Limiting treatment in prehospital care: A prospective, observational multicentre study

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Abstract

Background: Data are scarce on the withdrawal of life-sustaining therapies and limitation of care orders (LCOs) during physician-staffed Helicopter Emergency Medical Service (HEMS) missions. We investigated LCOs and the quality of information available when physicians made treatment decisions in prehospital care.

Methods: A prospective, nationwide, multicentre study including all Finnish physician-staffed HEMS bases during a six-month study period. All HEMS missions where a patient had pre-existing LCOs and/or a new LCO were included.

Results: There were 335 missions with LCOs, which represented 5.7% of all HEMS missions (n=5,895). There were 181 missions with pre-existing LCOs, and a total of 170 new LCOs were issued. Usually, the pre-existing LCO was a do not attempt cardiopulmonary resuscitation order only (n=133, 74%). The most frequent new LCO was 'termination of cardiopulmonary resuscitation' only (n=61, 36%), while 'no intensive care' combined with some other LCO was almost as common (n=54, 32%). When issuing a new LCO for patients who did not have any preceding LCOs (n=153), in every other (49%) case the physicians thought that the patient should have already had an LCO. When the physician made treatment decisions, patients' background information from on-scene paramedics was available in 260 (78%) of the LCO missions, while patients' medical records were available in 67 (20%) of the missions.

Conclusion: Making LCOs or treating patients with pre-existing LCOs is an integral part of HEMS physicians' work, with every twentieth mission involving LCO patients. The new LCOs mostly concerned withholding or withdrawal of cardiopulmonary resuscitation and intensive care.

Keywords: EMS, HEMS, DNAR, termination of cardiopulmonary resuscitation, end-of-life, ethics, decision-making

1. Background

In Finland, helicopter emergency medical service (HEMS) physicians are dispatched to treat all patients with life-threatening conditions, including patients in health care facilities (HCF) and nursing homes (NHs), on the basis of patient risk assessments made by centralized emergency dispatchers.[1] Occasionally, medical treatment is considered futile and ceased on-scene due to lethal trauma or sudden cardiac arrest with a perceived negligible chance of survival.[2] Sometimes, the acute deterioration of the patient results from the end stage of a terminal illness rather than an unexpected event.[3] In these situations, the HEMS physician may decide to limit life-sustaining therapies (LST) and proceed with palliative care procedures, respecting the ethical principles of medicine: patient autonomy, beneficence, non-maleficence, justice, dignity and honesty.[4]

Data on limitation of care decisions in a prehospital setting are scarce.[5–8] Studies on limitation of care orders (LCOs) other than termination of cardiopulmonary resuscitation (TOR) are rare and face a range of ethical and practical challenges.[5,9,10] We therefore aimed to determine how often LCOs occurred during HEMS missions and the frequency, content and reasons for new LCOs made by HEMS physicians. We conducted a prospective observational trial and further studied the prevalence and contents of pre-existing LCOs and the overall situation on the scene when HEMS physicians made decisions regarding treatment and LCOs during missions.

2. Methods

2.1. Study design

This was a prospective, observational multicentre study involving all five physician-staffed HEMS bases in Finland. The data were collected from all HEMS missions during a six-month study period between 6 Sept 2017 and 6 Mar 2018. We included missions in which HEMS physicians identified the patient as having a pre-existing LCO, made a new LCO at the scene or identified the patient as already having a pre-existing LCO and also made a new LCO at the scene. We also included missions in which the HEMS unit's participation was cancelled after it was dispatched. We excluded phone consultations. The study followed the STROBE statement checklist.[11]

2.2. Ethics

This was an observational study, and no clinical interventions were performed. The Ethics Committee of the Tampere University Hospital approved the study protocol on 17 March 2015 (Approval no: R15048). The study was approved by all five Finnish university hospitals (TAUH R15048 on 9 Apr 2015, KUH Medical Superintendent's Decision 9/2016 on 17 Jan 2016, TUH T14/2016 on 18 Jan 2016, OYS on 15 Dec 2016 and HUS HUS231/2016 on 14 Nov 2016), the National Institute for Health and Welfare (THL/861/5.05.00/2015 on 11 Nov 2015) and FinnHEMS Ltd (20 Nov 2015). Due to the design of the study, the need for informed consent was waived, as this study was not a medical trial according to Finnish legislation and the patients were not contacted by researchers. The HEMS physicians collected the data after being informed verbally and by an information letter about the study, and their participation was voluntary. Completion of the normal mission reports and medical records was obligatory according to the standard operating procedure.

