Every seventh acute medical admission is preventable

Henrik Koldborg Jepsen[1], Carsten Hendriksen[2], Henrik Nielsen[3], Birgitte Nybo[4] & Hans Perrild[1]

ABSTRACT

INTRODUCTION: The majority of patients who are admitted to the departments of internal medicine are admitted acutely. The aim of this study was to evaluate the appropriateness of admissions to a community hospital in Copenhagen.

MATERIAL AND METHODS: During a three-week period, all patients admitted to Bispebjerg Hospital's acute medical department (AMA) were consecutively included and retrospectively evaluated by a physician using the Appropriateness Evaluation Protocol (AEP). Based on the AEP criteria, admissions were categorized as appropriate or inappropriate. Uncertain admissions were evaluated and classified by three chief consultant physicians.

RESULTS: A total of 470 patients were included, and 14% were classified as inappropriate. A total of 73 admissions failed to meet any AEP criteria, and 131 admissions only meet one AEP criterion. Prior to admission, 365 patients were examined by the admitting doctor, and of patients not examined before admission, 17 were classified as inappropriate. A total of 30% of all patients admitted were discharged directly from the AMA within 24-48 hours, and 42 of those were inappropriately admitted.

CONCLUSION: Our study shows that 14% of acute admissions could have been prevented. We found no evidence that preadmitting examination is important to prevent inappropriate admission. Several admissions could have been handled appropriately by a diagnostic unit or through subacute referral to an outpatient clinic the following day. The AEP is a useful screening instrument, but insufficient for the evaluation of the handling of acute medical patients.

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More than 90% of the patients admitted to departments of internal medicine are admitted acutely. It is a continuous discussion whether a proportion of those are admitted inappropriately.

A Danish survey from 2003 [1] used the validated and widely used generic instrument, Appropriateness Evaluation Protocol (AEP) [2-6], and concluded that 84.5% of acute admissions were appropriate and that 14.5 % were inappropriate and could have been handled without acute admission.

The number of beds in internal medicine departments has been reduced over the past decades, and the average number of admittance days has decreased.

The aim of this study was to evaluate the appropriateness of admission of a consecutive number of acutely admitted patients to an acute medical ward in a community hospital in Copenhagen.

MATERIAL AND METHODS

Bispebjerg Hospital (BBH) is an acute intake community hospital in Copenhagen with a medical catchment area of approx. 280,000 citizens. The hospital has an open access emergency department with approximately 38,000 annual visits. The medical department at the BBH contains pulmonology, endocrinology, gastroenterology, cardiology, geriatrics and neurology. Acutely admitted medical patients are referred to an acute medical department (AMA), except for patients with cardiological or neurological emergencies who are admitted directly to specialized units.

Study population

During the three-week period from the 20th of September to the 11th of October 2010, all patients admitted to

Treatment of a medical patient.

ORIGINAL ARTICLE

1) Department of Endocrinology and Gastroenterolog, Bispebjerg Hospital
2) Department of Integrated Health Care, Bispebjerg Hospital
3) Department of Cardiology, Bispebjerg Hospital
4) Department of Pulmonology, Bispebjerg Hospital

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the AMA were consecutively included and analysed in order to evaluate the appropriateness of their admission. Patients with acute cardiovascular or neurological disease were not included in the study.

Reviewer instruments

Data collection

Upon arrival at the AMA, the patient's data were recorded. This included sex, age, referral diagnosis and route of admittance. The patient's time of arrival at the AMA was also recorded, as well as the time at which the patient was initially seen by a nurse. The patients were asked how much home care they were receiving. Information was collected systematically in a questionnaire. If the questionnaire was incomplete, the missing information was collected by a project employee (HKJ) in order to ensure that all the information was available before discharge.

Appropriate Evaluation Protocol

To evaluate the appropriateness of each admission, a translated and evaluated Danish version of the AEP was used [1, 7]. Data were collected on a daily basis and evaluated to classify the appropriateness of the admissions from the time of admission and the next 24 hours. HKJ reviewed all the patients' records to complete the AEP. Missing information was gathered when available. Unavailable information was marked as missing. The AEP evaluates only the first 24 hours of admission, but all patients were followed until discharge or death to evaluate the course of the hospital stay.

Methods of classification

Initially, it was evaluated whether one or more AEP criteria were met. It was known from other studies that the use of AEP criteria was helpful in assessing appropriateness, but there was a need for a more specific clinical assessment of some patient cases.

All admissions classified as inappropriate by the AEP or found to be reclassified by HKJ after the AEP evaluation were audited by three of the authors (HN, BN and HP, chief concultant physicians and specialists in internal medicine – cardiology, pulmonology and endocrinology, respectively). The records from 150 patients were therefore audited and a decision was made on whether the admission was appropriate or inappropriate.

The patient admissions were finally divided into four categories: A (AEP criteria but inappropriate), B (AEP criteria and appropriate), C (no AEP criteria and inappropriate) and D (no AEP criteria but appropriate).

