

Determinants of resource utilization in four palliative care units

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Objective: To assess resources mobilized per day and per patient receiving palliative care (PC) and to explain the observed cost variability. **Study setting:** We conducted a prospective study in four French PC units. **Study design/data collection:** For each patient, socio-demographic and medical data were collected (using a case-report form developed specifically for this purpose) and a daily cost for the provision of care was estimated. Three methods were used to analyse causal relationships. The first method was to ask the PC staff, individually and in group meetings, their own perception of the relationship between daily costs and the other variables; the remaining two methods used the data collected in the prospective study: correlational analysis and segmentation. The database contained 140 hospitalization sequences. **Principal findings:** The daily cost per patient was, on average, €434 (standard deviation: €73) and ranged from €301 to €667. Beyond differences in resources between PC units in this study, six variables were predictive of higher costs: degree of anxiety of patients and/or their families; proximity of death; extreme dependence; ENT cancer; relatively young age of the patient; and provision of certain procedures (drip, syringe driver, aspiration, oxygen therapy). **Conclusions:** These elements suggest using, not a single rate to finance this type of care, but modifying this tariff according to the characteristics of the patients. They raise the question about the criteria to be used if such a step were to be taken. *Palliative Medicine* 2006; 20: 95–106

Key words: costs; financing; hospital; palliative care

Introduction

The diagnosis related group (DRG) system first appeared in the US at the end of the 1970s,¹ and has been used since 1983 for the purpose of fixing hospital tariff rates.² It treats each hospital stay according to a clinical and therapeutic profile (the DRG). For each DRG there is a corresponding relative weighting, which becomes the basis for remuneration in acute-care hospitals. This system has been adopted in numerous countries,³ and was widened in a modified form to include sub-acute and non-acute hospitals.^{4–6} In France, the stays receiving palliative care (PC) are represented in two ways, according to the nature of the hospital which delivers the care. Whereas a specific and single DRG has just been created for the acute-care hospitals,⁷ (following the example of the American system),^{8,9} the system set up in the structure of extended care rests on a per diem basis, with the day rate dependent on the type of care, or similarly, on tariffs by profile-types of days.¹⁰ These profiles were defined *a priori* according to their likely

ability to discriminate among the generated costs, and they take into account many indicators: patient's age, diseases (HIV, others), degree of physical dependence and the association of these factors with a number of procedures judged to be 'demanding' (stomas, enteral feeding, blood transfusions) or 'very demanding' (parenteral feeding, ventilation). Recent works have highlighted that these classes are not sufficiently discriminating from an economic point of view and that the classification must be improved.¹¹ Other indicators can be proposed, such as the phase of care (acute, stable, deteriorating, terminal, bereavement) and/or the severity of illness (low, medium, high),⁶ but they are still viewed as *a priori*.

With respect to resource allocation, it is important to ensure the clinical and economic homogeneity of the palliative population and to identify the factors that best explain the variability of the costs between the patients. Published research on the costs of PC can be classified into six categories, on the basis of the objectives of these studies: (1) estimating the costs of PC;^{12–15} (2) relating costs to the effectiveness of different treatments;^{16–21} (3) comparing appropriate end of life care with conventional health-care;^{22–31} (4) comparing PC in the hospital setting and at home;^{13,32–34} (5) showing the impact of co-ordinated healthcare networks involving hospitals and

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local authorities;^{35,36} and (6) measuring the potential economic benefits to the community when developing PC units.^{37–39} Thus, these studies do not address the question that is posed in this paper. The objective of our study was to evaluate the costs of patients receiving PC and explain the variability in costs between patients, according to a series of descriptive factors of care: the type of PC unit in which the patient is hospitalized, socio-demographic and medical characteristics of the patients, and the nature of care provided. The dependent variable is the cost per patient/day, not the cost per hospital stay, due to the difficulty of predicting the lengths of hospitalization of these patients and the substantial variation in the number of days hospitalized.

Materials and methods

The database

Palliative care units (PC units) are hospital departments specialized in providing care for patients with serious or chronic pathologies and for whom life expectancy is often poor. In 2004, there were 78 such units in France.⁴⁰ They have, on average, ten beds and are located both in hospitals providing medicine, surgical and obstetric care (MSO), or in hospitals offering extended care and rehabilitation (ECR). Four PC units participated in our study, on a voluntary basis. Two were in MSO hospitals: the PC unit of the Institut Mutualiste Montsouris (15 beds, located in Paris) and the Hôpital Saint-André (10 beds, Bordeaux). The other two units were in ECR hospitals: the Maison Médicale Jeanne Garnier (81 beds but only 13 were included in the study, Paris) and the Centre Hospitalier de Senlis (nine beds).