2.3. Setting

The structure of the Finnish emergency medical service (EMS) system has been explained previously.[6] In addition to EMS units, HEMS units are dispatched by the national emergency dispatch centre to treat patients with severe trauma or critical medical emergencies. There are five physician-staffed HEMS bases located in cities with university hospitals in addition to one HEMS unit operating in Lapland with an advanced nurse paramedic. HEMS units aim to reach the majority of the Finnish population (5.51 million inhabitants) within approximately 30 minutes. The physician-staffed HEMS units are staffed with a HEMS crewmember, a pilot and a HEMS physician, and the physicians are mainly experienced anaesthesiologists. Medical records are not readily available electronically for physicians during missions.

HCFs and NHs have been described in detail previously.[1,12] In this study, HCFs refer mainly to municipal primary health care centres. NHs consist of various public or private homes and institutions staffed with health care professionals that provide care and assistance for old, morbid and disabled people, most of whom have dementia. Unlike in many other countries, long-term care patients in Finland reside in NHs permanently.[13,14]

2.4. Definitions

In prehospital settings in Finland, nurse paramedics can independently terminate a cardiopulmonary resuscitation (CPR) attempt in case of an unwitnessed cardiac arrest with asystole, secondary signs of death, obviously lethal trauma or if a 'do not attempt cardiopulmonary resuscitation' (DNAR) order is identified.[15] Other prehospital LCOs, such as the decision to terminate a CPR attempt, are

made by physicians on-scene or over the phone. HEMS physicians are allowed to make all the same LCOs as in-hospital physicians if indicated, and TOR protocols adhere to the European Resuscitation Council Guidelines.[15] In this study, a 'DNAR' decision also included situations where return of spontaneous circulation had been achieved after a cardiac arrest, but the HEMS physician withheld further CPR attempts in case a re-arrest would occur. 'Termination of a CPR attempt' meant discontinuing on-going CPR following the HEMS physician's order. 'No intensive care' was loosely defined to cover all treatments that HEMS physicians perceive as intensive care treatments, such as invasive monitoring, endotracheal intubation, mechanical ventilation or drugs that are comparable to those administered in ICUs. 'No intubation' was defined as no endotracheal intubation. 'No tertiary hospital transfer' meant that the patient could be moved from a private home or NH to a municipal primary HCF, but 'No transfer' meant that the patient would be treated in the current location: a private home or an NH. 'Other LCOs' concerned providing conservative treatment instead of invasive procedures (e.g. drug therapy instead of coronary artery bypass or meningioma resection) or the use of intravenous drugs, fluids or nasogastric feeding. For the sake of clarity, we use the abbreviation 'NH' to refer to both HCFs and NHs, while 'other locations' refer to private homes, public places and transport.

2.5. Data

The FinnHEMS database is an electronic database including data on HEMS missions, phone consultations and medical records of HEMS missions. A study sheet designed specifically for the purposes of this study was generated in the database when a HEMS physician identified an LCO during a HEMS mission. The primary object of the study was to examine the content and reasoning of new LCOs and what kind of information the physicians had available when making decisions about treatment.

2.6. Statistics

Statistical analyses were performed using IBM SPSS version 25, Statistics for Macintosh (Armonk, NY; IBM Corp). The data were described with frequencies, percentages and graphs. Differences between the patients located in NHs and those in other locations were analysed with Chi-Square or Fisher's Exact tests when appropriate. A p-value <0.05 was considered statistically significant, and all tests were two-sided.

