

Heart failure and community-acquired pneumonia: cases for home hospital?

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Abstract

Background. Home hospital is advocated in many western countries in spite of limited evidence of its economic advantage over usual hospital care. Heart failure and community-acquired pneumonia are two medical conditions which are frequently targeted by home hospital programs. While recent trials were devoted to comparisons of safety and costs, the acceptance of home hospital for patients with these conditions remains poorly described.

Objective. To document the medical eligibility and final transfer decision to home hospital for patients hospitalized with a primary diagnosis of heart failure or community-acquired pneumonia.

Design. Longitudinal study of patients admitted to the medical ward of acute care hospitals, up to the final decision concerning their transfer.

Setting. Medical departments of one university hospital and two regional teaching Swiss hospitals.

Patients. All patients admitted over a 9 month period to the three settings with a primary diagnosis of heart failure ($n=301$) or pneumonia ($n=441$).

Measurements. Presence of permanent exclusion criteria on admission; final decision of (in)eligibility based on medical criteria; final decision regarding the transfer, taking into account the opinions of the family physician, the patient and informal caregivers.

Results. While 27.9% of heart failure and 37.6% of pneumonia patients were considered to be eligible from a medical point of view, the program acceptance by family physicians, patients and informal caregivers was low and a transfer to home hospital was ultimately chosen for just 3.8% of heart failure and 9.6% of pneumonia patients. There were no major differences between the three settings.

Conclusions. In the case of these two conditions, the potential economic advantage of home hospital over usual inpatient care is compromised by the low proportion of patients ultimately transferred.

Keywords: acceptance, community-acquired pneumonia, heart failure, home hospital

Home hospital schemes benefit from the health care cost crisis common to many western countries. They could represent an attractive alternative to inpatient stays, potentially avoiding some of the detrimental effects of hospitalization on health described for elderly patients [1]. But they are in fact frequently promoted primarily in the hope of achieving cost reductions, based on the assumption that care provided in the patient's own home will be cheaper than inpatient stays in acute care hospitals. While recent reports of carefully controlled evaluations have been reassuring as regards the outcome of care in home hospital programs [2–5], they differ in their

conclusions concerning the comparative costs of inpatient and home hospital care for similar groups of patients [6–8]. However controversial the issue of the economic advantage of home hospital over inpatient care may be, little saving can be expected from a program that reduces the length of acute care hospital stays if it only involves a small proportion of patients. Substantial savings will arise only if the home hospital is attractive enough to reduce the acute care hospital utilization to an extent where hospital beds, and preferably units, can be closed. Furthermore, if the home hospital diverts a high number of patients from usual hospital care then new in-

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patient beds will no longer be needed. Unfortunately, recent trials devoted to the evaluation of home hospital as an alternative to an acute care hospital stay are mute regarding their recruitment fraction or, at best, use as a denominator a set of selected patients who are neither precisely described nor related to the general population of hospital admissions from which they are issued [2–4,6,7].

The medical conditions treated in home hospital programs as an alternative to inpatient acute care mainly affect the elderly. Heart failure, community-acquired pneumonia and chronic obstructive airway disease have been identified as the most suitable conditions for real or hypothetical home hospital programs for elderly patients [9,10]. These are common, readily identifiable conditions with known severity criteria that facilitate the selection of patients who can be safely treated at home with back-up care [11–13]. A prospective evaluation of patients admitted for these conditions estimated that, from a medical point of view, one third could be treated in a home hospital program [10].

Since non-medical factors also affect the feasibility of a home hospital transfer, other studies have investigated the acceptance of home hospital programs and the preferences for inpatient or for home care. A majority of young pneumonia patients [14] and of elderly heart failure or pneumonia patients [15] expressed interest in home hospital care. However, patients preferred the site of treatment that offered the best chances of survival, and many expressed their doubts about the capacity of home hospital programs to provide a quality of acute care that would compare with inpatient care [16,17]. The main limitation of the reported feasibility studies of home hospital for elderly patients with heart failure or pneumonia is their restriction to hypothetical programs. Balancing the perceived advantages of home hospital care, mainly expressed in terms of comfort, against the disadvantages, mostly related to safety, is not easy. Whether patients considered eligible for a home hospital transfer by their hospital physicians, and their carers at home, would agree to a transfer when real choices are offered, and not just preferences expressed for hypothetical programs, remains uncertain.

