ORIGINAL ARTICLE

Effectiveness and safety of an emergency department short-stay unit as an alternative to standard inpatient hospitalisation

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Background: Emergency department short-stay units (EDSSUs) are currently emerging worldwide as an alternative to standard inpatient hospitalisation. In our hospital, a 960-bed teaching tertiary institution in Barcelona, Spain, an EDSSU has been in operation during winter periods (November–March) since 1997.

Aim: To determine the efficacy and safety of our EDSSU.

Methods: Retrospective analysis of activity and quality outcomes, assessment of patient satisfaction levels and determination of the diagnostic-related groups that were mainly responsible for admissions to the EDSSU, comparing the clinical characteristics of those patients with the characteristics of patients with similar clinical diagnoses admitted to standard hospitalisation units.

Results: 5666 patients were treated in the EDSSU, with a progressive increase in the number of patients admitted per period, ranging from 707 in 1997–8 to 1227 in 2003–4 (73.5% increase). The mean length of stay ranged from 3.1 to 2.8 days, mortality from 2.5% to 5.1%, home discharge rate from 84% to 90%, and hospital readmission rate within the first week after discharge from 3.9% to 6.2%. In all, 98% of patients were satisfied with their stay at the EDSSU. The main diagnostic-related groups were chronic obstructive pulmonary disease (COPD = 50%) and acute heart failure (28%). Patients with COPD admitted at the EDSSU (n = 545) showed significantly (p = 0.05) lower mean length of stay (3.4 v 12 days) and mortality (1.7% v 8.1%), but a higher hospital readmission rate (9.9% v 7%) than those admitted to standard inpatient units (n = 1961).

Conclusions: In our experience, the EDSSU proved to be an effective and safe alternative to standard inpatient hospitalisation.

In recent years, the increased demand for urgent attention in most hospitals worldwide has meant that a high percentage of the total number of inpatients originates from emergency department wards. In some hospitals, this percentage is >50%.¹ Thus, the effect of this high number of emergency admissions on the overall operation of the hospital can be seen in the decrease in the number of hospital beds available for scheduled surgical activity, which in turn makes shortening waiting lists more difficult.^{2–5}

These facts have made the redesign of resources for emergency care a priority target for hospital management administrators.^{6–7} Such changes should necessarily include improving and adapting clinical work to the hourly, daily and seasonal fluctuations of the emergency demand.^{8–12}

In 1997, as part of a programme of interventions to improve the emergency department of the Bellvitge University Hospital (Barcelona, Spain),^{13–15} a 24-bed short-stay unit for urgent patients was opened during winter periods. The emergency department short-stay unit (EDSSU) was essentially created to provide an alternative to conventional medical hospitalisation for patients with urgent pathologies.

Although several studies of the EDSSU experience have been published the medical literature,^{16–22} reports assessing the results of such experiences in terms of effectiveness, safety and degree of patient satisfaction are still few. We therefore decided to undertake the present study, 6 years after our EDSSU was set up.

PATIENTS AND METHODS

Setting

The Bellvitge University Hospital is a 960-bed tertiary-care teaching institution located in the metropolitan area of

Barcelona, Spain. It provides medical care to a population of 1.5 million people in all specialties except paediatrics, obstetrics and burns. The emergency department annually treats about 120 000 patients, with a daily average of 330 visits. Approximately 10% of the overall number of patients visiting the emergency department is admitted to the hospital. About 50% (29 000/year) of total inpatient admissions originate from the emergency wards.