3. Results

There were 5,895 HEMS missions during the study, of which 11% (n=644) directly involved NHs. A total of 335 missions were associated with an LCO, representing 5.7% of all missions (Figure 1). The LCO patients were older than the HEMS patients on average (mean age 78 vs. 53 years). In NHs, 25% (n=158/644) of the missions were associated with LCOs compared to 3.4% (n=177/5,251) in other locations, ($p<0.001$). HEMS units encountered the patient on 140 (22%) missions to NHs and on 1,734 (33%) missions to other locations; in the rest of the cases, the missions were cancelled.

3.1. Pre-existing LCOs

There were 181 missions with pre-existing LCOs (54% of all missions with LCOs; 3.1% of all HEMS missions). The pre-existing limitations are shown in Table 1a. Thirty-four patients with pre-existing LCOs (19%) had multiple LCOs. The majority (n=117/181, 65%) of the patients with pre-existing LCOs were in NHs. Typically, the pre-existing limitation was DNAR only (n=133/181, 74%). We observed six spontaneous comments from physicians indicating that the pre-existing LCO was revealed only during or after a CPR attempt and two comments saying that, regardless of reasonable LCOs, the HEMS physician was dispatched to give end-of-life care in an NH. One HEMS physician was also dispatched to treat a terminal care patient in a private home.

(Table 1)

3.2. New LCOs

We observed 170 missions with new LCOs (51% of all missions with LCOs; 2.9% of all HEMS missions), of which 16 were made on patients who already had a pre-existing LCO. The frequency and content of new LCOs are shown in Table 1b. Almost every third (n=50/170, 29%) new LCO was made on a patient in an NH. In half (n=75/153, 49%; data on one patient missing) of the cases with a new LCO, the physician thought that the patient should have already had some limitation of treatment, while the other half of cases concerned trauma or an unexpected onset of critical illness (n=34/40, 85% in NHs vs. n=41/113, 36% in other locations, p<0.001).

3.3. Reasons for new LCOs

The reasons for new LCOs are shown in Table 2. The most common reason was the futility of the overall situation (n=49/170, 29%). For 65% of patients, the physician selected multiple reasons for the LCO decision. If the new LCO was made for a patient in an NH, the physician usually (n=31/50, 62%) selected three to five reasons for the limitation.

(Table 2)

3.4. Information available when making decisions regarding treatment and new LCOs

For 85% of the patients with pre-existing LCOs, the physicians reported having information on the pre-existing LCO on-scene when making treatment decisions. When making new LCOs, background information from nurse paramedics on-scene was available in 89% of the cases. The HEMS physicians made a full clinical examination in one third (34%) of the cases and the medical records were only available in 22% of cases (Table 3). Among the NH patients, the physicians did not report on any pre-existing emergency treatment plans, and the NH staff was sometimes unfamiliar with the

resident's history. HEMS physicians mostly made decisions regarding new LCOs without receiving a second opinion (n=147/170, 87%). In 18 cases (11%), the HEMS physician consulted another physician, usually a specialist in a central or university hospital who also had access to medical records. Discussions with NH physicians (n=4, 2%) or another HEMS physician (n=2, 1%) were rare.

(Table 3)

4. Discussion

This is the first prospective nationwide study of prehospital limitations on medical treatment. We explored the prevalence and contents of pre-existing LCOs, the available information and the overall situation when the HEMS physicians made LCOs. We found that 5.7% of HEMS missions were associated with LCOs. In most cases (74%), the observed pre-existing LCO was DNAR only, and withdrawing or withholding a CPR attempt comprised half of the new LCOs on-scene. Other pre-existing and new LCOs were rare on all HEMS missions. Missions with pre-existing or new LCOs were considerably more frequent in NH and HCF settings than elsewhere. Furthermore, new LCOs were often made for patients who the HEMS physicians thought should have already had an LCO. These findings strengthen the concern that the EMS system handles problems that arise from deficient end-of-life care planning and capability in society.[13,16]

