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Management of emergency medical events in a rural community

ORIGINAL ARTICLE

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Background.
No studies of emergency medical incidents and responses in Norwegian rural communities have previously been done. As part of a larger investigation of emergency medicine in a rural community, in this study we have identified such situations and the problems associated with them in more detail.

Material and method.
Austevoll is an island community with no connection by bridge to the mainland. It is located to the south of Bergen, and has approximately 4,400 inhabitants. All emergency incidents occurring there were registered over a period of two years. Data were collected on the assessment of the situation when notification was received and when the patient was examined, the relationship between the assessments made by the doctor and those made by the ambulance personnel, and the treatment initiated.

Results.
A total of 236 emergency events were recorded. For 43 per cent of the patients the doctor's assessment of the sev-erity of the situation was downgraded from the emergency call to the actual examination of the patient, while the event was up-graded for 11 per cent. For alarms dispatched from the emergency medical communication centres, the doctors downgraded their assessment of the severity of the patient's condition in 67 per cent of all cas-es, while the ambulance personnel downgraded their assessment in 85 per cent of the cases. A residential home constituted the first location for provision of treatment in 63 per cent of the cases. The most frequent emergency res-ponses were venous cannulation, airway measures, including administration of O_2, ECG recording and/or monitoring of cardiac rhythm and parenteral administration of drugs.

Interpretation.
The competence of GPs in emergency medicine should primarily encompass the basic practical procedures. The doctors and the ambulance personnel have complementary roles in the handling of emergency medical events. The ability to obtain an adequate overall view of the patient's condition is an important aspect of the doctor's role.

Sequences of emergency medical events in Norwegian rural communities have not previously been studied. Identification of such events may provide a better impression of the real spectrum of injuries and diseases, the degree of illness, the need for medical skills and required responses. Emergency medical events in rural areas occur under conditions that are very dissimilar to those in hospitals, and require a high degree of cooperation between GPs and ambulance services. We wanted to study the assessments of severity, the responses and the practical circumstances of such events in more detail.

Material and method

This article is part of a more comprehensive study of emergency medical events in Austevoll municipality over a period of two years. A detailed review of the study design is provided in another issue of this journal (1). The doctor graded the severity of the situation at the time of the emergency call and when the patient was examined as possibly life-threatening (red response), as not life-threatening but requiring immediate response (yellow response) or as not urgent (green response). In the description, the colour-coded degrees of response are reserved for the assessment of severity made after receipt of the emergency call.

Emergency medical responses were defined as venous cannulation, administration of drugs parenterally or by inhalation, airway measures including administration of oxygen, recording of ECG or monitoring of cardiac rhythm by oscilloscope, stabilisation of possible spinal fractures and cardiopulmonary resuscitation. The first location for provision of treatment was defined as the place where the doctor and the ambulance personnel first

met the patient. The second location for provision of treatment was the place to which the patient was brought or the means of transport used to travel there. However if this transport was by car and shorter than three kilometres, this was only defined as the second location if measures were initiated during this transport.

Results

A total of 236 emergency medical events were recorded, involving a total of 240 patients. Altogether 84 per cent of these patients suffered from acute diseases and 16 per cent had sustained injuries. Table 1 shows that 35 patients (15 per cent) were found to be in a possibly life-threatening condition, and 139 patients (58 per cent) were in an acutely serious condition at the time of their examination. Compared to the time of receipt of the emergency call, the doctors often downgraded their assessment of severity (43 per cent of the relevant patients), while 11 per cent were upgraded. During the actual examination, the doctors assessed the patients as being in a life-threatening situation more frequently than the ambulance personnel did (15 per cent as opposed to 9 per cent). Of the 79 red responses following an emergency call dispatched from the emergency medical centres, the doctors assessed 48 cases (61 per cent) as potentially life-threatening at the time of receipt of the call. During the actual examination of the patient, the doctors maintained this grading for 16 of these 48 cases (33 per cent, or 20 per cent of all 79 calls), whereas the ambulance personnel maintained their grading for 12 of them (15 per cent of all cases). Examples of diagnoses for which all the red responses dispatched by the emergency medical communication centre were assessed as less serious than this at the time of the examination included alcohol poisoning, seizures, skin lesions and vertigo attacks. A doctor upgraded one of the 31 events, which on receipt of the call for a red response dispatched by the emergency medical communication centre was graded by the doctor as a yellow response, to a potentially life-threatening condition at the time of the examination.

