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## Admissions to the medical department – who admits and why

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### ORIGINAL ARTICLE

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### BACKGROUND

The objective of this study was to identify the basis for admission to a large medical department in Norway. We have assessed hospitalisation and whether triage may help identify relevant patients.

## MATERIAL AND METHOD

All admissions to Drammen Hospital over a full week in the autumn of 2014 were recorded with the patient's age, gender, referring doctor/institution, from where the patient was admitted and his/her diagnosis at admission and discharge. All light of the condition upon departure from the primary health services, were systematically evaluated by two general practitioners at the medical department through a review of the referral notes. The patients were triaged in the emergency reception, and the degree of seriousness of their condition was assessed against possible alternatives to hospitalisation.

## RESULTS

The study included 255 admissions (52 % women, average age 62 years). In 57 % of the cases, the referring doctor was from a GP (26 %), out-of-hours doctor (31 %) and in 24 % from the specialist health services. Altogether 18 % of the cases were admitted from a doctor. The most frequent diagnoses for admission included cardiovascular disease (38 %), pulmonary disorders (20 %). For 7 % of the patients who had been admitted by a primary doctor we found possible alternatives to hospitalisation, mainly intermediate care unit. There was no correlation between triage and alternatives to hospitalisation.

## INTERPRETATION

The proportion of admissions from general practitioners was higher than that found by equivalent studies. One in every eight cases was deemed relevant for alternative solutions. Triage does not identify patient pathways that are suitable for alternatives to hospitalisation.

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### Main message

General practitioners and out-of-hours doctors each accounted for approximately one-quarter of the admissions to the medical department.

A structured review of the referral notes could identify an alternative to hospitalisation in one of every eight cases, but not confirmed by a retrospective review of the hospital records.

The Manchester Triage Scale (MTS) and the Modified Early Warning Scale (MEWS) triage tools are unsuitable for selecting patients for whom hospitalisation is avoidable.

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Approximately 900 000 patients are admitted to somatic hospital wards in Norway each year (1), and approximately 100 000 are admitted to an internal medicine unit (2). The 98 beds at the medical department of Drammen Hospital account for approximately 10 % of the total number of somatic beds in Norway. The department has a little more than 10 000 admissions per year, and the main reason for admission is need of emergency treatment. The number of admissions is increasing at a regular pace – by 7.9 % in total from 2010 to 2014 (communication).

The admissions come from GPs in the area and the out-of-hours services, as well as from specialists in private practice and from the hospital. It is a policy goal to involve GPs to a greater extent in the assessment of emergency admissions (3, 4), but few studies have been undertaken in Norway to identify those who admit patients (5).

Assessing which patients to hospitalise is one of the key tasks of doctors in the primary health service. A GP has an estimated 1000 patients per year, and somewhat less than 300 of these concern acute conditions (6). On average, 2–3 % of those who come for a consultation are admitted to hospital, approximately 75 patients per year. The sorting undertaken by the primary doctors must be sufficient to identify conditions that require serious attention. The price of high safety, however, is that some patients are admitted with conditions that later turn out to be non-serious.

Some diseases and conditions indicate that the patient is in clear need of hospitalisation, such as suspicion of acute myocardial infarction and sepsis. For certain conditions there are general guidelines regarding who should be admitted, for example, asthma exacerbation (7) and a high Wells score for deep-vein thrombosis (8). Most often no specific criteria will be available, and the degree of seriousness is not normally applied in the referral notes.

The decision to hospitalise thus tends to be based on professional discretionary judgement and an assessment of what is in the patient's best interests. The referring doctor will assess the medical condition and possible risk of exacerbation, the wishes and expectations of the patient, and psychosocial issues.

A study conducted in Tromsø found that 24 % of those who were admitted for emergency treatment at the medical department would have benefited from their hospitalisation (9). A later mapping study from Trondheim found that approximately 20 % of those who received emergency treatment were eligible for alternative measures, whereof admission to an observation ward constituted the most common alternative. It concluded, however, that at the time of admission it was difficult to distinguish between those who would benefit from hospitalisation and those who would not.