The prevalence of identified pre-existing LCOs in NHs on HEMS missions was 18%, but HEMS physicians did not encounter any pre-existing emergency care plans during NHs missions. The prevalence of advance directives and LCOs seems surprisingly low, although it was higher than in an earlier study in 2002 (13%).[17] In another Finnish study, the prevalence of DNAR orders among NH residents was 67% and the prevalence of treatment plans in electric medical records was 71% in 2011.[18] The reason for these differences could be geographic variability, or, if the NH residents have sufficient end-of-life care plans, the HEMS physicians may not need to be dispatched at all; moreover, information on pre-existing LCOs is rarely available in EMS situations.[1,19] Thus, numerous cases may have been left outside of this study cohort, as HEMS units may have treated NH patients without knowing about the pre-existing LCOs. We were therefore unable to identify the true prevalence of pre-existing LCOs among HEMS missions. In recent studies of out-of-hospital cardiac arrest patients, the prevalence of advance directives was found to be 7.5% in France[19], and the prevalence of DNAR

orders was 6.2% in UK[20]. In Germany, 89% of prehospital physicians have encountered patients with advance directives in emergency settings.[21]

As the numbers of old and very old citizens increases, so does the number of people with multiple comorbidities and those who need assistance in daily activities.[22] Generally, all of these individuals have the need for advance care planning.[23] The national guidelines require that residents in 24-hour NH care have treatment plans easily available, which must include a medical emergency care plan for acute situations and end-of-life care—DNAR alone is not a sufficient treatment plan.[16,23–25] Communication between the patient and/or proxies and attending physician about treatment goals may ease the conversations on LCOs, the harms and benefits of different treatments and increase both the patient's and proxies' understanding about the inevitably approaching end of life.[4,26] The situation is always suboptimal if the HEMS physician on-scene has to make LCOs for patients who—and whose proxies—have not previously understood the severity of the overall situation.[27]

Other new LCOs besides TOR or DNAR were rare (1% of all HEMS missions). Almost all new LCOs concerned only LST, whereas primary care was never limited. In a French study, 76% of prehospital physicians reported that they had made at least one prehospital LCO concerning LST, and the reasons for the LCOs were similar to our results.[5] Interestingly, in our study poor functional status was a reason for 42% of new LCOs. This is the most ethically controversial topic related to LCOs, but poor functional status seems to decrease patients' survival from critical illness.[28,29] In the Finnish system, in practice, poor functional status means dependence in basic activities of daily living as a result of chronic conditions. In other areas as well, living in an NH has been found to negatively affect survival from an acute critical illness[30,31], although CPR in NHs is not always futile[30]. Nonetheless, NH residence has been considered a reason for ICU admission refusal[32], and it has been suggested to be a good starting point for end-of-life care planning.[24,28]

The rate of new LCOs made by HEMS physicians seems reasonable and suggests that making LCOs is an integral part of prehospital physicians' clinical work in Finland. Because in some cultures the practice of withholding LST in prehospital settings may seem brutal[33], we would like to highlight that the new LCOs were made in clearly futile situations. In other situations and with a lack of sufficient information, HEMS physicians usually proceed with full LST.[34] If HEMS is dispatched to a futile situation with insufficient preplanned end-of-life care, experienced prehospital physicians can provide palliative care in addition to the LCOs. This practice would likely be more humane than burdensome transitions to emergency departments[12,35]. However, the use of HEMS to solve organization-level problems in end-of-life care arrangements probably does not represent the optimal use of health care resources.[36]

The availability of medical records in only one-fifth of the cases of new LCOs is alarming. In addition, there were cases in which the physician making treatment decisions was not informed about pre-existing LCOs, and the dispatch algorithm does not include compulsory questions about such orders. According to Finnish legislation, the patient should always be treated with respect to his or her wishes or assumed best interest. The law allows any single licensed physician to make any LCO without discussion (if impossible to discuss etc.) with the patient or proxy, but all LCOs must be clearly documented and reasoned. In addition, it is not considered acceptable to offer treatments that are expected to be ineffective, maleficent or extremely expensive with minor expected health benefits. Hence, guidelines recommend making LCOs only through shared decision-making by a physician representing an appropriate specialty after discussion with the patient and/or the patient's family to come to a mutual understanding—and documenting this discussion.[25] However, in a HEMS setting, adhering to these guidelines is often cumbersome if not impossible. Mobile access to electronic medical records would clearly improve this situation. In Finland, the National Archive of Health