The feasibility of a home transfer was tested in the medical departments of three acute care hospitals participating in a pilot home hospital program in the Canton of Vaud, Switzerland. This paper reports on the acceptability of home hospital for patients with a primary diagnosis of heart failure or pneumonia, taking into account not only their medical condition but also their social environment and the preferences expressed by family physicians, patients and their informal caregivers.

Methods

Settings

A pilot home hospital program was set up by the Public Health Department of the Canton of Vaud in July 1997, in an attempt to reduce hospital-related costs. It was initially limited to patients admitted to the medical departments of

three acute care hospitals, one university-affiliated hospital, Centre hospitalier universitaire vaudois (CHUV) and two regional teaching hospitals in Morges and Yverdon. The hospitals are financed partly by public funding and partly by patient health insurance. Although they are not related to each other in their organization or decision-making procedure, they agreed to adopt common protocols for the selection of patients eligible for the home hospital program.

In each setting, a coordinating team of nurses and physicians hired by the hospital and financed by the home hospital program had the task of selecting patients for home hospital. Access to home hospital was initially granted to patients presenting with a limited number of conditions, such as heart failure and pneumonia, selected for their high frequency in medical wards. All patients received initial information at admission, including written material presenting the home hospital program. The home hospital coordinating team screened each patient for medical eligibility, contacted the family physicians and subsequently checked the patients and their informal caregivers acceptance of a transfer, organized the transfer and advised the family physician. Most heart failure and pneumonia patients interested in the home hospital program were transferred during the second or third hospital day.

The home hospital program was mostly based on community resources, with nursing care and home help provided by the local home care program and medical care provided by the family physician. Family physicians referred to a standard protocol elaborated for each medical condition by hospital physicians in the three settings, and the hospital team remained available for advice during the home hospital stay. Standard protocols specified the general investigation and treatment process, including the number of required physician visits (at least one per day) and nurse visits (at least 3 per day during the first 48–72 hours, then at least one per day). Intravenous therapy was performed at home. Back transfer to the hospital was possible in case of complication or requirement for specialized diagnostic test. The mean length of stay in the home hospital program was 6.5 days for heart failure patients (median 7 days) and 5.2 days for pneumonia patients (median 5 days).

Population

A total of 742 patients were admitted from July 1997 to March 1998 to the three hospitals with a primary diagnosis of heart failure ($n=301$) or community-acquired pneumonia ($n=441$). Of this cohort, 39 heart failure and 57 pneumonia patients were excluded based on administrative criteria such as their home address (outside the intervention area of the home hospital program), their age (under 18), or their private insurance status. This last administrative criterion excluded patients only during the first few months of the program (12 heart failure and 13 pneumonia patients were excluded essentially because they were private patients). Systematic screening for home hospital eligibility was thus performed on 262 heart failure and 384 pneumonia patients.

Definition and assessment of medical eligibility for home hospital care

A common list of criteria that precluded a transfer to home hospital was defined by the physicians involved in the home hospital program (OL, BY); it was then approved by the medical teams in the three hospitals. Patients could be excluded from the day of admission, when the following criteria were fulfilled: non-compliance with therapy (e.g. drug or alcohol abuse), dementia or severe psychiatric pathology, pregnancy, for patients with either condition, and a history of heart transplantation or an acute valvular disease for heart failure patients.

Other exclusion criteria were then reported on a daily basis by the physicians in charge of patient selection for the home hospital program. A time limit was specified for certain exclusion criteria related to heart failure patients, after which the patient was considered as definitely ineligible. Criteria for heart failure patients were intensive care (maximum 2 days), intermediate care (maximum 4 days), intravenous nitrates or antiarrhythmics (maximum 4 days), investigations/treatment of an associated acute disease (except pulmonary infection), confusion, scheduled angiotensin-converting enzyme inhibitors test, invasive diagnostic procedures in progress, haemodynamic instability (BP < 100 mmHg, pulse > 100/min, oligo-anuria < 500 ml/24h), respiratory failure (respiration > 30/min, O₂ mask > 40%), Na < 120 mmol/l, K < 3 or > 6 mmol/l, and a > 30% increase in creatinine over 24 hours. Criteria for pneumonia patients were intensive care, intermediate care, investigations or treatment of an associated acute pathology (except heart failure), confusion, haemodynamic instability (BP < 100 mmHg, pulse > 100 per minute, oligo-anuria < 500 ml in 24 hours), respiratory failure (respiration rate > 30 per minute, FiO₂ > 40%), Na < 130 mmol/l, creatinine > 200 µmol/l (new finding), aspartate aminotransferase or alanine aminotransferase > twice normal values, haematocrit < 30%, and neutrophil count < 1000/mm³. When such criteria were absent, the patient was considered eligible from a medical point of view unless the physician specified other clinical problems not mentioned on the common list. The medical screening ended when a final decision could be made on patients (in)eligibility, or when the patient did not need an acute care bed any more.