EDSSU: structural and operational functioning

The EDSSU has 24 beds in individual rooms and is physically separated from the other hospital units. Administratively, the unit depends on the emergency department. An attending doctor is assigned to the EDSSU 24 h/day, with three shifts on weekdays (first shift, 8:00–16:00 h; second shift, 12:00–20:00 h; third shift 20:00–8:00 h) and a 24-h shift on Saturdays and Sundays. The EDSSU also has two consulting specialists from the respiratory and cardiology services assigned specifically to the unit. A recruitment for rapid clinical stabilisation of patients with seasonal acute exacerbation of chronic cardiac or respiratory pathologies, or other slightly to moderately serious entities expected to be resolved in a short period of time, was established as the main criterion for admission to the EDSSU. Admission criteria consisted of patients previously admitted to the general emergency room who once seen by the emergency attending doctor present all the following characteristics: home discharge prediction of >12 h but <72 h; urgent tests required for diagnosis already made in the emergency

Abbreviations: COPD, chronic obstructive pulmonary disease; DRG, diagnostic-related group; EDSSU, emergency department short-stay unit

department; confirmed clear medical diagnosis in the emergency department before entering the EDSSU; main reason for being admitted to the EDSSU being control of response to the therapeutics given; haemodynamic stabilisation; no surgical conditions; no social problems; and no isolation requirements. All these characteristics were decided in collaboration with the medical unit. For other possible diagnostic or therapeutic care requirements different from the main criteria established for admission, patients admitted to the EDSSU are transferred to standard hospital wards, outpatient clinics or the home-care hospital unit. The EDSSU can only be used for the above-mentioned criteria, which are strictly followed by staff. The EDSSU has been operative every year during November–March from 1997 to 2004, except for the period November 2000–March 2001 when it was closed for rebuilding. As all EDSSU nurses and doctors are additional to normal hospital staff, there is a special budget for the unit.

Objectives

The objectives of this study were to: (1) analyse the main activity and quality outcomes of the EDSSU during the first 6 years of operation (November–March of 1997–8, 1998–9, 1999–2000, 2001–2, 2002–3 and 2003–4); (2) analyse the degree of satisfaction of patients treated in the EDSSU; and (3) select the diagnostic-related groups (DRGs) that were mainly responsible for admission to the EDSSU and to compare the clinical characteristics of those patients with the characteristics of patients with the same diagnosis who were admitted to traditional hospital units.

Study design

To achieve objective 1, a retrospective study reviewing the statistical data and clinical charts of patients was carried out. The following indicators were analysed: number of patients admitted, age, sex, main diagnosis that prompted admission, severity of underlying diseases, average length of EDSSU stay, percentage of home discharges, percentage of patients transferred to standard hospital units, mortality, rate of EDSSU bed occupancy, rate of monthly patient rotation per bed, rate of unscheduled revisits to the emergency department within 7 days of discharge from the EDSSU and rate of readmission to hospital within 7 days of discharge from the EDSSU. The severity of the underlying diseases was established according to the McCabe–Jackson classification,²² which includes three groups: group 1, chronic or benign diseases; group 2, malignant diseases or diseases with a life expectancy of <5 years; and group 3, diseases with a life expectancy of <1 year.

To achieve objective 2, a specific satisfaction questionnaire was given at discharge (or death) to patients (or their families) who had been admitted to the EDSSU, during the third November–March period included in the study. The satisfaction survey consisted of 25 self-scored questions that either required a “yes or no” answer or had a multiple-choice format with the following choices: very good, good, acceptable, poor. The stay in the EDSSU, the healthcare received, the performance of the healthcare workers, the coordination of teams, the opening hours and the food service were assessed. We used the same patient satisfaction questionnaire that has been used previously in the hospital, so patients in the EDSSU responded to the same questions as those admitted to conventional wards.

To achieve objective 3, the main DRGs prompting admission to the EDSSU were established in accordance with the International Classification of Diseases—ninth revision.²³ The clinical characteristics of those DRGs mainly responsible for admission to the EDSSU during two November–March periods included in the study (1999–2000 and 2001–2) were

compared with those of patients with the same diagnosis who were admitted to standard hospital wards from January to December during the same years. The groups were compared in terms of age, sex, average length of hospital stay, mortality and rate of readmission to the hospital within 10 days of discharge.

Statistical analysis

Several parameters of descriptive statistics were used. The comparison of proportions was carried out using the χ^2 test for the categorical variables and Student's *t* test for the quantitative variables. All variables having a two-tailed *p* value of ≤ 0.05 were considered significant. The SPSS/PC package was used to process the data.

