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HOW URGENT ARE EMERGENCY ADMISSIONS?

An Evaluation of Emergency Admissions to General Hospitals in a Norwegian County

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Abstract

Objectives: To assess necessary treatment and degree of urgency for patients admitted to emergency rooms, and potential health consequences of transfer to nearest alternative hospital.
Methods: During 1 month, we included all 1,300 emergently admitted patients in all seven general hospitals in a Norwegian county with a population of 236,921 inhabitants. The number of patients in need of surgical and/or intensive medical treatment, the urgency of the necessary treatment, and the risk to each patient of adverse permanent health consequences of further transport to nearest alternative hospital were assessed by a multidisciplinary expert panel.
Results: Ninety-four patients (7.2% of 1300 patients) were considered in need of either surgical (n = 22) or intensive medical treatment (n = 70) or both (n = 2) within 8 hours of arrival in hospital. Medical treatment had the greatest urgency, while surgery most often could be postponed. In cases where the patients were initially to be given only stabilizing treatment and then transported (assisted by qualified personnel) to another hospital, the panel estimated the risk of losing health benefit to be high for 14 patients. In six of these cases the risk was linked to delay of thrombolytic treatment.
Conclusions: Fewer than 10% of the patients who are admitted as emergency cases to general hospitals in Norway need surgical or intensive medical treatment within 8 hours of their arrival. The medical consequences of transport of patients to the nearest alternative hospital are generally small and can often be further reduced by simple means.

Keywords: Emergency medical services, Admissions, Appropriateness, Hospital planning

Health care consumption and hospital admission rates are steadily increasing in industrialized countries despite improved public health. In particular, the relative

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volume of emergencies among hospital admissions is increasing (3;11;15;16). The reasons for this increase are not clear (10;13;19). The high volume of emergency admissions may result in both the delay of treatment for patients needing immediate care (4) and in the further downgrading of nonemergency patients.

Very few population-based studies of the total group of emergently admitted patients have been conducted. We therefore registered all emergency admissions in seven hospitals in Nordland County, Norway, for 1 month and used the data to describe the case mix, the necessary treatment, and the degree of urgency in this sample. Motivated by an ongoing public debate about hospital structure in the county, we also assessed the potential health consequences of transferring the patients to the nearest alternative hospital.

METHODS

Data on all emergency admissions (uncomplicated childbirth not included) were recorded on arrival at seven general hospitals in Nordland County in northern Norway from April 15 to May 13, 1991. Nordland County has 236,921 inhabitants. Six of the hospitals of the county are small local hospitals, serving populations from about 17,000 to 35,000 people. They are organized in general surgical and internal medical departments, supported by x-ray, laboratory, and anesthesia services. The seventh hospital is the central hospital of the county, offering a local population of about 71,000 people service from a number of medical specialties. The travel distance by ground ambulance from one hospital to the nearest alternative hospital varies between 1.5 and 3 hours.

The recorded variables included age, sex, case history, and admission diagnosis of each patient. In addition, the attending doctor, on a subjective basis without external definitions or guidance, classified the medical status of the patients as either critical, stable, or good (Figure 1). The attending doctor also assessed whether the patient's medical condition would have been significantly worsened if the patient had been transferred to the nearest alternative hospital without having first received any acute surgical or intensive medical treatment.

All patients in the category critical, all patients judged to be worsened by further transport, and a random sample of 103 patients from the rest of the population were included in the present study. The combined sample included 289 patients who were further reviewed in two steps. In the first step, two consultant anesthesiologists (RH and JT) prepared an anonymous, detailed case report, including clinical course and discharge diagnosis, for each patient. Without knowing from which category the individual patients were drawn, the anesthesiologists further assessed whether the patient possibly needed treatment (121 patients) or not (168 patients) within 8 hours of arrival at the hospital (Figure 1).

In the second step, the 121 case reports for the patients possibly needing treatment were assessed by a multidisciplinary expert panel consisting of two general practitioners, two internists, two anesthesiologists, and a surgeon. All members of the panel were consultants with several years of clinical experience. All except for one of the anesthesiologists normally worked in hospitals in Nordland County.

Assessment of Urgency and Level of Treatment Needed

The panel assessed the patient's need for minor or major surgical and/or medical intensive treatment (Table 1) after arrival at the hospital. They also assessed how long the treatment could be postponed (0.5, 1, 3, or 8 hours) without permanent health consequences or loss of treatment benefits.