Definition and assessment of acceptance of the home hospital program

When a patient was considered eligible, the opinion of the family physician was first sought; next, the consent of the patient and his informal caregivers was required for any home hospital transfer. The acceptance of the home hospital program was assessed according to the actual transfer of the patient to his private home.

Statistical analysis

Analyses were performed separately for heart failure and pneumonia patients, classified on the basis of their primary

diagnosis, although the two conditions may coexist, particularly in elderly patients. Results concerning medical eligibility are presented by hospital. However, the analysis of home hospital acceptability was performed over the whole sample, in view of the small numbers observed. Statistical tests used for comparisons between eligible and ineligible patients were chi-squared for categorical variables in general, and Fisher's exact test when expected numbers were less than five. The distributions of age and screening duration for eligible and ineligible patients were compared and the significance of differences tested using a two-sample Wilcoxon rank-sum (Mann-Whitney) test.

Ethics

The study protocol complies with the ethical rules for human experimentation and was approved by the Ethics committee of the Faculty of medicine, University of Lausanne. All patients were included in the home hospital program after written informed consent.

Results

Medical eligibility of heart failure patients

Of the 262 heart failure patients fulfilling the administrative conditions for access to the home hospital program, 55 (21.0%) presented on admission with characteristics that precluded a transfer to their home; dementia or severe psychiatric pathology were the predominant reasons (reported in 14.5% of cases), followed by non-compliance with treatment (7.3%). All other criteria were rarely reported.

The other patients, not discarded on the basis of immediate exclusion criteria, were screened every day in order to assess their eligibility from a medical perspective. Overall, 73 (27.9% of all admitted patients) were considered eligible. The proportion ranged from 27.3% in the university-affiliated hospital to 29.6% in Yverdon regional hospital (Table 1). Among the 207 patients submitted for screening during their hospital stay, those considered eligible for home hospital care were significantly older (a difference of 6 years between the median ages of eligible and ineligible patients) but the type of heart disease and the frequency of other cardiac diagnoses were similar in eligible and ineligible patients (Table 2). The screening duration was shorter before a positive eligibility decision than before a negative one. A higher proportion of ineligible patients were admitted to the intensive care unit and the need for investigations or treatment of associated acute diseases was more frequently reported; all other criteria were not significantly associated with the final decision regarding the eligibility status.

Medical eligibility of community-acquired pneumonia patients

In the group of 384 pneumonia patients, the presence on admission of one or more criteria definitely precluding a home hospital transfer was recorded in 102 patients (26.6%).

Table 1 Medical eligibility for home hospital transfer, by hospital setting and pathology

Hospital setting	Heart failure		Community-acquired pneumonia	
	<i>n</i>	Percent eligible	<i>n</i>	Percent eligible
CHUV	194	27.3	257	33.9
Morges	41	29.3	77	42.9
Yverdon	27	29.6	50	42.0
Total	262	27.9	384	36.7

Table 2 Characteristics of patients admitted with a primary diagnosis of heart failure and screened daily for medical eligibility for home hospital transfer (*n*=207)

	Total (<i>n</i> =207)	Medical eligibility		<i>P</i> value
		Yes (<i>n</i> =73)	No (<i>n</i> =134)	
Age (years, median)	80	84	78	<0.001
Male gender (%)	53.7	50.7	55.3	0.525
Heart failure type				0.304
Left only (%)	46.7	41.4	49.6	
Right only (%)	4.6	7.1	3.2	
Left and right (%)	48.7	51.4	47.2	
Causes of heart failure				
Coronary heart disease (%)	60.6	65.3	57.9	0.309
Dilated cardiomyopathy (%)	27.1	30.6	25.2	0.414
Valvular disease (%)	25.3	28.2	23.6	0.480
Hypertension (%)	53.3	50.0	55.1	0.487
Day of medical (in)eligibility decision (day, median)	3	3	4	<0.001
Ineligibility criteria reported ¹				
Intensive care (%)	15.9	1.4	23.9	<0.001
Intermediate care (%)	55.6	50.7	58.2	0.298
Intravenous nitrates or antiarrhythmics (%)	25.6	19.2	29.1	0.118
Investigations/treatment of associated acute disease (%)	29.0	5.5	41.8	<0.001
Confusion (%)	4.4	1.4	6.0	0.164
Scheduled ACE ² inhibitors test (%)	9.2	5.5	11.2	0.174
Invasive diagnostic procedures in progress (%)	5.3	4.1	6.0	0.750
Haemodynamic instability (%)	20.8	16.4	23.1	0.257
Respiratory failure (%)	22.7	17.8	25.4	0.214
Na < 120mmol/l; K < 3 or > 6mmol/l; serum creatinine increase > 30% (%)	4.8	1.4	6.7	0.102