Information already contains reliable up-to-date records from both the private and public sectors, so creating such access should be pursued.[37] However, more emphasis should be placed on making advance care plans earlier—and by physicians familiar with the patient's situation rather than HEMS physicians—in order to ensure patients' access to appropriate and qualified palliative care.[16]

When interpreting these results, one must remember that we only included missions where HEMS units were dispatched to the scene. The national emergency dispatch centre dispatches the HEMS unit only if there is suspicion of severe trauma, acute cardiac arrest, unconsciousness or severe vital dysfunction. When the HEMS unit is dispatched, the physician can call to the EMS unit on-scene to clarify the situation and cancel the HEMS unit's participation in that mission if needed. NHs and private homes have many kinds of patients with varying comorbidities and functional status, and they all have equal rights for similar health care. LCOs can be made after individual assessment of the patient's ability to recover from severe trauma or critical illness, but HEMS dispatch cannot be excluded only by the location of the patient in an NH or HCF.[1,30] When looking at the cancellation rates, it is noticeable that HEMS physicians can often make decisions before arriving on-scene. Yet, the dispatch criteria should give the HEMS physician an opportunity to make a confirmation call before accepting the mission.

4.4. Strengths and limitations of the study

The major strengths of this study are its nationwide prospective multicentre design and collection of data using the same electronic database used for HEMS missions. However, the results represent only the situations in which the HEMS physicians perceived that they made a new LCO or identified a pre-existing LCO. The difference between the decision to forego treatment after all reasonable efforts have been made to save the patient and the decision to limit medical treatment because of futility is

minute; there might be variation between the physicians' perceptions of what is considered as treatment withdrawal. In addition, there may be some cancelled missions not included in the data, as cancellation of a HEMS unit is not an LCO, although it means withholding their clinical competence and intensive care-level treatments on-scene. This study is also unable to identify patients for whom the HEMS physician did not dare to make a new LCO even if they considered it. Potential reasons for not making a new LCO include insufficient available background information or the fact that making and documenting LCOs can be time consuming. The opportunity to 'load and go' may be faster, and leaving the possible LCO decision-making to hospital emergency departments can be juridically safer and generally acceptable, although some transfers at the end of life may be burdensome.[13,33] The low prevalence of pre-existing LCOs suggests that LCOs could be more common than they appear in our results. There were at least eight cases in which data were missing due to HEMS physicians' decision not to volunteer to collect data. In these cases, the HEMS physicians had stated that the mission was associated with an LCO in the compulsory database, but they did not complete the study sheet.

5. Conclusions

Making limitations of medical treatment is an integral part of HEMS physicians' clinical work in Finland. LCOs are common when the HEMS unit is dispatched to nursing homes and health care facilities. Usually, new prehospital LCOs involve withholding or withdrawing CPR and intensive care. When issuing a new LCO, the physicians that were studied often thought that the patient should have already had an LCO. The findings of this study suggest that there is still room for improvement in advance care planning in Finland and that HEMS physicians handle these end-of-life care challenges in their daily work.

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Conflict of interest

The authors declare that they have no conflict of interest regarding this study.

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Legend to figure

Figure 1. The data collection, inclusion and exclusion criteria of our study. LCO is a 'limitation of care order'.

Table 1. The frequency and content of limitation of care orders in HEMS missions.