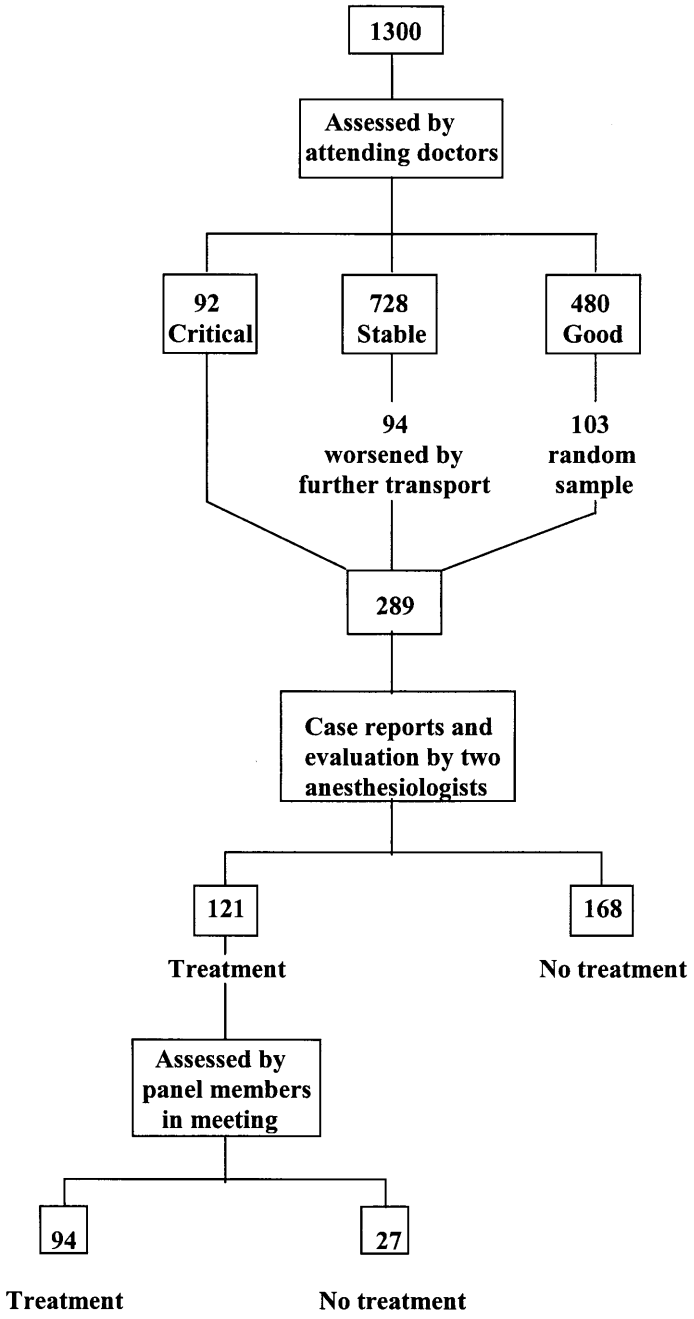

Figure 1. Flow chart for the assessment of patients included in the study. Treatment = need for surgical or intensive medical treatment within 8 hours after arrival at hospital.

Assessment of the Consequences of Further Transport

The panel assessed the risk (low $< 10\%$ or high $\geq 10\%$) to each patient of adverse permanent health consequences of further transport to the nearest alternative hospital by ground or air ambulance, if they did not receive surgical or intensive medical treatment at their attending hospital. The assessment considered only consequences in terms of loss of life expectancy or loss of physical or mental function.

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Table 1. Examples of Levels of Surgical and Intensive Medical Treatment

Minor surgery	Minor intensive treatment
Tracheotomy	Intubation/ventilation
Pleural drain	Resuscitation
Laparoscentesis	Treatment of arrhythmias
Incarcerated hernia	Vasoactive drugs (intravenous)
Appendectomy	Cardiac pacemaker
Extrauterine pregnancy	Peritoneal dialysis
Uterine curettage	Heparin infusion
Cesarean operation	
Simple fractures	
Major surgery	**Major intensive treatment**
Major head injuries	Respiratory treatment
Perforation of the eye	Intubation in epiglottitis
Aortic aneurysm	Pericardiocentesis
Greater laparotomies	Swan-Ganz catheter
Liver rupture	Blood transfusions > 6 units/hr
Complicated deliveries	Hemodialysis
Complicated fractures	