¹At least 1 day between admission day and decision day.

²ACE, angiotensin-converting enzyme.

Here, too, dementia or severe psychiatric pathology was the most frequently quoted criterion (19.0%), followed by non-compliance with treatment (9.9%).

The proportion of medically eligible patients was slightly higher (36.7%, *n*=141) in the pneumonia group than in the heart failure group. The difference between the university-affiliated hospital and regional hospitals was also greater (33.9% versus 42.0% and 42.9%). Among the 282 subjects screened every day since admission, the eligible patients were

older than the ineligible patients (Table 3). Other respiratory-related diagnoses were not significantly associated with the eligibility, apart from neoplasms which were reported more frequently in ineligible patients. The screening duration was shorter for the eligible patients than for the ineligible patients. Severity criteria such as treatment in intensive or intermediate care units, the need for investigation or treatment of other acute diseases, or signs of respiratory failure were significantly more frequent in ineligible patients.

Table 3 Characteristics of patients admitted with a primary diagnosis of community-acquired pneumonia and screened daily for medical eligibility for home hospital transfer ($n=282$)

	Total	Medical eligibility		P value
		Yes ($n=141$)	No ($n=141$)	
Age (years, median)	75	77	71	0.0141
Male gender (%)	56.0	53.3	58.6	0.376
Other respiratory-related diagnoses				
Chronic obstructive airway disease (%)	34.1	35.7	32.6	0.599
Asthma (%)	7.5	7.5	7.4	0.972
Immunodeficiency (%)	4.9	3.8	6.0	0.401
Neoplasm (%)	6.3	3.0	9.6	0.026
Past tuberculosis (%)	5.6	7.5	3.7	0.179
Restrictive syndrome (%)	5.2	3.0	7.5	0.102
Day of medical (in)eligibility decision (day, median)	3	2	4	<0.001
Ineligibility criteria reported ¹				
Intensive care (%)	13.8	4.3	23.4	<0.001
Intermediate care (%)	39.4	33.3	45.4	0.038
Investigations/treatment of associated acute disease (%)	24.1	10.7	37.6	<0.001
Confusion (%)	5.7	5.0	6.4	0.607
Haemodynamic instability (%)	13.8	12.1	15.6	0.388
Respiratory failure (%)	22.3	16.3	28.4	0.015
Na<130mmol/l; serum creatinine>200µmol/l; aspartate aminotransferase or alanine aminotransferase>2 normal values	4.6	4.3	5.0	0.776
Haematocrit <30%; neutrophil count <1000/mm ³	1.1	0.7	1.4	1.000

¹At least 1 day between admission day and decision day.

Table 4 Final decision concerning patients declared eligible from a medical point of view

Final decision ¹	Heart failure		Community-acquired pneumonia	
	<i>n</i>	Percent	<i>n</i>	Percent
Family physician barrier	10	13.7	16	11.3
Patient barrier	23	31.5	38	27.0
Informal caregiver barrier	30	41.1	50	35.5
Transfer to home hospital	10	13.7	37	26.2
Total	73	100.0	141	100.0

¹The decision was taken sequentially, looking first at barriers raised by the family physician, followed by those raised by the patient and then by the informal caregiver.

Acceptability of home hospital care

Table 4 shows that barriers to home hospital care were reported slightly more frequently at all levels in the heart failure group. Among medically eligible patients, a transfer was ultimately possible for one in seven heart failure patients, and for one in four pneumonia patients. In the pneumonia group, male patients were transferred more frequently (37.0% versus 16.6%, $P=0.005$); while the age distribution of transferred patients was uniform, very old patients were clearly

predominant in the non-transferred group. Because of the smaller sample size, these factors are not described for the heart failure group.