The frequencies and contents of limitation of care orders (LCOs)		All N=335		NH/HCF N=158		Other Locations N=177	
		N	%	N	%	N	%
A	Pre-existing LCOs (N=181)	181	54	117	74	64	36
The frequency of different pre-existing LCOs[a]							
	DNAR	167	92	110	94	57	89
	No intensive care	37	20	20	17	17	26
	No tertiary hospital admission	2	1.1	1	0.9	1	1.6
	No transfers	1	0.6	1	0.9	-	-
	Other[b]	11	6.1	4	3.4	7	11
The number of patients with pre-existing LCOs							
	DNAR	133	73	92	79	41	64
	DNAR + no intensive care	31	17	18	15	13	20
	Other single limitation of medical care	10	5.5	4	3.4	6	9
	No intensive care	3	1.7	2	1.7	1	1.6
	DNAR + no intensive care + some other LCO	3	1.7	-	-	3	4.7
	No tertiary hospital transfer	1	0.6	1	0.9	-	-
B	New LCOs (N=170)	170	51	50	32	120	68
The frequency of different new LCOs[c]							
	DNAR	69	41	17	34	52	43
	Termination of a resuscitation attempt	66	39	16	32	50	42
	No intensive care	63	37	27	54	36	30
	No intubation	46	27	18	36	28	23
	No tertiary hospital admission	2	1.2	2	4.0	-	-
	No transfer	4	2.4	4	8.0	-	-
	Other	12	7.1	1	2.0	11	9.2
The number of patients with new LCOs							
	End of a resuscitation attempt	61	36	14	28	47	39

No intensive care + some other LCO	54	32	22	44	32	27
DNAR	24	14	3	6	21	18
Other new LCO or other combination of LCOs	22	13	6	12	16	13
No intensive care	9	5.3	5	10	4	3

DNAR is do not attempt cardiopulmonary resuscitation.
[a] Thirty-four patients had multiple pre-existing LCOs.
[b] The category “other” included three patients with a living will, two patients with diagnosed terminal care and one patient with diagnosed palliative care.
[c] Sixty-four patients had multiple new LCOs.

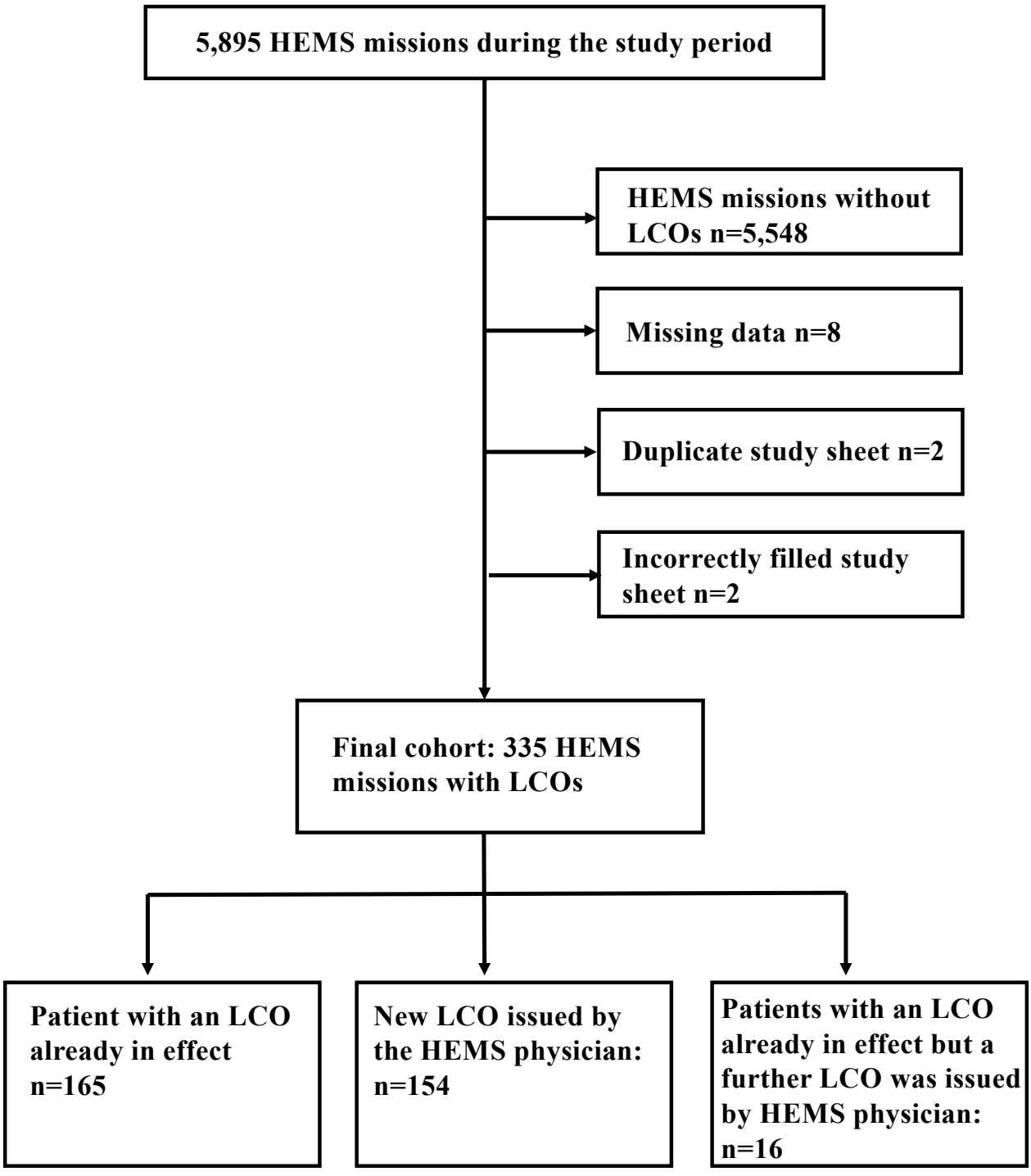
Table 2. The reasons that HEMS physicians made new limitation of care orders (LCOs) in HEMS missions.