A mapping study of admissions from Værnes casualty clinic found that approximately one in every five could have been managed with a consultation with a specialist the next day or admission to a municipal intermediate care unit/nursing home (10). These retrospective analyses, and there are no prospective studies that show how patients who might benefit from hospitalisation are identified at the time of admission.

Triage tools are used in most emergency receptions in Norway to assess the degree of urgency. Many use systems they have developed, whereas others use validated tools (11). Few studies have been made to assess whether these tools can be used to identify patients for whom hospitalisation is avoidable.

A study from Cape Town undertaken in 2008 used the Modified Early Warning Scale (MEWS) in an emergency reception. The risk of death increased with rising scores, as did the risk of death during the hospitalisation period (12). Triage tools have primarily been used to assess the degrees of urgency in emergency receptions, and we have little knowledge of the applicability of these tools in the primary health service.

In this study we registered data on admissions to a medical department with a large catchment area. We investigated whether it was possible to identify patients for whom hospitalisation was avoidable prior to the hospitalisation period by reviewing the referral notes, and in its aftermath by studying the patients' discharge reports. In addition, we investigated possible correlations between the result of triage in the reception and the degree of seriousness of the condition.

## Material and method

All admissions to the medical department were registered over a randomly chosen full week from Monday through Sunday.

### Epidemiological data

From the hospital's patient records we registered sex, age, the distribution between emergency and elective admissions, ward/treatment provided in the reception, hospitalisation time, the referring doctor and from where the patients were admitted. We also registered the 25 most frequently occurring diagnoses at admission and discharge.

### Prospective analysis

The referral notes from primary doctors were assessed by a medical council consisting of two GPs and a specialty registrar from the medical department. We used a structured consensus method (Delphi) which has previously been used in similar studies (13). We registered whether the referrals contained a defined medical issue and whether any alternatives to hospitalisation were available in light of the patient's condition.

The alternatives were categorised as admission to a municipal intermediate care unit, an appointment with a GP or outpatient clinic, or discharge to the home (with supervision if relevant), or as a pending admission and conference between the GP and the medical council.

The medical council emphasised the presence of a need for diagnostic clarification, the degree of seriousness and the risk of psychosocial factors. These criteria are in line with those for admission to a municipal intermediate care unit, which state that the patient should be diagnostically clear, or the risk of exacerbation should be minor (14). This discretionary assessment was made on the basis of the information available at the time of the referral, and with no knowledge of the further course of the patient's condition.

### Retrospective analysis

The records from the hospitalisation periods were reviewed retrospectively. We compared the group for which possible alternatives to admission had been described with an identical number of patients randomly drawn from the rest of the group.

This review was undertaken by two GPs and two specialty registrars at the medical department. These doctors had not participated in the prospective analysis of the referral notes and had no information as to whether or not these patients had been assigned to the group with alternatives to admission.

### Triage

The patients were triaged by a nurse upon arrival in the emergency reception. The MEWS tool and the Manchester Triage System (MTS) are both validated for triage in emergency receptions and are in use at Drammen Hospital (15–17).

The MEWS tool is based on vital variables – respiration frequency, pulse, systolic blood pressure, temperature and consciousness – and consists of 52 flowcharts for various presentations in which different symptoms are rated and compiled into a total assessment score.

Results from the triage were collated with the analyses of availability of alternatives to admission. We tested a possible correlation between the triage score and alternatives to admission with the aid of the statistics software package SPSS.

Totalled results are reported as averages with measures of dispersion, unless stated otherwise.

Clinical information and figures have been anonymised, and no personal registrations were made. The project was approved by the local research ethics committee at Oslo University Hospital, who is also responsible for Vestre Viken Hospital Trust. The study has also been submitted to the Norwegian Data Inspectorate for medical and health research ethics, which concluded that it was not subject to approval.