The study was prospective and data was collected between June and October 2000. In order to obtain 30 case files per site, data were gathered in each unit during three-week periods, each week separated by one month. The PC teams themselves collected the data using a case-report form developed specifically for this purpose.⁴¹ Data was socio-demographic (patients' age, sex, length of stay, how they were admitted and discharged from hospital) and medical (disease, symptoms, dependency, prognosis, types of care and amount of time spent by the staff with patients and/or their families, medications, medical tests). The degree of dependency of each patient was estimated on the basis of a daily score, ranging from 7 to 28, based on the facility with which each did the following activities: dressing one's self, mobility, eating, continence, behaviour, relationships, washing oneself. Each item was scored on a scale of 1 (independent patient) to 4 (patient requiring complete assistance). Patients' prognosis was estimated using the Karnofsky index (100% = good health, 0% = death).^{42,43} There was therefore no *a priori* selection of patients.

Assigning costs to the consumption of resources

The study adopted the perspective of costs incurred by the PC units. For each patient, a daily cost for the provision of care was estimated. This represented the full cost, including staff wages, drugs, diagnostic tests, depreciation and maintenance of heavy equipment, disposable devices, logistical expenses (laundry, meals, etc.) and overheads (depreciation and maintenance of buildings). We assigned as many expenses as possible to the patients, based on their actual consumption (length of time spent in care by caregiver, prescriptions). Expenses hard to assign on an individual basis, such as the time spent by teams on activities not involving the provision of care (meetings, making reports, ordering drugs and materials, the overall administration of the units, participating in training sessions, etc.), heavy equipment, logistics and overheads, were assigned uniformly to all the patients. The cost of drugs was calculated according to an ad-hoc survey of hospital pharmacies and the cost of medical tests, based on the Nomenclature Générale des Actes Professionnels (NGAP).⁴⁴ Other unit costs were standardized in order to avoid assigning cost-differentials to patients on the basis of indicators not related to their condition: salaries were estimated as if all personnel were earning mid-career salaries in public sector hospitals,⁴⁵ the average cost of heavy equipment was calculated for all four PC units combined, and the daily logistical and overhead costs were obtained from the Hospital Directorate of the Ministry of Health.

Data analysis

Because of the differences in human resources, and thus the differences in cost between the two types of PC unit, the data was analysed separately. Data were analysed in two stages. Firstly, the full cost per patient/day was calculated for the whole sample and by the type of PC unit (MSO, ECR). We also estimated the cost of each item and the amount directly incurred by the patients. Significant differences in the mean costs between the two types of PC unit are shown in boldface in the table of results (using the criterion of $P < 0.05$ based on *t*-tests).

Secondly, costs were linked to all the other data of the database. Three methods were used to analyse causal relationships. The first was to ask the PC staff, individually and in group meetings, their own perception of the relationship between daily costs per patient and the other variables. The question asked was: 'which factors explain why you granted more time to some patients than to others?' Within the framework of the individual interviews, 13 people randomly selected at the sites which took part in this study, were interviewed: five doctors, four nurses, including two supervisors, two psychologists and one head of Department of Medical Information (DMI). The group meetings were composed of nine doctors and

three nurses. The meetings were conducted for the majority members of the committee of experts of the study. The two other methods used the data collected in the prospective study – correlational analysis and segmentation:

- For the correlational analysis, we used the test of correlation of Pearson when the variables were quantitative, and a test comparing the averages when they were qualitative (average costs in each sub-group). The tests were carried out in the 5% threshold.
- The segmentation is a multivariate statistical technique: the variable which one seeks to explain is a qualitative variable (fact that the patient may be associated with a high, average or low cost), called ‘target’. The model entails partitioning the data in a sequential way into groups, according to the response categories of the independent variables selected for their explanatory capacity. The result of this segmentation is described in a decision tree, which indicates the independent variables that best predict the target.

Results

Main characteristics of the sample

Table 1 provides a description of the sample. The database contained 140 hospitalization sequences: 69 in MSO PC units (59 patients) and 71 in ECR PC units (60 patients). The average age of the patients was 62.8 years with a standard deviation of 16.3 years (62.8 ± 16.3 years) and was significantly higher in the MSO PC units (67.2 versus 58.4 years). The average length of stay was 50.0 ± 56.3 days, indicating substantial variation between patients (range: 2–335 days). In >90% of cases, the disease was a cancer. The average dependency score was 21.7 ± 5.7 . The mean Karnofsky index was close to 30, indicating that the patients were seriously handicapped, with reduced mobility and requiring hospitalization, although death was not necessarily imminent. The MSO PC unit population presented more symptoms than those in ECR PC units, and benefited from more care (six hours/day versus four hours). Of this time, 90% was provided to the patient and 10% to their families. Nurses and nurse’s aides provided three-quarters of this measure of care. We refer the reader to two articles for more information on our sample.^{51,52}

Full cost per patient/day

The full cost per patient/day was, on average, $\text{€}434 \pm 73$. The lowest cost was $\text{€}301$ and the maximum was $\text{€}667$ (Table 1). For 10% of patients, the daily cost was $<\text{€}328$; for 50%, $<\text{€}438$; and $<\text{€}525$ for 90% of the patients.