Reasons for new LCOs (n=170)	n	%
Reasons for new LCOs		
Futility of the overall situation	125	74
Multiple/severe comorbidities	84	49
Old age	73	43
Poor baseline functional status	72	42
Pre-existing LCOs or advance directive	11	6.5
Other	10	5.9
Patients with different reasons for new LCOs		
One reason for a new LCO	60	35
Futility of the overall situation	49	29
Old age	6	3.5
Comorbidities	2	1.2
Poor baseline functional status	2	1.2
Pre-existing LCOs or advance directive	0	0
Other	1	0.6
Two reasons for a new LCO	44	26
Comorbidities + functional status	14	8.2
Overall situation + old age	14	8.2
Other combination	16	9.4
Three reasons for a new LCO	38	22
Comorbidities + functional status + old age	10	5.9
Comorbidities + functional status + overall situation	10	5.9
Comorbidities + old age + overall situation	9	5.3
Other combination	9	5.3
Four reasons for a new LCO	27	16
Comorbidities + functional status + age + overall situation	18	11
Other combination	9	5.3
Five reasons for a new LCO	1	0.6
Comorbidities + functional status + age + overall situation + pre-existing LCOs	1	0.6

Table 3. The information available when HEMS physicians made decisions on treatment and new limitation of care orders.

Type of information available	All n=335	%	New LCO n=170	%
Information from EMS situation	260	78	154	91
Full clinical examination by HEMS physician	83	25	57	34
Anamnesis from a nurse paramedic	256	76	152	89
Measured vital parameters	159	47	90	53
ECG	46	14	28	16
Information from a person on scene[a]	156	47	90	53
Information on any pre-existing LCOs	154	46	13	7.6
Medication list without medical records	68	20	39	23
Medical records	67	20	38	22
Information only from emergency dispatch centre[b]	41	12	7	4.1

HEMS = helicopter emergency medical service, and LCO = limitation of care order.
[a] Not EMS personnel; for example, a proxy, NH staff, some other physician, police or neighbor.
[b] Information from the dispatch centre is received via text message or spoken information retrieved from the emergency dispatch centre on the radio while traveling to the scene. This may contain information on pre-existing LCOs or NH residence. In cases shown in the inferior row of the table, the text message was the only available information.


5,895 HEMS missions during the study period
HEMS missions without LCOs n=5,548
Missing data n=8
Duplicate study sheet n=2
Incorrectly filled study sheet n=2
Final cohort: 335 HEMS missions with LCOs
Patient with an LCO already in effect n=165
New LCO issued by the HEMS physician: n=154
Patients with an LCO already in effect but a further LCO was issued by HEMS physician: n=16