Table 1

The doctor's grading of the severity of the situation at the time of the examination of the patient, by the doctor's grading of severity upon receipt of the alarm call

	Severity after examination (N and percentage of all)				
	Possibly life-threatening	**Acutely serious**	**Not urgent**	**Not relevant**	**Total**
Severity of the situation graded upon receipt of the alarm call	N (%)	N (%)	N (%)	N (%)	N (%)
Possibly life-threatening	22 (9)	37 (15)	20 (8)	0 (0)	79 (33)
Acutely serious	9 (4)	88 (37)	44 (18)	1 (0)	142 (59)
Not urgent	4 (2)	13 (5)	0 (0)	0 (0)	17 (7)

	Severity after examination (N and percentage of all)				
	Possibly life-threatening	**Acutely serious**	**Not urgent**	**Not relevant**	**Total**
Not relevant	0 (0)	1 (0)	0 (0)	1 (0)	2 (1)
Total	35 (15)	139 (58)	64 (26)	2 (1)	240 (100)

Table 2 shows that the treatment was most frequently initiated in a residential home. One-fifth of the patients were transported to a doctor's surgery, an ambulance vehicle or an ambulance boat before any treatment was initiated. In nine-tenths of all cases an ambulance vehicle or an ambulance boat served as the second location for provision of treatment.

Table 2

Location of the incident and the first and second location for provision of treatment for 240 patients. First and second locations for treatment were not relevant for two and 97 patients respectively

	Location of the incident N = 240N (%)	**First location for treatment N = 238N (%)**	**Second location for treatment N = 143N (%)**
House	170 (71)	150 (63)	1 (1)
Road, square, terrain or car	26 (11)	22 (10)	5 (3)
Public place indoors	19 (8)	9 (4)	0 (0)
Workplace or leisure	14 (6)	2 (1)	0 (0)
Boat/sea	9 (4)	5 (2)	0 (0)
Doctor's surgery	2 (1)	21 (9)	9 (6)
Ambulance car	0 (0)	13 (5)	65 (45)
Ambulance boat	0 (0)	16 (7)	63 (44)
Total	240 (100)	238 (100)	143 (99)

Table 3 shows that 84 per cent of the emergency medical interventions were initiated in the first location where the personnel encountered the patient, and 16 per cent in the second location. The most frequent interventions included venous cannulation, airway measures including administration of O_2, recording of ECG and/or monitoring of cardiac rhythm and parenteral administration of drugs. An average of 1.7 measures were taken on the patients, most of which were at the first treatment location (1.5, compared to 0.3). On patients whom the doctor assessed to be in a life-threatening condition an average of 2.5 measures were initiated, compared to 1.9 on patients assessed as acutely and seriously ill and 0.8 on patients assessed as being in a non-urgent condition.

Table 3

Special procedures initiated on the first and second location of treatment (percentage of 240 patients)

	First location of treatment	Second location of treatment[1]	Total
	N (%)	N (%)	N (%)
Venous cannulation	88 (37)	24 (10)	112 (47)
Airway measure including administration of O_2	89 (37)	17 (7)	106 (43)
Administration of drugs[2]	69 (29)	13 (5)	82 (34)
ECG recording /monitoring of cardiac rhythm	66 (28)	13 (5)	79 (33)
Stabilisation of large fracture and spinal column	14 (6)	3 (1)	17 (7)
Inhalation of drugs	10 (4)	2 (1)	12 (5)
Breast compression for cardiopulmonary resuscitation	6 (3)	0 (0)	6 (3)
Other	10 (4)	3 (1)	13 (5)
Total	352	66	418
[i]			