## Results

A total of 255 patients were admitted during the week studied, whereof 132 were women (51.8 %) (Table 1). Approximately 80 % of the total population involved patients in the age group 16–65 years. This group accounts for approximately 80 % of the total population. Closer to 3 % of the total population involved patients older than 85 years; this group accounts for approximately 3 % of the total population. However, the highest proportion of patients was found in the age group 76–85 years.

**Table 1**

Sex and age distribution of patients admitted to the medical department of Drammen Hospital over one week in 2014

Sex and age (years)	16–25		26–35		36–45		46–55		56–65		66–75		76–85		86+	
	Number	(%)	Number	(%)	Number	(%)	Number	(%)	Number	(%)	Number	(%)	Number	(%)	Number	(%)
Women	15	(5.9)	9	(3.5)	10	(3.9)	12	(4.7)	26	(10.2)	20	(7.8)	28	(11.0)	12	(4.7)
Men	2	(0.8)	10	(3.9)	12	(4.7)	15	(5.9)	16	(6.3)	28	(11.0)	24	(9.4)	16	(6.3)
Total	17	(6.7)	19	(7.5)	22	(8.6)	27	(10.6)	42	(16.5)	48	(18.8)	52	(20.4)	28	(11.0)
Population Buskerud County		(14.9)		(14.8)		(17.6)		(17.2)		(14.8)		(11.8)		(6.0)		

The patients were admitted from a regular dwelling (90 %), from another hospital department (5 %) or from another hospital. Patients admitted from nursing homes or other municipal institutions were counted in the group admitted from regular dwelling.

Altogether 93 % of the patients were admitted for emergency treatment, while the rest (7 %) were elective admissions. Most patients (76 %) were admitted from the primary health services – 26 % by referral from a GP and 31 % from municipal casualty clinics/outpatient clinics.

**Table 2**

Referring doctor for admissions to the medical department of Drammen Hospital over a week in 2014

Referring doctor	Number
General practitioner	67
Casualty clinic/out-of-hours services	79
Direct admission	47
Outpatient clinic and open return	45
Other institution	16
Not stated	1
Total	255

## Progression

The vast majority of the admitted patients (82 %) were placed in an inpatient ward, while the others were examined and reception before discharge. The average time spent on examination and treatment in the emergency reception was two hours.

The hospitalisation time for those who were admitted was 3.7 days, approximately the same as for those who came direct to the emergency department (3.5 days). With the exception of two patients, these arrived by ambulance.

## Diagnoses

The main diagnoses at admission and discharge are described in Table 3. The most common diagnostic groups upon admission were cardiovascular disease, 101 cases (40 %), pulmonary disorders, 28 cases (11 %) and infections, 22 cases (9 %).

**Table 3**

Diagnoses in patients admitted to the medical department at Drammen Hospital over one week in 2014

Diagnoses	Upon admission	
	Number	(%)
Chest pain	42	(16.5)
Cardiac arrhythmia	25	(9.8)
Angina pectoris, including unstable angina	15	(5.9)
Acute myocardial infarction	7	(2.7)
Cardiac failure, hypertension	7	(2.7)
Syncope/loss of consciousness	5	(2.0)
Cardiac valve failure, endocarditis, pericarditis	0	(0.0)
Total cardiovascular disorders	101	(39.6)
Pneumonia, all forms	12	(4.7)
Shortness of breath	8	(3.1)
Chronic obstructive pulmonary disease, including asthma	5	(2.0)
Pulmonary embolism	3	(1.2)
Total pulmonary disorders	28	(11.0)
Infections – erysipelas, sepsis, gastroenteritis, meningitis	19	(7.5)
Fever, unspecific infection	3	(1.2)
Total infections, excl. cardiovascular, pulmonary and renal disorders	22	(8.6)
Poisoning	12	(4.7)
Renal disorder	7	(2.7)
Diabetes mellitus	2	(0.8)
Total nephrological disorders/diabetes	21	(8.2)
Anaemia, haemorrhage, including gastrointestinal haemorrhage	14	(5.5)
Abdominal pain	2	(0.8)
Total gastroenterological disorders	16	(6.3)
Deep-vein thrombosis, phlebitis	13	(5.1)
Poor general condition, dizziness, somnolence, confusion, weight loss	13	(5.1)
Cancer, examination or exacerbation	7	(2.7)
Cerebrovascular disease	1	(0.4)
Other	24	(9.4)
Total various diagnoses	58	(22.7)
Diagnosis not stated	9	(3.5)