Figure 1 provides a visual representation of the cost differences between the two types of unit ($\text{€}482 \pm 55$ versus 388 ± 58 , $P < 0.001$). The breakdown of the total cost per patient/day was as follows: staff salaries: 62.1%; logistical expenses: 22.7%; overheads: 5.4%; drugs: 4.7%; depreciation and maintenance of heavy equipment: 3.5%; disposable devices: 1.2%; and diagnostic tests: 0.5%. There were significant differences between MSO and ECR PC units for personnel costs ($\text{€}312$ versus 228 , $P < 0.001$) and medications ($\text{€}25$ versus 15 , $P = 0.04$). Of the $\text{€}434$ average cost calculated per patient/day, 30% directly involved care for the patients (medications, tests, time spent with the patient or the family), the remaining amount corresponded to indirect costs: disposable devices, heavy equipment, logistical support, overheads, time spent by the staff not directly involving the care of patients.

Factors accounting for the variability in costs between patients, according to staff-members

Before analysing the database, we conducted a field survey of PC personnel, on the variables they considered most important in contributing to the daily cost of care. The responses are given in Table 2. The most frequently mentioned items were: the degree of anxiety of the patients and/or of their families, the nature of the initial disease (amyotrophic lateral sclerosis, ENT cancers, breast cancers with significant wounds), the proximity of death, the abrupt alteration in their state (onset of a new condition, a sudden change from being relatively independent to becoming completely dependent, the rapid progression of the disease) and providing dressings to patients. According to our informants, while anxiety was mentioned most often, a number of other symptoms were associated with a significant increase in the care required: agitation (frequent with ENT cancers), occlusions, intractable pain, and respiratory problems. The multiplicity of symptoms of discomfort was also mentioned: the more symptoms a patient develops, the more time needs to be spent evaluating these symptoms and providing adequate care. Other factors mentioned were: digestive stomas, blood transfusions, the patient’s admission to the PC unit, the patient’s social isolation, the limited understanding of the disease and its outcome by patients and/or their families, comas, patients who are young (in their 30s), and the prevention of bedsores (having to change the patient’s position every two or three hours, day and night).

Correlation between the daily cost per patient and the other components of the stay

Table 3 presents the degree of correlation between the daily cost per patient and the other quantitative variables associated with the stay. The variables that correlated significantly with the daily cost of care are identified in

Table 1 Description of the sample and daily costs per patient

No. of patients	All patients (n=119)	MSO PC units (n=59)	ECR PC units (n=60)
Age (years) ^a	62.8±16.3	58.4±15.4	67.2±17.2
Length of hospitalization (days) ^a	50.0±56.3	44.3±43.1	55.7±69.2
Range of lengths of hospitalization (days)	2–335	2–224	1–335
Number of hospitalization sequences	All patients (n=140)	MSO PC units (n=69)	ECR PC units (n=71)
Initial disease ^b			
Cancer (%)	90.0	88.1	93.3
Neurological disease (%)	6.7	6.8	6.7
AIDS (%)	0.8	1.7	0.0
Circulatory system pathology (%)	0.8	1.7	0.0
Other (%)	0.8	1.7	0.0
Dependency score per day (7–28) ^a	21.7±5.9	20.9±6.4	22.4±5.5
Karnofsky index per day (0–100) ^a	28.4±13.7	29.7±14.4	27.1±13.0
Number of symptoms per day ^a	13.0±5.6	16.7±6.8	9.4±4.4
Number of medications per day ^a	10.3±3.8	1.5±3.9	9.2±3.8
Number of medical tests per day ^a	1.2±2.4	1.8±3.4	0.6±1.4
Time spent per day (minutes) ^a	298.5±97.6	362.9±94.5	235.9±100.7
With the patient (%)	89.5	91	88
With the patient's family (%)	10.5	9	12
Time spent with the patient per day (minutes) ^a	268.4±81.5	331.8±80.8	206.8±82.1
Physicians	26.2±16.6	40.1±24.8	12.7±8.6
Nurses	112.0±48.0	141.6±55.8	83.2±40.5
Nurse's aides	88.8±36.3	100.4±43.0	77.6±29.7
Other paramedics (physiotherapists etc.)	11.1±12.9	15.5±16.6	6.8±9.4
Administrative staff	10.7±12.1	16.0±15.6	5.5±8.7
Other practitioners	21.8±26.3	22.6±15.6	21.1±36.6
Total cost (€) ^a	434.15±73.30	482.07±54.52	387.58±57.61
Range of costs (€)	300.82–667.06	383.90–667.06	300.82–521.60
Total cost (€) ^a	434.15±73.30	482.07±54.52	387.58±57.61
Personnel	269.44±60.37	312.16±39.03	227.92±47.01
Medications	20.21±27.69	25.06±35.11	15.48±16.70
Medical tests	2.17±2.50	2.50±4.98	1.84±5.49
Disposable devices (fixed amount)	5.23	5.23	5.23
Heavy equipment (fixed amount)	15.11	15.11	15.11
Logistics (fixed amount)	98.47	98.47	98.47
Overheads (fixed amount)	23.53	23.53	23.53
Total cost per day (€) ^a	434.15±73.30	482.07±54.52	387.58±57.61
Individualized costs (medications, tests, time spent with the patient and his/her family)	110.17±45.85	140.04±36.60	81.14±33.75

^aMean ± standard deviation.