Pilot study

From the 9th to the 11th of September, a pilot survey was conducted. The purpose of this study was to train all involved personnel and expose any logistics issues. During the pilot study, we consecutively included and evaluated 56 admissions (not included in the study), and HKJ was trained in the use of AEP. Only small (logistic) adjustments concerning the application procedures and the text of the questionnaire were made.

TABLE 1

Summary of haracteristics collected from 470 consecutive patients. Median age: 71 years (range: 16-102 years).

	n	%
Gender		
Female	270	57.4
Male	200	42.6
Admitted by		
General practitioner	144	30.6
Emergency service doctors	149	31.7
Doctors from casualty department	137	29.2
Other doctors	37	7.9
Seen by doctor before admission	365	77.7
Permanent residence		
Nursing home (or similar)	63	13.4
Day of the week of admission		
Week day	328	69.8
Weekend (Friday 15:00-Monday 07:30)	142	30.2
Time of arrival to the AMA		
00:00-08:00	73	15.5
08:00-16:00	202	43.0
16:00-00:00	195	41.5

AMA = acute medical department.

Quality assurance

A random selection of patient records (n = 10) was evaluated by one of the authors (CH) who did not participate in the weekly meetings. No disagreement was found between audits.

Data analyses

All data were transferred to an Excel spreadsheet for analysis.

Trial registration: not relevant.

RESULTS

During the three-week period, a total of 470 patients were admitted to the AMA (an average of 22 admissions per day). Patient baseline data are presented in **Table 1**.

The number of patients in the AEP groups are shown in **Table 2**.

A total of 73 admissions had 0 AEP, 131 had 1 AEP, 125 had 2 AEP, 71 had 3 AEP, 39 had 4 AEP, 16 had 5 AEP, seven had 6 AEP, five had 7 AEP and three had 8 AEP.

In all, 200 patients had intravenous fluid replace-

TABLE 2

Appropriateness Evaluation Protocol (AEP). Data from 470 consecutive admissions.

AEP criteria		n	%
A	*Surgery or other procedures in 24 h, requiring* a) General/regional anaesthesia and/or b) Equipment or other facilities only for in-patients	34	7.2
B	Vital signs monotoring at least every two hours	85	18.1
C	Intravenous medications	221	47.0
D	Intravenous fluid replacements	200	42.6
E	Observation for toxic reaction to medication	28	6.0
F	Continuous or intermittent (at least every 8 h) respiratory assistance	154	32.7
G	*Severe electrolyte or blood gas abormality – any one of the four following sets* Na^+ < 123 mmol/l or > 156 mmol/l K^+ < 2.5 mmol/l or > 6 mmol/l HCO^{3-} < 20 mmol/l or > 36 mmol/l Arterial pH < 7.3 or > 7.45	72	15.3
H	Acute loss of sight or hearing (within 48 h of admission)	0	0
I	Acute loss of ability to move any body part (within 48 h of admission)	2	0.4
J	Persistent fever > 38.0 °C, for more than 5 days	3	0.6
K	Active bleeding	1	0.2
L	Wound dehiscence or evisceration	1	0.2
M	Pulse rate < 50/min. or >140/min. per min.	11	2.3
N	*Blood pressure* Systolic < 90 mmHg or > 200 mmHg and/or Diastolic < 60 mmHg or > 120 mmHg	84	17.9
O	Sudden onset of unconsciousness (coma or unresponsiveness)	29	6.2
P	ECG evidence of acute ischaemia, must be suspicion of new myocardial infarction	6	1.3

ECG = electrocardiogramme.

TABLE 3

Overview: appropriate and inappropriate admissions. The values are n (%).

AEP criteria	Inappropriate	Appropriate	Total
≥ 1	A 28 (6)	B 369 (78)	397 (84)
0	C 37 (8)	D 36 (8)	73 (16)
Total	65 (14)	405 (86)	470 (100)

AEP = Appropriateness Evaluation Protocol.

TABLE 4

Inappropriate admissions.

	n	%
Admitted by		
General practitioner	25	38
Emergency service doctors	27	42
Doctors from casualty department	11	17
Other doctors	2	3
Total inappropriate admissions	65	100
Permanent residence		
Nursing home (or similar)	10	15
Day of the week of admission		
Week day	49	75
Weekend (Friday 15:00-Monday 07:30)	16	25
Time of arrival to the AMA		
00:00-08:00	10	15
08:00-16:00	27	42
16:00-00:00	28	43

AMA = acute medical department.

ment as AEP, but only 59 had intravenous fluid as the sole AEP. Among these, only ten were found to be inappropriate. Ten of the 59 patients were admitted from a nursing home. Only five of these admissions were categorized as inappropriate.

We found that 405 (86%) of all admissions were appropriate and that 65 (14%) were inappropriate (**Table 3**).