RESULTS

Since 1997, a total of 5666 patients were treated in the EDSSU during the six November–March periods during which the unit has been operative. Analysis of the activity and quality indicators showed a progressive increase in the overall number of patients admitted in each period: 707 in 1997–8, 811 in 1998–9, 948 in 1999–2000, 975 in 2001–2, 998 in 2002–3 and 1227 in 2003–4. These admissions represented 14–17% of the total number of patients requiring admission to hospital from the emergency department during winter periods. Distribution by sex and age was stable throughout the six periods; the percentage of female patients was 55–57%, and 72–75% of patients were >65 years old, with a mean (standard deviation) age of 71 (15) years. In addition, the overall percentage of patients who had underlying diseases belonging to groups 2 and 3 of the McCabe–Jackson classification remained stable over the six periods, ranging between 27% and 30%.

Table 1 summarises the remaining comparative indicators in terms of the relative increase in activity, main diagnosis for admission, average length of stay, index of occupancy, index of rotation, percentage of home discharges, percentage of patients transferred to standard hospital units, mortality and rate of readmission. The occupation index is calculated as the mean percentage of occupied beds over the total (24 beds of the EDSSU) at 00:00 h—that is, the rate of bed occupancy in the EDSSU. The rotation index is calculated as the mean number of patients admitted monthly per bed—that is, the rate of monthly patient rotation per bed.

Table 2 shows the main clinical diagnoses prompting admission to the EDSSU by order of frequency.

In reference to objective 2 (patient satisfaction), during the EDSSU's third period of operation (November 1999–March 2000), the total of 948 admissions corresponded to 854 patients (87 patients were admitted to the EDSSU for twice or more during the same period). Of the 854 patients, 283 (33%) filled out the self-scored satisfaction survey given to them or their families on discharge or death. This response rate was more than double that usually found in a similar survey given to inpatients in the hospital wards (14%). The patients' assessment of their stay in the EDSSU, the treatment and professional ability of the healthcare staff, the coordination of the teams and the scheduling of consultations was considered “very good” or “good” in 98% of cases. The parameters that received the lowest evaluation were those referring to food services and the noise level of the EDSSU at night, which 44% of the patients judged to be “acceptable” or “poor”. According to the survey, 76% of patients considered that their health problem had been solved and 87% responded that they would like to be readmitted to the unit if their condition worsened.

Of a total of 2506 patients with acute exacerbation of COPD as the main diagnosis prompting admission to our hospital in the period between November 1996 and March

Table 1 Main activity and quality indicators of the emergency department short-stay unit during 1997–2004

	1997–8	1998–9	1999–2000	2001–2	2002–3	2003–4
Patients admitted (n)	707	811	948	975	998	1227
Relative increase of activity (%)	—	12.8	14.4	3	2.3	23
Mean (SD) length of stay (days)	3.08 (1.4)	3.69 (1.6)	4.01 (1.8)	3.96 (1.8)	2.94 (1.2)	2.73 (1.0)
COPD as a major diagnosis (%)	53	49	47	48	45	51
Home discharge (%)	89	88	84	90	87	85
Transfer to hospital units (%)	8.5	8.5	9	6	7	6
Global mortality (%)	2.5	3.1	2.8	4	7	5
Occupation index* (%)	60.1	82.8	78.4	79.6	76.2	88.0
Rotation index†	5.9	6.8	7.9	8.1	8.3	9.7
Hospital readmission <7 days of discharge (%)	3.9	4.8	4.4	3.1	5.0	6.2
Unscheduled return to ED <7 days (%) (no admission required)	2.9	3.2	3.3	2.9	5.0	4.8

ED, emergency department; COPD, chronic obstructive pulmonary disease.

*Mean percentage of occupied beds over the total (24 beds) at 00:00 h; †mean monthly number of patients admitted per bed.

1999, 1961 were admitted to standard inpatient units (respiratory medicine or internal medicine services) and 545 to the EDSSU. Table 3 compares both groups.