^bPercent of cases.

Figures in bold: significant differences between MSO PC units and ECR PC units (P < 0.05).

MSO PC units, palliative care unit located in a hospital providing acute-care; ECR PC units, palliative care unit located in a hospital providing rehabilitation care. Figures in bold indicate significant differences between MSO PC units and ECR PC units (P < 0.05).

bold in the table (Pearson correlation coefficients: P < 0.05). Four characteristics are common to both types of unit: the number of daily interventions required by the state of the patient, their level of dependence (in particular, with respect to eating, washing themselves and getting dressed), their consumption of drugs (number of pharmaceutical products prescribed per day) and their vital prognosis (fact of having a low Karnofsky index).

The tests comparing average costs show that the presence of one of the following elements is associated with intense supervision: drips (including parenteral nutrition), aspirations (bronchial, naso-tracheal, fibro-

aspiration), syringe drivers (or patient controlled analgesia pumps) and oxygen therapy (Table 4). A total of 75% of patients MSO and 72% of patients ECR had at least one of these procedures during the study. Their cost is significantly higher than that of the other patients (MSO units: €449 versus 493, P = 0.003; ECR units: €345 versus 404, P < 0.001).

Segmentation of the sample studied, according to the characteristics of the patients

In each type of PC team, we segmented patients into three groups (with equal sample sizes): level 1 corresponds to relatively low costs, level 2 to costs close to the

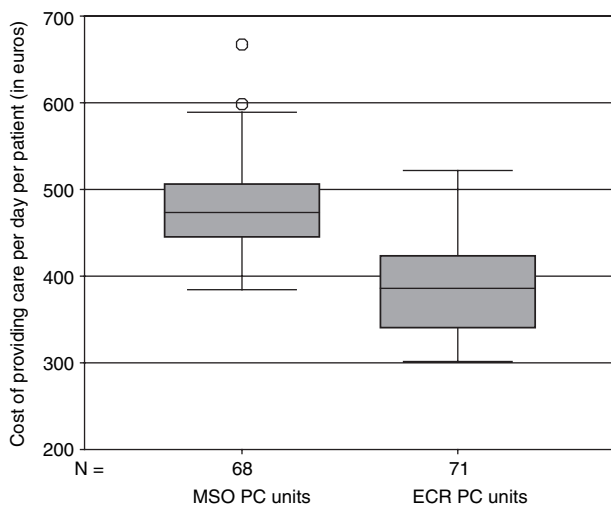


Figure 1 Graphic representation of daily costs per patient (in €).

mean, and level 3 to relatively high costs (Table 5). For the MSO PC units, the most significant variables were the nature of the disease (cancer versus other diseases), patients' degree of dependency (daily score ≥ 14) and patients' age (≥ 67 years) (Figure 2). Cancer patients who were relatively young and had a high dependency score were associated with higher costs (DC3). Those cancer patients who mobilized the least resources (DC1 in Figure 2) were both more independent and older. The first segmentation criterion of the ECR population was patients' age (± 74 years) (Figure 2). Also important were the degree of dependency (± 28) and the presence of elimination difficulties. The higher costs (DC3) were

associated with patients < 75 who were completely dependent. The group mobilizing the least resources (DC1) consisted of those patients older than 74 years, not presenting elimination difficulties.

Discussion

Comparing costs in our research with those found in other studies

We compared costs in our study (€434 per patient/day) with the findings of other French studies. They found daily costs to be €293,¹² €433,¹² €213–610,⁴⁶ and €426.³⁷ Our study goes beyond the simple notion of daily cost to take into account the inter-patient variability of costs. Moreover, it identified the cost differences between the two types of PC unit and between patients in similar types of units. The difference between the two types of units essentially reflects the fact the MSO PC units had more personnel. The difference in costs inter-patients suggest using, not a single rate, to finance this type of care, but modifying this tariff according to the characteristics of the patients. We studied only four sites due to the time intensiveness implied by the collection of data. The investigation thus took the form of a feasibility study, and we wish to conduct a future study to validate the obtained results with a larger sample of teams and patients.

Choice of methodology used

Several methods could be put forth in order to explain the variability of the per day costs. Most commonly, one develops a model of regression. In such a model, the

Table 2 Factors accounting for the cost variability according to caregivers interviewed

Answers provided by the caregivers interviewed	
Anxiety	Need to talk, psychological distress of the patient and/or the family, solitude of the family
Nature of the disease	Amyotrophic lateral sclerosis (ALS), breast cancer with significant wounds, ENT cancer, broncho-pulmonary cancer, AIDS, brain tumours
Symptoms (apart from anxiety)	Multiplicity of symptoms, agitation, occlusion, hyperalgesia, breathing difficulties
Proximity of death	Anxiety, high level of dependency, tracheobronchial obstruction, aspiration
Change in health status	Appearance of a new medical fact, change from being independent to dependent, rapid progression of the disease
Dressings	Gastrostomy, tracheostomy, breast cancer with significant wounds, fistulas
Procedures	Digestive stomas, blood transfusions
Other factors	Admission to the PC unit Loss of social role Poor awareness of outcomes by the patient and his/her family Family of comatose patients Young patients (in their thirties) Prevention of bedsores Replying to the patient's requests