Admitting doctors examined 365 (77.7%) of the patients prior to admission. In six cases, we had insufficient information regarding this matter. Thus, 99 (21.1%) of the patients were not seen by the admitting doctor before hospitalization, yet only 17 of these were classified as inappropriate. Ten out of the 65 inappropriate admissions were admitted from a nursing home or similar, six of these patients had not been seen by a doctor.

Patients admitted by a general practitioner (GP) had been seen by admitting doctors in 61.1% of the cases, and 73.2% of the patients admitted by emergency service doctors in the primary sector had been seen by the doctor before hospitalization.

The BBH Casualty Department produced 17% of the inappropriate admissions, while GPs and doctors from emergency services accounted for 38% and 41%, respectively (**Table 4**).

A total of 143 (30%) patients were discharged directly from the AMA within 24-48 hours. Two patients died during their stay at the AMA. The remaining 325 patients were referred to other hospital departments from where they were later discharged or died. During hospitalization, 21 (4.7%) patients died. Among the patients directly discharged from the AMA, 42 (29%) patients were categorized as inappropriately admitted.

DISCUSSION

We conducted this study assuming that the patients admitted acutely to our acute medical ward were those with an acute need for treatment and/or evaluation. Our evaluation was based on information obtained after arrival to the hospital. The admitting doctor's perspective was not included in the evaluation.

We found that inappropriate admissions accounted for 14% of all admissions to the AMA. Given the catchment area and population, we believe that this rate is

concordant with that of many other departments of internal medicine and in accordance with a previous Danish study [1].

No AEP criteria were found in 73 out of 470 admissions. A total of 36 of these cases were reclassified as appropriate. One or more AEP criteria were found in 397 admissions. Twenty-eight of these were reclassified as inappropriate by clinical evaluation, yielding a total of 65 inappropriate admissions.

Previous studies have also concluded that a second review of patients' data is necessary, as AEP criteria alone cannot distinguish between appropriate and inappropriate patient admissions in all cases [1, 5]. In this study, a second review reclassified 64 (13.6%) of the admissions.

In patient admissions where no AEP criteria were identified, but which were subsequently reclassified as appropriate, several different diagnoses were found. These cases included vertigo, patients suspected of having pulmonary embolism and/or deep vein thrombosis and hyperglycaemia [1]. For all these patients, admission was justified by a need for urgent observation, treatment or examination.

Intravenous fluid treatment to nursing home patients is often mentioned as a cause of inappropriate admission. In the present study, intravenous fluid treatment was the only AEP criterion in 59 admissions. Ten of these were reclassified as inappropriate. Half of these (n = 5) were from nursing homes.

In admissions with only one AEP criterion, a number of patients were reclassified as inappropriate These were patients with one of the following AEP criteria: abnormal blood pressure (n = 5), need for intravenous medication (n = 7), need for respiratory assistance (n = 3), severe electrolyte or blood gas abnormality (n = 3), persistent fever > 38°C (n = 1) or abnormal pulse rate (n = 1). The subsequent patient path analyses of these patients showed that the admission was inappropriate.

We looked at the referral diagnosis of the 65 patients classified as inappropriate admissions, both with and without AEP. The referring doctors' provisional diagnosis was either dehydration, dyspnoea, pneumonia, confusion, abdominal pain, fever, back pain, hypertension, International Normalized Ratio (INR) > 7, deep venous thrombosis or vertigo. These diagnoses are all a just cause for acute referral. However, we reclassified these as inappropriate because we realized that the subsequent patient path after an appropriate re-evaluation or initial treatment was extremely short since admission of the patients was not necessary.

In 22 of the 65 admissions classified or reclassified as inappropriate, a sub-acute referral to an outpatient clinic (any of a range of medical specialities) the next day would have been appropriate, and some could perhaps have been handled by the GP. We therefore suggest that most of these 65 inappropriate admissions are renamed as preventable admissions.

We recommend that acute medical departments create a diagnostic unit with easy access to X-ray and blood samples that can handle patients acutely without subsequent hospitalisation. As the mean age of patients referred acutely to medical departments is relatively high, we further suggest the introduction of a patient path coordinated with primary care staff.

The goal of the above measures is to avoid inappropriate admissions. In our study population, we found no indication that this goal was achieved by the referring doctor's preadmission patient examination.

In conclusion, our study has shown that a minimum of 14% of the admissions to an acute medical ward with subsequent hospitalisation are preventable. We found no indication that examination by the referring doctor was of crucial importance. In our setting, we found that admissions classified according to internationally accepted AEP as inappropriate were justified, but could have been handled otherwise either as subacute referral to an out patient clinic or by a short pathway with diagnosis and treatment initiation without admission.

AEP criteria alone are not sufficient to describe the complex handling within acute medicine [5]. New tools are needed. We hope that our study as well as other studies may help form the basis for such new working tools.

CORRESPONDENCE: *Henrik Koldborg Jepsen*, Endokrinologisk Gastroenterologisk Afdeling, Bispebjerg Hospital, Bispebjerg Bakke 23, 2400 Copenhagen NV, Denmark. E-mail: hksnit@gmail.com

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