Limitations

Although the groups were similar in terms of sex, presence of chronic cor pulmonale and seriousness of related underlying diseases, the group of patients chosen by the doctors for admission in the emergency department to the EDSSU had significantly less serious clinical parameters in terms of age, treatment undergone for chronic disease with long-term oxygen treatment at home and partial pressure of oxygen measurements at the time of admission. These results were probably responsible for the fact that patients admitted to the EDSSU had significantly lower average stays and mortality than those who were admitted to standard inpatient units. However, the rate of readmission to the hospital within 10 days of discharge was significantly higher in the EDSSU (9.9% v 7%). We think that the higher readmission rates of patients with COPD to the EDSSU than to the normal hospital wards does not mean they should not be eligible for admission to the EDSSU. Furthermore, we advocate that future prospective studies are needed to evaluate those clinical factors predictive of short stay at the time of presentation to the emergency department.

When data from 1996, the year before the opening of the EDSSU, are compared with those from the 3 years of the EDSSU's operation (1997–2000), the results show that

the admission of patients with “less serious” acute COPD to the EDSSU did not cause a statistically significant ($p=0.05$) change in the average length of stay of other patients who, with the same main diagnosis, were admitted to standard hospital units: 1996, 11.9 days; 1997, 12.3 days; 1998, 13.0 days; 1999, 11.7 days; and 2000, 12.7 days.

DISCUSSION

The results showed that after six winter periods of operation, the EDSSU was able to offer a classic resource, the hospital bed, for a short period of time to a selected group of patients with a well-defined criterion for admission. In our experience, the unit has proved to be effective, safe and satisfactory for patients.

We believe there are several keys to the success of the EDSSU. Firstly, the fact that it was located in a building separate from the standard hospital area ensured that administratively the unit's beds were assigned only to the appropriate patients. Secondly, the fact that the emergency department and the administrative staff were together responsible for the clinical management of the EDSSU ensured that the unit responded to the actual needs of the hospital. Thirdly, strictly defining the criteria for admission allowed the emergency department doctors to select those patients who had a predicted short length of stay and high probability of home discharge at the time of their presentation to the emergency department.

Finally, guaranteeing continuous care 24 h/day by means of an operational model based on work shifts as opposed to the traditional model seen in the in-hospital wards of doctors-on-duty for 24 h, meant that each patient was routinely seen three times a day (once per shift). In addition, the period for admission or discharge was extended to throughout the day, in contrast with in-hospital wards where the admission or discharge is restricted to the morning. This resulted in substantial rotation of patients and allowed us to constantly have beds available for admissions (percentage of bed occupancy was about 80%). This active dynamic of admissions and discharges, in which the night shift had an important role, might have had negative effects on the patients' assessment of comfort and specifically on the noise levels during the night. This point should be taken into account and improvements made in the future.

The largest diagnostic group was that with “acute exacerbation of COPD”. Although it is well known that the use of healthcare resources by patients with exacerbation of chronic diseases is quite substantial,^{24, 25} the American Thoracic Society²⁶ in 1995 recognised the lack of consensus in setting the optimal duration of hospitalisation for patients with COPD in terms of achieving maximum efficiency. Given that published studies on factors predictive of short stay in patients with chronic limitation of airway flow presenting to

Table 2 Global distribution of the most frequent diagnosis-related groups in the emergency department short-stay unit

DRGs	Total* n = 5666 (%)
COPD and associated diseases	2821 (49.8)
Acute heart failure and associated diseases	1575 (27.8)
Pneumonia and other respiratory tract infections	243 (4.3)
Diabetes mellitus and other endocrine diseases	147 (2.6)
Pharmacological overdose	147 (2.6)
Acute anaemia	96 (1.7)
Acute enteritis	62 (1.1)
Acute nephritis and other urinary tract infections	56 (1)
Terminal cancer	56 (1)
Transitory stroke episode	28 (0.5)
Others†	430 (7.6)

COPD, chronic obstructive pulmonary disease; DRGs, diagnosis-related groups.

