the conclusion that *interprofessional education may be one strategy to assist in the development of strong communication and teamwork skills that will enhance the clinical handover process between ambulance and ED personnel* (9).

Di Delupis et al. come to the conclusion that there was a significant increase in the handover quality after the training in use of a standardised handover tool (6). Education such as pamphlets and lectures bring improvement in the process and better compliance with the guidelines (23). On the other hand e-learning itself does not improve adherence to the handover guidelines (17).

Conclusion

Despite all the complications recorded and lack of training and structure of the handoff from the pre-hospital to the in-hospital care, some regions reported that verbal handover from paramedics was found relevant and the hospital personnel were satisfied with handover quality (15).

These articles support the need for structured handover and training in providing it, which might improve the safety of provided care by reducing the information loss. A few authors even encourage having a national guideline or standard for both givers and receivers of handover (5, 15). The structure is more needed in the cases of severe conditions (e.g. cardiac arrest, myocardial infarction, severe arrhythmia etc.) because low acuity patients are easier to handle (24, 25).

This review finds that there are no published data on pre-notification handover from pre-hospital to in-hospital care, which might be important for the preparation of the hospital teams (e.g. PCI or ECMO team) and also for the further treatment of the patient. Thus, the next research might be aimed at pre-notification and radio handovers, because these areas might be subject to the same risks and were not tested at all. The use of electronic tools to support the information handover might be also tested.

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Authors Contribution

DP, JP, PChC, AK and DM contributed equally to this work. DP, JP and PChC made the literature search, DP and JP made the screening according to the inclusion and exclusion criteria and DP, JP and PChC made the coding. DM and AK lead the methodology of the review team. DP and JP wrote the paper and PChC and DM made corrections. All of the authors made important intellectual contributions to the manuscript and all authors approved the final version before submission.

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The authors declare no conflicts of interest.

Ethics approval, informed consent and human rights

The review article is waived from the institutional review board approval. None of the articles included aimed to clinically test an intervention on a patient.

The authors agree to publication.

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