Diagnoses	Upon admission	
	Number	(%)
Total	255	(100)

### Assessment of alternatives

Of the 255 patients, 146 were admitted by a primary doctor, and 135 referral notes were available. Based on these, alterr registered in 18 patients, i.e. somewhat more than 13 % (Table 4). For two of every three patients (n = 12), a bed in a mu institution was the most relevant alternative.

**Table 4**

Alternatives to admission in patients admitted to the medical department of Drammen Hospital over one week in 2014

Admission or alternative	Number
To be admitted	116
Total alternatives	18
Not defined	1
<b>Total</b>	<b>135</b>
<b>Distribution of alternatives</b>	
Municipal intermediate care/nursing home, observation ward	12
Appointment with GP/outpatient clinic within 3 days	3
Discharge to home, with supervision or temporary admission as needed	2
Conference between primary doctor and hospital doctor	1
<b>Total</b>	<b>18</b>

The doctors who retrospectively reviewed the outcome of the hospitalisation period agreed that an alternative to admiss appropriate or better for nine of the 18 patients. As regards the other nine, the admission was deemed necessary. In tota was found for 7 % of those who had been admitted by a primary doctor.

### Triage

Altogether 106 patients had both a referral note that was reviewed by the medical council and had been triaged. Among 18 patients for whom relevant alternatives to admission had been identified.

Table 5 shows the alternatives to admission by degree of seriousness. The distribution proved to be random as well as u to the nine patients for whom we found that alternatives were available upon admission as well as after a review of the h

**Table 5**

Comparison of triage and alternative in patients admitted to the medical department of Drammen Hospital over one week in 2014. MEWS: Modified Early Warning Scale

Comparison triage and alternative	MTS			MEWS		
	Urgency groups	Total	Admitted	Alternative	Total	Admitted
		number	Number	(%)	Number	(%)
	Immediately, 0 min., code red	0	0		0	4 (100.0)
	Very urgent, 10 min., code orange	43	41 (95.3)	2 (4.7)	16	14 (87.5)
	Urgent, 60 min., code yellow	41	33 (80.5)	8 (19.5)	18	17 (94.4)
	Can wait, 120 min., code green	17	15 (88.2)	2 (11.8)	35	29 (82.9)
	Not urgent, 240 min., code blue	3	2 (66.7)	1 (33.3)	32	28 (87.5)
	Not stated	2	2	0	1	1
	<b>Total</b>	<b>106</b>	<b>93</b>	<b>13</b>	<b>106</b>	<b>93</b>

A correlation analysis showed a low and non-significant correlation between alternatives to admission and the two triag Pearson's r = 0.024 (p = 0.81), and for the MTS tool, the correlation was r = 0.122 (p = 0.22).

## Discussion

We found that 57 % of the 255 admissions to the medical department had been made by primary doctors, distributed among GPs and casualty clinics. Previous studies have shown a significantly smaller proportion of admissions from GPs. In a study at St. Olavs Hospital in week 23, summer 2003, Eikeland and collaborators found that only 12 % of the emergency admissions to the medical and gynaecological departments had been made by a GP (5).

Our study was conducted during a regular working week and only included admissions to the medical department. As far as we have yet investigated whether the proportion of admissions made by GPs has increased since the introduction of the Receptio.