*No significant differences were observed when comparing proportions of the different DRGs over the period of the study.

†Include soft tissue infections and other skin disorders, seizures, persistent renal colic, slight cranial trauma, persistent headache and other complaints.

Table 3 Comparison of the clinical characteristics of exacerbated patients with chronic obstructive pulmonary disease admitted to conventional hospital units with those admitted to the emergency department short-stay unit

	HU (n = 1961)	EDSSU (n = 545)	p Value
Male (%)	63	62	NS*
Mean (SD) age (years)	69.5 (15)	63.7 (15)	<0.05
McCabe-Jackson (groups 2, 3) ²² (%)	29	27	NS
Long-term oxygen treatment (%)	13.4	8.8	<0.01
pO ₂ <60 mm Hg at the ED (%)	59.6	48.3	<0.01
Mean (SD) length of stay (days)	12 (3.1)	3.4 (1.9)	<0.05
Mortality (%)	8.1	1.7	<0.05
Hospital readmission rate (within 10 days from discharge) (%)	7	9.9	<0.05

ED, emergency department; EDSSU, emergency department short-stay unit; HU, hospital unit; NS, not significant; pO₂, partial pressure of oxygen.

the emergency department with shortness of breath are limited mainly to the paediatric population with asthma or to only a small number of adults with acute COPD,^{27, 28} we analysed the clinical characteristics of our patients with COPD in whom a short stay could be suggested or predicted.

Although the comparative analysis carried out was limited because it was retrospective in nature, it did include a large number of patients, none of whom had received any other special treatment and for whom admission either to a conventional hospital ward or to the EDSSU was decided exclusively on a clinical basis by a large number of doctors treating patients in the emergency department during the period of the study. Importantly, patients admitted to the EDSSU were managed with a shorter mean length of stay than those who were admitted to standard inpatient units, although they subsequently had an increased probability of revisiting the emergency department within 10 days after discharge. In our cohort of patients with COPD admitted to the EDSSU with acute exacerbation, almost half of them presented with respiratory failure, a parameter that is not likely to be a good predictor of early discharge and most probably could have influenced the higher index of unplanned readmission rates observed. We favour and emphasise the use of appropriate admission criteria and a better adjusted decision-making process based on the clinical characteristics of patients with COPD when presenting to the emergency department, which will enable us to better select candidates for the EDSSU, which in turn will diminish the negative effect of the high readmission rates of patients with COPD.

The increase in the readmission rate seen in the unit over the 6 years that it has been opened (3.9–6.2%) is consistent with the increasing activity during the 6 years (from 707 to 1227 admitted patients—ie, a 73.5% increase) and also with the increased rotation index (from 5.9 to 9.7). We should therefore consider whether the activity of the unit should be increased any further and should seek an optimal balance between effectiveness and safety. Our goal should be to achieve effectiveness but not to compromise on safety. The hospital has not suffered from this increasing trend in readmission rate, but neither has it experienced such a remarkable increase in activity during this period compared with the EDSSU. In retrospect, to minimise unscheduled returns to the emergency department, further prospective studies should be undertaken to identify those clinical factors predictive of short stay that would help emergency department doctors when making decisions regarding admission to the EDSSU.

In our opinion, a first logical explanation for the shorter mean length of stay is that patients chosen for admission to the EDSSU presented to the emergency department with less severe clinical parameters. However, given that a high

percentage of patients admitted to the EDSSU presented with serious illness, we do not dismiss other factors that might have also significantly contributed to patient management—for example, strictly focusing on the rapid stabilisation of patients or providing care continuously 24 h a day. Furthermore, the selection of this group of “less serious” patients for admission to the EDSSU did not seem to have had a negative effect on the total average length of stay of the other patients admitted to standard hospital units.

CONCLUSION

In summary, these results provide evidence that EDSSUs can be an effective and safe alternative to standard inpatient hospitalisation for patients requiring urgent treatment, probably not just for certain seasons, but throughout the whole year.

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