Table 3 Variables correlated with the daily cost of care

	MSO (corr)	PC units (P)
Karnofsky index (0–100) ^a	– 0.29	0.015
No. of metastases	–0.10	0.452
Age	–0.08	0.526
No. of symptoms D (difficulty of positioning)	–0.04	0.748
No. of symptoms G (skin, mucous symptoms)	0.01	0.962
No. of symptoms E (oral symptoms)	0.03	0.835
No. of different medical interventions per day	0.04	0.774
No. of symptoms B (digestive symptoms)	0.08	0.536
No. of years since the onset of the disease	0.08	0.627
No. of symptoms C (elimination symptoms)	0.10	0.402
No. of symptoms F (lung symptoms)	0.14	0.268
Dependency score (continence)	0.17	0.154
No. of medical tests per day	0.20	0.106
No. of symptoms A (pain)	0.20	0.101
Dependency score (verbal and non-verbal communication)	0.20	0.096
Dependency score (social interactions)	0.21	0.096
No. of symptoms J (other symptoms)	0.22	0.075
No. of symptoms I (psychological symptoms)	0.22	0.073
Dependency score (mobility)	0.24	0.068
Dependency score (dressing one's self) ^a	0.24	0.051
Dependency score (7–28) ^a	0.26	0.032
No. of symptoms	0.27	0.028
Dependency score (washing one's self) ^a	0.27	0.024
Dependency score (eating) ^a	0.29	0.017
No. of symptoms H (neurological symptoms)	0.30	0.013
No. of medicaments per day ^a	0.39	0.001
No. of total medical interventions per day ^a	0.59	< 0.001
	ECR (corr)	PC units (P)
Age	– 0.52	< 0.001
Karnofsky index (0–100) ^a	– 0.34	0.003
No. of symptoms J (other symptoms)	– 0.26	0.029
No. of symptoms E (oral symptoms)	–0.18	0.143
No. of metastases	–0.10	0.440
No. of symptoms H (neurological symptoms)	–0.07	0.553
No. of symptoms I (psychological symptoms)	–0.02	0.857
No. of years since the onset of the disease	0.03	0.826
No. of symptoms D (difficulty of positioning)	0.08	0.496
No. of symptoms	0.09	0.478
No. of symptoms G (skin, mucous symptoms)	0.12	0.330
No. of symptoms B (digestive symptoms)	0.14	0.232
No. of symptoms C (elimination symptoms)	0.17	0.154
No. of symptoms A (pain)	0.18	0.144
No. of medical tests per day	0.23	0.057
No. of medicaments per day ^a	0.37	0.001
Dependency score (continence)	0.38	0.001
Dependency score (verbal and non-verbal communication)	0.43	< 0.001
Dependency score (washing one's self) ^a	0.43	< 0.001
Dependency score (dressing one's self) ^a	0.46	< 0.001
Dependency score (mobility) ^a	0.47	< 0.001
No. of symptoms F (lung symptoms)	0.47	< 0.001
No. of different medical interventions per day	0.48	< 0.001
Dependency score (social interactions)	0.51	< 0.001
Dependency score (7–28) ^a	0.56	< 0.001
Dependency score (eating) ^a	0.59	< 0.001
No. of total medical interventions per day ^a	0.70	< 0.001

^aVariables common to both types of PC unit.

In bold: variables correlated significantly with the daily cost of care ($P < 0.05$).

MSO PC units, palliative care unit located in a hospital providing acute-care; ECR PC units, palliative care unit located in a hospital providing rehabilitation care; corr: Pearson correlation coefficient; P, significant level.

Numbers in bold indicate variables correlated significantly with the daily cost of care ($P < 0.05$).

variable which one seeks to explain (Y) is a function of other variables (X_1, X_2, \dots, X_n). Initially, it is this method which we used. But, it soon appeared that the variables

used as explanatory factors were highly correlated with one another, so that a stable and robust model must be defined. In addition, we observed (from interviews