[i] [1] Includes only those initiated at the second location of treatment

[2] Drugs administered intravenously, intramuscularly or subcutaneously

Six patients underwent cardiopulmonary resuscitation, two because of drowning and four who had suffered cardiac arrest that was most likely of cardial origin. One of the patients suffered cardiac arrest while the personnel were present. The estimated response time from when the collapse occurred was 3 – 5 minutes for one patient, 9 – 12 minutes for two, is undetermined for one patient, and in the case of one patient the subsequent evaluation concluded that most likely over an hour elapsed from the time when the collapse occurred to the arrival of personnel at the location. In the four cases with a response time of up to 12 minutes, the doctor and the ambulance personnel arrived first in two instances each. In these four cases, the response time of the other group of personnel was approximately fifteen minutes longer. In three of the cases, witnesses to the event attempted to undertake cardiopulmonary resuscitation before the arrival of personnel, and in two of the cases, the quality of the compressions was assessed as good. Four underwent venous cannulation and administration of intravenous drugs (three by a doctor and one by ambulance personnel); in the other two cases the physical circumstances did not allow for this. In one case, intubation was also impossible. In the remaining five cases, the medical personnel in Austevoll (in three cases the ambulance personnel and in two cases a doctor) inserted a larynx tube, which was verified as functioning by auscultation and measurement of exhaled CO_2 (two cases), measurement of

exhaled CO_2 only (two cases) and auscultation only (one case). In all six cases, asystolia was the first cardiac rhythm recorded. An ambulance helicopter was requested in all of these cases, but was prevented from arriving in two of them. Two of the patients were brought to the ambulance helicopter with spontaneous circulation, while the resuscitation attempts were discontinued on the spot in four cases.

The doctors performed 63 per cent of the venous cannulations, and 77 per cent of the airway procedures were initiated by the ambulance personnel. Finally, altogether 164 patients (68 per cent) were transported to hospital, whereas 11 (5 per cent) were transported home, five were brought to other places and in 60 cases (25 per cent) no transport took place. A total of 140 transports to hospital took place by ambulance vehicle or boat for all or part of the distance, 21 were brought by helicopter and three were transported by other means. An ambulance helicopter was requested by personnel from Austevoll or dispatched by the emergency medical communication centre in 33 cases, and arrived at the scene in 26 cases, while weather conditions and other problems prevented this in seven cases (21 per cent).

Table 4 shows the frequency of various physical obstacles during the treatment of the patient. Reduced safety for the patient and the personnel was mostly caused by adverse physical conditions surrounding the response, such as slippery ground that impeded moving of the patient. In 12 per cent of the treatment sequences, adverse physical conditions prevented the personnel from undertaking one or more desired procedures at the first treatment location. The ambulance personnel experienced one or more adverse conditions in 12 per cent of the transports in which they were involved (19 of 154). The doctors met with similar problems in 25 of 116 transports in which they were involved (22 per cent). The difference stemmed from different assessments of the problems associated with transport capacity and in obtaining an ambulance helicopter.

Table 4

Physical and practical problems involved in the management of the patient (Patients relevant for the category, N and?percentage for each category)

Type of problem	Relevant	N (%)
Physical problems in establishing contact with the patient	237	15 (6)
The patient had to be moved before treatment could begin	236	30 (13)
The patient's position had to be changed before treatment could begin	234	32 (14)
Unsatisfactory working conditions – doctor's assessment	232	42 (18)
Unsatisfactory working conditions – ambulance personnel's assessment	196	27 (14)
Insufficient safety for the patient – doctor's assessment	234	11 (5)
Insufficient safety for the patient – ambulance personnel's assessment	210	20 (10)
Insufficient safety for health personnel – doctor's assessment	238	9 (4)
Insufficient safety for health personnel – ambulance personnel's assessment	213	17 (8)

Type of problem	Relevant	N (%)
Problems when moving patient to first onward transport	167	30 (18)

The doctors noted technical problems with messages and communication in 11 per cent of the cases (n=235). The corresponding figure for the ambulance personnel was 5 per cent (n=198). The doctors noted non-technical problems with messages and communication in the form of misunderstandings, absence of important information, ineffective alerts or other problems in 26 per cent of the cases. This type of problems occurred much more frequently in cases where the doctor graded the event as a red response at the time of receipt of the call (40 per cent) than when the incident was graded as a yellow response (21 per cent), and such problems occurred rarely in the case of a green response (6 per cent).