The following hypothetical preconditions were set for assessing the consequences of transport:

- The attending hospital was replaced by a first-aid station, staffed by a general practitioner. Simple diagnostic tests were available (e.g., blood samples, electrocardiogram, x-ray of lungs and extremities) as well as drugs for emergency situations, intravenous solutions, and O-negative blood to stabilize the patient before transport.
- The patients were followed by a general practitioner during transport by ground ambulance. In transport by air ambulance (helicopter or airplane), the patients were followed by an anesthesiologist. Consequently, more advanced treatment (i.e., ventilatory support, infusion of vasoactive drugs) could be given during this type of transport compared with ground transport (12).
- The duration of transport by ground or air ambulance was stated in every case.

The Expert Panel Process

The assessment in the panel took place in two stages:

1. Prior to a panel meeting, the panelists individually stated their primary assessments on a special form; and
2. During the meeting, they revealed their estimates and presented their arguments. After discussing areas of disagreements, each panelist then revised his or her estimates and stated them on the form.

Judgments were considered to be in agreement when six or more of the seven panel members stated the same need for treatment within the same time interval after the patient's arrival at the hospital or, concerning the consequences of further transport, stated the same risk for loss of health benefit by the two alternatives of transport. It was not a prerequisite that agreement be achieved during the panel process.

Communication was established with the hospitals during the panel meetings in case any member of the panel should request more information about a patient. Additional information was obtained for only one patient.

Table 2. Emergency Hospital Admissions During 1 Month: Patients' Medical Condition on Arrival at the Hospital as Assessed by Attending Doctors

	Catchment population	Emergency admissions		In critical condition		Stable but worsened by transport	
Hospital	n	n	Rate per/1,000	n	%	n	%
Central hospital	71,026	277	3.9	16	5.8	[a]	
Six local hospitals	165,895	1,023	6.2	76	7.4	94	9.2
Total	236,921	1,300	5.5	92	7.1	94	7.2

[a] Not assessed for patients admitted to the central hospital.

Statistical Calculations

A standard chi-square test for a $2 \times n$ table was used to evaluate whether there were significant differences among proportions of patients assessed to need treatment in different age and diagnostic groups. Confidence limits for proportions were obtained from the binomial distribution.

RESULTS

Patients

Altogether 1,300 emergency admissions were registered during the study (Table 2). Among the six local hospitals, the proportion of patients considered by the attending doctors to be in critical clinical condition averaged 7.4% (range, 4.9–13.5), while a further 9.2% (range, 1.2–28.1) were considered to be in a stable clinical condition that would have worsened if treatment had been delayed by transport to another hospital.

Need for Treatment

The two anesthesiologists initially classified 121 patients as needing surgical or intensive treatment within 8 hours of arrival in the hospital. During the evaluation process, however, the panel concluded that only 94 of these (7.2% [95% CI, 5.8–8.6%] of the total of 1,300 patients) needed such treatment (Table 3).

Table 3. Emergency Admissions During 1 Month: Patients Assessed by Expert Panel To Need Treatment Within 8 Hours, by Age

Emergency admissions			In need of treatment within 8 hours		
Age (yrs)	n	%	n	%	% of all admissions
0–10	99	7.6	5	5.3	5.0
11–30	200	15.4	10	10.6	5.0
31–50	208	16.0	7	7.4	3.4
51–60	113	8.7	9	9.6	8.0
61–70	203	15.6	25	26.6	12.3
71–80	283	21.8	25	26.6	8.8
81–100	194	14.9	13	13.8	6.7
	1,300	100.0	94	99.9	7.2

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Table 4. Emergency Admissions During 1 Month: Patients Assessed by Expert Panel To Need Treatment Within 8 Hours, by Diagnostic Groups

	Emergency admissions		In need of treatment within 8 hours		
Diagnostic group	n	%	n	%	% of all emergency admissions
Traumas, including fractures	163	12.5	10	10.6	6.1
Urogenital system, including problems in pregnancy	86	6.6	7	7.4	8.1
Gastrointestinal system	226	17.4	9	9.6	4.0
Cardiovascular system	312	24.0	59	62.8	18.9
Infections, tumors, diabetes, hematological system	101	7.8	4	4.3	4.0
Respiratory system	114	8.8	3	3.2	2.6
Intoxications, psychiatric social indications	70	5.4	1	1.1	1.4
Central nervous system, including stroke	79	6.1	1	1.1	1.2
Skin, musculoskeletal system	27	2.1	0	0	0
Other symptoms and unspecified conditions	105	8.1	0	0	0
Diagnosis missing	17	0.3	0	0	0
	1,300	99.1	94	100.1	7.2