Family physicians did not often oppose to the home hospital transfer; their cited reasons were mostly related to the social components of their patients' situations. Patient refusal was more common and was motivated in 53.7% of cases by doubts about the safety of care outside the hospital or by the fear of being alone. Concerns about the burden on family caregivers was less commonly mentioned (13% of

Table 5 Summary of enrollment in the home hospital program (three hospitals, consecutive admissions to medical departments over 9 months)

	Heart failure	Community-acquired pneumonia
Total admissions	301	441
Excluded, total	228	300
Administrative	39	57
Immediate	55	102
Medical criteria	134	141
Eligible, total	73	141
Refusal	63	104
Enrollment	10	37

patient-related refusals), and a variety of other reasons was expressed. The inadequacy of informal care was the principal barrier to home hospital care. In most cases, a lack of informal care or the poor health of the spouse were reported.

Discussion

We found that, of all admissions in medical wards, the proportions of heart failure and pneumonia patients ultimately transferred to the home hospital program were as low as 3.8% in heart failure patients and 9.6% in pneumonia patients (Table 5). We lack data from other programs to compare with these results, but the proportion declared eligible based on medical criteria in our study (heart failure, 27.9%; pneumonia, 36.7%) is close to estimates reported by Leff *et al.* [10] (heart failure, 26.7%; pneumonia, 46.0%; chronic obstructive airway disease, 27.7%). Our confidence in these results is reinforced by the similarity of the proportions found by independent teams working in the three participating hospitals. For most patients, the definitive medical decision on eligibility was made within 3 days both for heart failure and pneumonia groups; this compares with the median time to relative clinical stability in pneumonia patients reported by Halm *et al.* [18]. This period was longer for ineligible patients, who were more likely to have spent time in intensive care units and present with other acute conditions. The finding of a significantly higher age in the group of eligible patients, both for heart failure and pneumonia, may be related to differences in risk selection on admission to the acute care hospital. A family physician may decide to hospitalize an old patient in a less severe stage of illness, owing to considerations of frailty and social isolation.

If we speculate that home hospital is a cost-effective alternative to inpatient care for these conditions that are so prevalent in medical wards, the potential economic impact of transferring one third of all heart failure and pneumonia patients is undoubtedly attractive. However, for home hospital to be a safe alternative, the participation of the patient and his usual carers is required. Home hospital should be freely chosen and has to take into account the patients social environment. Even though some studies of patient preferences regarding their care location have encouraged home

hospital advocates [14,15], the acceptability of such care, taking account of all the factors that influence the decision to transfer a patient home, still needed to be tested. In their most recent report, Leff *et al.* attempted to recruit elderly patients in the medical ward of a large hospital. Although they concluded that huge savings could potentially be made in the US national healthcare system, their data hardly support such a conclusion with only 17 patients transferred to home hospital over an 18 month period [19]. We observed that home hospital care was ultimately possible for only one in seven medically eligible patients with heart failure, and for one in four with pneumonia. The major barriers to a transfer were the fear of a suboptimal level of care and the inadequacy of informal care. These findings were not surprising, considering the old age of patients medically eligible for the home hospital. The lower acceptability of home hospital care in the heart failure group may be explained both by the older age characteristic of patients with heart failure and by the high level of burden and stress on informal caregivers reported for this condition [20].

Part of the reluctance for a transfer to home hospital might also be related to the place of recruitment. Patients in our study were in the first place referred to the hospital by their family physician and they would really have been hospitalized in the absence of the home hospital program; therefore the results of economic analyses comparing home hospital and hospital care apply to such patients. Of course, home hospital might be more attractive for patients recruited in primary care practices but it is less clear that the economic advantage in favour of home hospital apply to programs offering a direct access from the community. Such programs must be evaluated with a critical appraisal of the real need for hospital care of referred patients; this is an obvious condition for comparing costs with usual hospital care.

We conclude that, irrespective of the cost differences between home hospital and inpatient care potentially applicable to heart failure and pneumonia, the proportion of medically eligible and voluntary patients is so low that major savings should not be expected from a program recruiting within the walls of the hospital. More research should be devoted to the economic advantage of home hospital for other conditions, whether non-acute or in other medical specialties. The motivation for developing home hospital

schemes for patients presenting with heart failure or pneumonia should rather be sought in the satisfaction of the small group of patients who value particularly the comfort of being cared for at home.

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