Discussion

The study shows that in a rural community where the GP on call and the ambulance service are highly accessible and mobile, it will be natural to initiate the treatment of acutely ill patients at the place of the incident.

After examination, close to half of the patients had the severity of their situation downgraded as compared to the doctor's assessment upon receipt of the alarm call. In addition, we have shown elsewhere that at the time of receipt of the alarm call, the doctor downgraded the red response calls received from the emergency medical communication centre to a yellow response in close to four-tenths of the cases (1). Thus, at two stages the doctor was able to calm down the situation to a considerable extent.

Cardiopulmonary resuscitation was undertaken on six patients, in five of these cases in the form of advanced life support. In the majority of these six cases of response to patients with circulatory failure the personnel had a relatively short response time, since the doctor arrived to the patient relatively rapidly in those cases where the ambulance crew had a delay in their response time, and vice versa. Both of these groups of personnel need to possess expert skills in initiation of cardiopulmonary resuscitation, without having to wait for the other group.

Non-technical communication problems in the form of, for example, misunderstandings, absence of important information and ineffective alerts, occurred relatively frequently. The more serious the assessment of the situation at the time of receipt of the alarm call, the more dominating these problems were.

The competence of GPs in the field of emergency medicine should first and foremost encompass fundamental, practical procedures, such as how to perform a venous cannulation and administer intravenous drugs, basic competence in airway management including skills in handling an O_2 bottle with valves and simple techniques for administering oxygen, recording and

monitoring of ECG, attaching a cervical collar, simple bandaging of fractures and being able to use the emergency communications network. Many GPs do not feel confident in applying these simple techniques (3, 4). At a later stage, it will be important to acquire skills in the other elements of advanced cardiopulmonary resuscitation, as well as cooperation in rescue operations and moving/evacuating from the location of the incident. Training is these procedures is meaningful mainly if joint exercises can be undertaken with the local medical emergency team.

Those who design training courses in emergency medicine for GPs ought to reflect on their urge to provide training in emergency tracheotomy, thorax puncture and intraosseous infusion. To enhance the confidence and participation of the GPs in medical emergencies, the largest effect could probably be achieved by focusing on the fundamental, practical skills mentioned above (5).

In the study, the ambulance personnel report a higher incidence of insufficient safety for the patient and the personnel than what the doctors do, and they note a lower frequency of technical problems associated with radio communication. To a greater extent than the ambulance personnel, the doctors perceive problems related to key logistical aspects of the transport of the patient, such as capacity problems and unavailability of helicopters. Both the doctors and the ambulance personnel report very frequent reductions in the assessment of the severity of the situation from the time of receipt of the alarm call to the time of examination of the patient. This downgrading of the assessment of severity occurs more frequently among the ambulance personnel. This may be because they to some extent leave this assessment to the doctor. The assessment of severity and level of stress could possibly be higher among ambulance personnel working in situations where they have no support by a doctor.

The 240 patients had 62 different ICPC diagnostic codes (4). The scope of variation in the medical emergencies is therefore much larger than a limited number of core conditions. Competent and distinct participation by a doctor in medical emergency situations is likely to be important for patients to receive the best possible diagnostics and selection of an appropriate treatment, followed by an appropriate level of transport.

We conclude that the doctors and the ambulance personnel have complementary roles in handling medical emergency events. The ability to obtain an adequate overall view of the patient's condition is an important aspect of the doctor's role.

Conflicts of interest: None declared

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