To test the reliability of the classification made by the two anesthesiologists, the panel also assessed 55 patients randomly chosen from the 168 patients initially considered as belonging to the no-treatment group (Figure 1). In 4 of the 55 cases, the panel disagreed with the anesthesiologists' classification. Correcting for this "error," the final proportion of patients assessed to need treatment within 8 hours of arrival at the hospital therefore increased to 7.7% (95% CI, 6.2–9.2%).

The proportion of patients needing treatment within 8 hours varied significantly between age groups ($p = .014$) (Table 3). The highest proportion occurred in patients aged 61 to 70 years (12.3%), while the lowest proportion occurred in patients aged 31–50 years (3.4%). The proportion needing treatment also varied significantly between diagnostic groups ($p < .001$) (Table 4). The highest proportion was found among patients with cardiovascular diagnoses (18.9%).

Of the 94 patients considered to need treatment within 8 hours of arrival, the panel concluded that 22 patients (23.4%) needed surgery, 70 (74.5%) needed intensive medical treatment, and two needed both. These two patients were an 81-year-old man with an aortic aneurysm that ruptured during x-ray examination and a 61-year-old woman with a urethral calculus and incipient sepsis (treatment needed within 30 minutes and 3 hours, respectively).

The level and urgency of the treatment needed for the other 92 patients is shown in Table 5. Sixty patients needed minor intensive medical treatment within 1 hour of arrival in hospital. Of these, 51 (85%) needed treatment for acute cardiological problems, including myocardial infarction, angina pectoris, cardiac arrhythmias, and cardiac incompensation. Of the remaining nine patients, two had pulmonary embolus, one had drug intoxication, one convulsions, one dehydration from gastroenteritis, two asthma, one urosepsis, and one diabetes.

According to the panel, none of the patients needed surgical treatment within the first hour of arrival, while 12 patients needed minor or major surgery within 3 hours (Table 5).

Table 5. Patients Assessed by Expert Panel To Need Surgical or Intensive Medical Treatment Within 8 Hours, by Level and Urgency of Treatment

No. of hours after admittance	Level of surgical treatment		Level of intensive medical treatment		Total
	Minor	Major	Minor	Major	
0.5	0	0	42	3	45
1	0	0	18	0	18
3	10	2	7	0	19
8	9	1	0	0	10
Total	19	3	67	3	92[a]

[a] Two patients needing both surgical and intensive medical treatment are excluded from the table.

Three patients were assessed as needing major surgery: a 34-year-old woman with ileus, a 17-year-old boy with an abscess and intestinal gangrene following appendicitis, and a 10-month-old infant with intestinal invagination.

Consequences of Further Transport

Of the 94 patients assessed to need treatment within 8 hours after arrival, 18 were admitted to the central hospital of Nordland County and further transport was not an option. Agreement on the medical consequences of further transport was achieved for 68 of the remaining 76 patients (Table 6). Forty-eight patients could be transported either by helicopter or ground ambulance to the next hospital with low risk of losing health benefit, whereas for 14 patients the risk of losing health benefit was assessed as high for both kinds of transport. One of these patients had a pulmonary embolus; the remaining 13 had heart problems. Six had an acute myocardial infarction and the potential loss of health benefit by further transport was considered high because it would delay the start of thrombolytic treatment with streptokinase.

For six patients, the panel concluded that the risk would be low by helicopter transport but high by ground ambulance.

DISCUSSION

Of the 1,300 emergently admitted patients, our expert panel concluded that about 8% needed surgical or intensive medical treatment within 8 hours of arrival at the hospital. This result corresponds with the primary assessments by attending doctors at the hospitals.

Table 6. Expert Panel's Assessment of Risk of Losing Health Benefit from Treatment by Further Transport to Next Hospital by Ground Ambulance or by Ambulance Helicopter

		Risk[a] by helicopter transport		
		Low	High	Total
Risk[a] by ambulance transport	Low	48	0	48
	High	6	14	20
Total		54	14	68

[a] Low risk $<$ 10% and high risk $\geq$ 10% of permanent health loss or treatment benefit.