Table 4 Relationship between the daily cost and the non-quantitative variables

	MSO (t)	PC units (P)	ECR (t)	PC units (P)
Sex (male/female)	1.96	0.054	-1.13	0.264
Deceased during the hospitalization (yes/no)	-1.84	0.072	-0.05	0.958
Deceased during the survey (yes/no)	0.98	0.332	-3.12	0.003
Cancer (yes/no)	-0.19	0.849	1.63	0.108
AIDS (yes/no)	1.39	0.169	-	-
Neurological disease (yes/no)	-0.42	0.677	-1.63	0.108
Pathology of circulatory pathway (yes/no)	0.33	0.745	-	-
Other diseases (yes/no)	-0.08	0.936	-	-
ENT cancer (yes/no)	0.03	0.975	-1.31	0.195
Hepatic metastasis (yes/no)	0.49	0.624	-0.39	0.697
Curative treatment (yes/no)	2.02	0.053	-0.41	0.685
Patient uses wheel-chair (yes/no)	3.03	0.003	1.59	0.115
Karnofsky index low (≤ 30 : yes/no)	-1.88	0.064	-1.56	0.122
Pain symptoms (yes/no)	-0.74	0.460	-2.01	0.049
Digestive symptoms (yes/no)	-0.67	0.505	-0.99	0.326
Eliminating symptoms (yes/no)	-0.13	0.895	-1.49	0.140
Difficulty of positioning (yes/no)	0.22	0.824	-1.28	0.207
Oral symptoms (yes/no)	0.83	0.407	1.64	0.106
Lung symptoms (yes/no)	0.10	0.921	-3.17	0.002
Skin, mucous symptoms (yes/no)	0.72	0.473	-0.22	0.824
Neurological symptoms (yes/no)	-1.09	0.282	-1.18	0.242
Psychological symptoms (yes/no)	-1.29	0.213	0.27	0.789
Other symptoms (yes/no)	-2.08	0.042	0.88	0.383
Antibiotic therapy (yes/no)	-0.98	0.329	-1.68	0.097
Biological test (yes/no)	-1.48	0.144	-0.97	0.335
Radiological test (yes/no)	-1.21	0.233	-0.73	0.468
Time spent by the team with patients ≥ 5 hours (yes/no) ^a	-4.57	< 0.001	-7.21	< 0.001
Aspiration (yes/no) ^a	-2.19	0.032	-5.44	< 0.001
Urinary catheter (yes/no)	-1.20	0.234	-2.07	0.043
Mouth care (yes/no)	-2.91	0.005	-1.25	0.217
Parenteral nutrition (yes/no)	-0.64	0.525	-2.54	0.021
Enteral nutrition (yes/no)	0.36	0.178	-2.09	0.041
Digestive system stomas (yes/no)	-0.87	0.387	-1.06	0.294
Oxygenotherapy (yes/no) ^a	-2.24	0.028	-3.26	0.002
Tracheotomy (yes/no)	0.65	0.518	-2.71	0.008
Perfusion (yes/no) ^a	-3.43	0.001	-4.86	< 0.001
Evaluating psychological distress (by doctors) (yes/no)	0.56	0.580	1.61	0.112
Evaluating family distress (by doctors) (yes/no)	-2.39	0.021	-0.22	0.828
Patient support (by doctors) (yes/no)	0.38	0.731	3.84	< 0.001
Explanation of disease and symptoms (yes/no)	-1.29	0.201	-0.02	0.981
Information on diagnosis and prognosis (yes/no)	-0.31	0.755	0.23	0.819
Educating patient about treatments (yes/no)	0.64	0.522	0.89	0.376
Decision-making meeting (yes/no)	0.05	0.961	0.93	0.358
Support to patient's family (by doctors) (yes/no)	-0.01	0.992	-2.23	0.029
Giving explanations to family (by doctors) (yes/no)	-1.46	0.148	-0.62	0.535
Bedsore prevention (yes/no)	-1.24	0.221	-1.70	0.093
Massage (yes/no)	-1.54	0.129	1.82	0.073
Hair/nail cut (yes/no)	-0.10	0.922	0.17	0.864
Diapers (yes/no)	-0.56	0.579	0.58	0.565
Bedsore dressing (yes/no)	-1.44	0.154	-1.32	0.191
Injections (yes/no)	-1.40	0.168	-3.94	< 0.001
Syringe driver or pump (yes/no) ^a	-2.40	0.024	-5.12	< 0.001
Catheter (yes/no)	-1.51	0.137	-2.84	0.006
Aerosol (yes/no)	-0.65	0.515	-4.84	< 0.001

^aVariables common to both types of PC unit.

MSO PC units, palliative care unit located in a hospital providing acute-care; ECR PC units, palliative care unit located in a hospital providing rehabilitation care; t, Student's t-test; P, significant level.

Numbers in bold indicate variables correlated significantly with the daily cost of care ($P < 0.05$).

carried out with caregivers and from a preliminary analysis of the data),^{51,52} that the studied population is not homogeneous, neither at the clinical level, nor from an economic point of view. We thus decided to focus on less classic, but more relevant methods for our research:

(1) the field survey consisted of questioning PC staff on those factors which they consider as important, and to list their answers; (2) the correlation study makes it possible to be free from the problems previously evoked and to focus on the relationships between the

Table 5 Level of daily costs per patient by type of PC unit

Type of PC unit	n	Level of costs: terciles (€)		
		Low (level 1) DC1	Medium (level 2) DC2	High (level 3) DC3
MSO	68	384–461	461–491	491–667
ECR	71	301–351	351–411	411–522

MSO PC units, palliative care unit located in a hospital providing acute-care; ECR PC units, palliative care unit located in a hospital providing rehabilitation care; DC, level of daily costs.

daily cost per patient and each of the other variables taken independently of one another; (3) the segmentation is an adequate technique when the population is heterogeneous (it is the method used by Fetter to develop the DRGs (on an estimation of costs per stay)).¹ The variable which one seeks to explain is not a continuous variable (the daily cost per patient), but a qualitative variable (the fact that the patient may be associated with a high, average or low cost). For methods 2 and 3, we took into account the differences in levels between the two types of studied PC units, and treated them separately.