Altogether 82 % of the patients were admitted to an inpatient ward; the others were assessed and treated in the reception day. In general, a complete assessment and treatment in the reception, with no use of an inpatient ward, may be an alternative for many patients. Often, the patient is admitted because the primary doctor is concerned that an acute exacerbation may occur. Patients only need a clear diagnosis, a so-called diagnostic loop, and can be further followed up as outpatients or by the primary doctor. However, establishing a full diagnosis in the emergency reception requires a high rate of staffing with skilled personnel, and patients correctly and to avoid excessive treatment time and general congestion in the emergency reception.

There is currently a debate unfolding over the organisation of the emergency receptions, widely recognising that increased safety as well as more effective patient pathways (18–20). In our study, for example, we observed that some patients who had completed their treatment in the reception according to an algorithm that has later become better defined. This has gone on among the primary doctors in the hospital's catchment area. It is assumed that similar algorithms, for example pertaining to triage, can achieve more effective and safe patient pathways in the emergency reception.

Average hospitalisation time was 3.7 days. The corresponding figure for the entire year was 4.0 days (Einar Husebye, personal communication). Hospitalisation times tend to be shorter in Norway than in other European countries; according to an OECD report from 2010, the average for all hospitalisations in Norway was 3.7 days and 6.9 days in Europe as a whole (21). In general, hospitalisations are tending to decrease, as well as in virtually all other countries. This is primarily due to medical developments and pressure on beds and available resources. Furthermore, primary health services are now required to receive patients who are ready for discharge.

The diagnoses at admission corresponded relatively well with those at discharge in our study; this concurs with two large studies undertaken in Norway (22, 23).

A little more than 20 % of the patients were admitted with a symptomatic diagnosis, while this figure had been approximately 10 % in our review of the referral notes.

In our review of the referral notes we found possible alternatives to hospitalisation for a little more than 13 % of the patients. An alternative to hospitalisation was found to be appropriate for only one-half of those for whom this was relevant upon admission. If an estimate of alternatives to admission, a correct identification of these patients would nevertheless help relieve the department. The assessments made upon admission and those made retrospectively after the hospitalisation period shows the degree of success in identifying these patients in advance. This has also been the conclusion in other studies that have investigated opportunities to reduce unnecessary admissions (5, 9).

In many studies, the necessity of admission has been assessed post hoc, in light of the results of the examination and treatment. In our study, we have analysed the information available in advance as well as post hoc. We believe that the criteria for admission, it is essential to use the medical assessment made prospectively as a basis, and then retrospective of the admissions is safe and medically sound.

We found little correspondence between the assessment of degrees of seriousness made in the reception immediately after admission and alternatives to it. This shows that triage tools are unsuitable for this type of sorting. Traditional triage tools are primarily based on urgency at the pre-hospital stage and in emergency receptions, yet it is still surprising to see such a weak correlation between assessment and alternatives to admission.

It seems evident that primary doctors who need to consider referral cannot use tools that have low sensitivity. For example, if a primary doctor assesses 300 patients with acute conditions and 50 of these have a real need of hospitalisation, even a sensitivity of 100 % of patients would not be granted the admission they need. To keep this number as low as possible, the primary doctors will only refer patients for whom the further progression cannot be foreseen with any certainty. It is reasonable to assume that many hospital doctors feel that the primary doctors refer patients unnecessarily. If we use the same figures and assume that the decisions have a specificity of 90 %, the corresponding figure will be 70 admissions, whereof 25 will be unnecessary.

On the other hand, liberal referring practices on the part of the primary doctors will necessarily increase the burden on the hospital. An accumulation of patients, for example in the emergency reception, may give rise to an increased risk of medical error and delay.

We conclude that a minor proportion of the patients who are currently hospitalised (6–7 %) would have benefitted equally from alternatives. However, these patients are difficult to identify at the time of admission. Since the number of admissions is steadily increasing, it is important to establish better routines and methods to identify those patients who ought to be hospitalised and those who can be treated as outpatients.

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