The present study also shows that the majority of patients who most urgently needed treatment, that is treatment within 1 hour of arrival at the emergency room, needed intensive medical treatment. In general these were older patients with acute cardiac problems. Although it is sometimes claimed that advanced medical qualifications are necessary to treat such patients adequately, major parts of acute cardiologic treatment, such as thrombolytic treatment or treatment of cardiac arrhythmias or insufficiency, are relatively standardized and can be carried out or at least started before arrival at the hospital. If one assumes that the six patients treated with streptokinase in our study were treated before reaching the hospital, the proportion of patients that needed intensive medical or surgical treatment within 3 hours from arrival at the hospital was only 6.0%.

In most cases surgery could wait. Only one patient needed surgical treatment within 1 hour of arrival at the hospital.

A randomized controlled trial of the urgency of treatment and the consequences of transport to another hospital is not acceptable on either practical or ethical premises. Evaluation by external experts is therefore a valuable and usually the only feasible approach to evaluating this course of treatment. However, our results should be interpreted with caution: despite the overall size of the study, the number of seriously ill patients was relatively small and the results are based on the subjective evaluations of an expert panel. The validity and reliability of expert judgment can be questioned (5). All members of our panel except one worked at the hospitals in the county where the study was conducted. Even though the case reports were anonymous concerning the identity of both patient and hospital, the panel members could possibly have recognized the patients and been influenced by their own attitudes about the role of local hospitals. The present study was carried out in a period with intense public debate about hospital structure in Nordland County. This might have biased the assessments toward increased urgency and inflated consequences of further transport.

The rural setting of Nordland County may limit generalization of our results. However, 51% of the catchment population live in the communities where the hospitals are located. In addition, the county has a well-developed air ambulance system staffed by physicians, which compensates for the long transport distances.

Appropriateness of care is difficult to measure (6;9). We are not aware of other population-based studies that have evaluated the need for treatment or consequences of further transport of the total volume of emergency admissions to general hospitals. Studies on emergency admissions carried out in university hospitals (1;17) or limited to departments, units, or symptoms (2;7;8;14;18) have provided little useful information in the present context. Methodological differences make comparison difficult, but the urgency and level of surgical and intensive medical treatment needed in such studies have been found to be higher (8;14) than in the present study.

Our expert panel concluded that the medical consequences of transferring patients to the next hospital in case their nearest local hospital was closed were relatively small provided that the patients had first been given stabilizing treatment and were followed by qualified health personnel. The attending doctors considered the risks caused by the delay in treatment resulting from transfer to be substantially higher than the panel. This may have been because the character of the evaluations was somewhat different or perhaps the opinions of the attending doctors reflected loyalty toward their own hospitals.

The relative volume of emergency admissions to Norwegian hospitals is increasing. In 1995, 63% of all admissions were emergency admissions (16). This is

an increase of 16% compared with 1991. The proportion of emergency admissions is greatest in smaller hospitals and in medical rather than surgical departments (personal communication, Torhild Heggestad, Norwegian Institute for Hospital Research). The reasons for the increase in emergency admissions are not fully known. It could hardly be caused by the introduction of new medical technology and new medical abilities, because these mainly concern elective procedures. The aging population, with concomitant increase in morbidity, may play a role. Also, when confronted with hospital queues, emergency admission may be a way for general practitioners to get access to hospital care within a shorter time. Finally, the increased focus on doctors' neglect may have boosted defensive medical behavior and risk aversion among the general practitioners. Whatever the reason, the present study highlights unrestrained use of emergency admissions, which imposes a considerable burden on limited hospital resources.

Sometimes small local general hospitals are invidiously labeled patient traps, where patients remain instead of being transferred to a more appropriate higher level hospital. In our study, in only one case could transfer to a higher hospital level be discussed. This was, however, an elderly patient with an advanced serious disease, and it was likely that the clinicians considered it unethical to transfer this patient to a higher level hospital for advanced intensive care, even though this was not explicitly stated in the medical record. We therefore find no reason to label the local hospitals of Nordland County as patient traps.

In conclusion, our study indicates that less than 10% of the patients admitted to local general hospitals in a Norwegian county as emergency cases in fact need surgical or intensive medical treatment within 8 hours of their arrival at the hospital. Our study also indicates that the medical consequences of transferring patients to the next hospital are relatively small even in a sparsely populated area, provided they are given initial stabilizing treatment and are followed by qualified personnel.

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