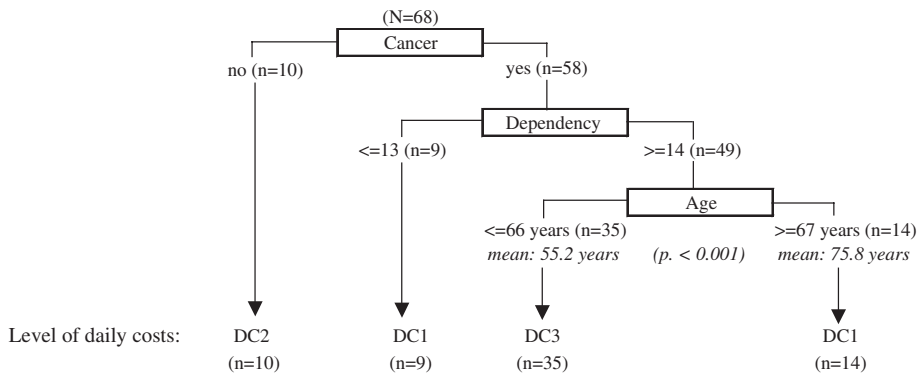
The relevance of the results

Our study enables us to identify some predictive factors of daily PC costs, the principal factors being: the degree

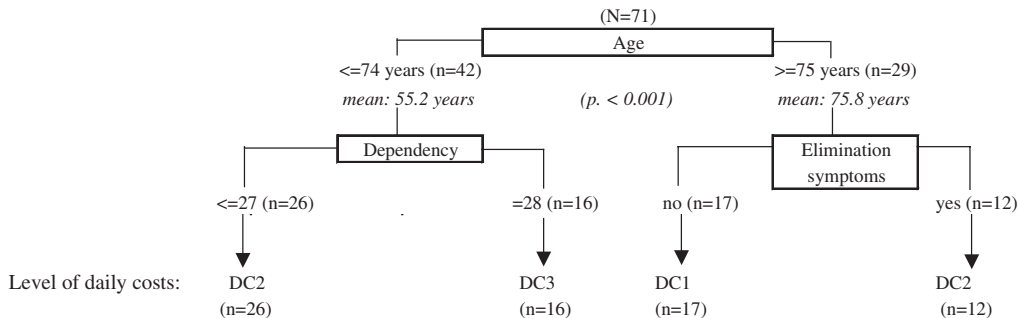
of the patient's anxiety, or that of the family, the closeness of death, extreme dependence, the fact of having an ENT cancer, the provision of certain procedures and the fact of being relatively young. The relationship between the daily cost and the group of other variables has been validated by non-parametric tests (tests of the median for quantitative variables, the χ^2 -test for qualitative variables): subjecting the data to these tests, in effect, bore results similar to those presented in Tables 3 and 4.

It is now appropriate to assess the relevance of these results. (1) We first consider the relationship between costs and the level of anxiety. PC promotes providing 'holistic care'. From this perspective, the relief of suffering is an integral part of this activity.^{47,48} All in all, the cost, in these situations, is primarily related to staff costs. The relationship between the cost and the level of anxiety

MSO PC units



ECR PC units

**Figure 2** Segmentation of the sample studied.

of the patients can be explained by the importance (in number and density) of their requests (to make them more comfortable, to open the window, to hear them). Their anxiety is, in general, contagious and the family needs also to be supported in this context, which requires even more caregiver presence. Moreover, their situation can require the intervention of a psychologist or a psychiatrist. (2) At the 'dying phase', the patient becomes very dependent, new symptoms emerge, other symptoms become intense, and treatments need to be adapted rapidly to the patient's changing condition; as the patient's family may take on anxiety and guilt, the care provided has to become increasingly the collective activity of the health-team.⁴⁹ The proximity of death, therefore, calls for an increase in material and human resources, and so represents an increase in costs. (3) The relationship between dependency and cost can be readily explained: patients' increasing loss of autonomy means that staff has to adopt behaviours toward the patient that are either complementary (helping the patient to...) or by substituting themselves (doing things the patient cannot do). (4) ENT cancers are well-known by PC staff as requiring a great deal of care and therefore of time: dressing of gastrostomies and tracheotomies, respiratory problems, agitation, difficulties in expressing oneself, and functioning within the patient's psychosocial context, etc. (5) The process associated with some procedures (drips, aspiration, syringe drivers, oxygen therapy) were often related to complex clinical situations, patients with ENT cancers, and those who were close to death. (6) For a given disease and level of dependency, it became clear that younger patients mobilized more resources than other patients. The principal explanation probably lies in how these younger patients experience their situation, involving a combination of anxiety, feeling of injustice and a sense of guilt.

Certain elements, such as the number of years in operation or the rate of expansion of the different PC units, can probably explain a part of the differences in costs observed between the different teams. We did not integrate these elements as explanatory factors for two reasons: (1) our sample is too small (four PC units) to be able to test the proposed hypothesis; (2) the differences in means between the two studied types of teams (MSO/ECR) are so important that they alone over determine the possible differences in costs which could, in addition, be noted.

The potential usefulness of the indicators for purposes of budget allocations

The study showed that the population of PC is not homogeneous from an economic point of view and allows one to determine, by a method *a posteriori*, the most discriminant factors. The use of a single DRG results in penalizing the establishments which have identified a

significant percentage of patients as requiring a high-level of resources, and it runs the risk that such patients entering the units of care will be perverse incentive. But on what bases are we to establish sub-groups of patients? The indicators are usable only if they satisfy three conditions: (1) objectivity (they are understood and identified by all those involved in exactly the same way); (2) availability (collecting such indices does not seriously increase the staff workload); and (3) neutrality in medical practices (they do not lead to undertaking useless procedures). Three of our indicators are objective: patient's age, the type of the disease and procedures (aspiration, oxygen therapy, drips, syringe drivers). The other indicators could be rendered objective, but they are easy not to use.

Usual reference costs or standard costs?

The question posed in this article is that of the financing of PC at the hospital. As we highlighted in the introduction, some element of the DRG system can be found throughout the world. This system recommends that hospitalizations are reimbursed to the hospitals on the basis of reference costs calculated on a representative sample of hospitals. The notion here is that hospitals whose costs exceed the pre-established reimbursement rates will be financial losers, and that each hospital will be able to determine the sectors in which it is most efficient. If this model seems legitimate when the function of the hospital is to cure, one must put its applicability into question when the hospital's function is to accompany people at the end of their lives. In this case, indeed, the quality of the care delivered to the patients can be affected by reduced means and this system poses potentially adverse risks for the patient and for his/her family (shortening the durations of hospitalization by returning the patient to sometimes unprepared residences or by transfers towards other types of structures).

A recent movement recommends that PC should not be financed from usual reference costs, but that good professional practices should be taken into account in the reimbursement scheme. An example is the work carried out by the University of Sheffield's School of Health and Related Research (SchARR) to define the costs of the National Institute of Clinical Excellence (NICE) guidance on improving supportive and PC in adults with cancer in the UK.⁵⁰ A model of standard costs per stay is in the process of being developed. If the strictly clinical aspects of the stays can be parameterized, on the other hand, two issues need to be addressed: (1) the patients involved with PC require much counselling and psychosocial care and the duration of this care varies on a case-by-case basis;^{51,52} how, therefore, does one take into account this dimension in the definition of normalized costs?; (2) we noted an important variability of the lengths of stay

(which led us to analyse costs/day, and not costs/stay); is it then better to consider a model which remains based on complete stays, or on the contrary, to adopt a model of reimbursement based on the days of hospitalization?

Conclusion

This study makes two contributions: (1) it provides benchmarks of the costs, specific to specialized hospital-based PC units (the average cost per patient/day, a breakdown of the costs into their constituent elements); (2) it shows that patients hospitalized in PC units have hospital-stays which vary substantially and that they do not all mobilize the same amount of resources (€301–667 per day) despite their clinical condition, which is always disquieting. These differences are explained at the same time by elements specific to the PC units studied (and in particular by their level of human framing), but also by elements specific to the patients and their needs. The factors which best explain the variability in daily costs per patient in each type of unit are: the degree of the patient's anxiety (or that of the family), the closeness of death, extremity of dependence, having an ENT cancer, the provision of certain procedures and age.

From an economic point of view, this article raises three questions: (1) the relevance of the use of fixed prices/stay (compared to fixed prices/day of care); (2) the relevance of the use of a single fixed price, for the heterogeneous PC stays (compared to fixed prices modified according to the characteristics of the patients); (3) the relevance of the use of usual cost references (compared to standard costs of good professional practices with regards to PC). The recently selected solution in France, to finance these types of services at the MSO hospital, was to charge the stays of PC, according to the characteristics of the unit in which the patient is hospitalized: the rate is especially high if the care is delivered by a team recognized as PC – €9.051 per stay if the patient is hospitalized in a PC unit, €8.404 per stay if the patient is hospitalized in a traditional service with a 'dedicated bed' for PC, €6.465 per stay if the patient is hospitalized in a traditional service without a 'dedicated bed' for PC.⁵³ Moreover, daily subsidies are planned for the long stays (more than 35 days), in order not to penalize the hospitals of which the length of stay is high and to minimize the risk of premature exits (hasty returns home, transfers to other structures of care) for the patients and their family.

Acknowledgements

We could not have conducted this research without the financial support of the Fondation de France and of the Groupe de Recherche et d'Applications Hospitalières (GRAPH). We also thank the medical teams who

provided the data, the Advisory Panel^a associated with this study and Raj Dedhia (Northwestern University Feinberg School of Medicine, USA).

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