# DEAR GENERAL MANAGER: DOES YOUR PALLIATIVE CARE TEAM SUPPORTS YOUR BUDGET?

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## Introduction

It is well known that most of the healthcare expenditure in Western countries is generated at the end of life, within the last 6 months of life accounting for 40% of healthcare expenditure (1-2). This situation, combined with an ageing population in this part of the world, has led to a rapid growth in healthcare expenditure in recent years.

Certain studies demonstrate that palliative care teams (PCT) decrease the cost of clinical attendance in patients with advanced disease without reducing the quality of care, but most of this studies are focused on measure the impact of the home PCU on the number of hospitalizations, length of hospital stays, number and length stays in the Intensive Care Unit (ICU), chemotherapy use, hospital emergency room visits and readmissions at 30 days post-discharge (3-4).

The aim of this study, is to analyse the of end-of-life patient care cost during their last admission, comparing whether patients are hospitalized in the Palliative Care Unit (PCU) or in another Hospital Unit (Non-PCU).

## Methods

A retrospective, comparative, observational, resource consumption analysis, from the hospital perspective, was conducted on patients who died of advanced disease in Infanta Elena Hospital (IEH) during a three-year period (January 2016 to December 2018). IEH is a University District Hospital, located in Valdemoro, Community of Madrid, Spain, that has 135 admission beds and a palliative care unit (PCU) that assists between 8 and 14 admitted patients daily, staffed by a physician, a nurse, and a psychologist. Cost analysis, from the hospital perspective, was performed to compare the results between those who were attended in a PCU versus those attended in other departments (Non-PCU).

To ensure the homogeneity of the groups compared, only patients with palliative care needs and high mortality risk were included. Palliative Care needs were measured using NECPAL 4.0 (5). Mortality risk was measured using the Severity of Illness Index (SOI), and the Risk of Mortality (MOR) were used as mortality criterion (6). Children under 18 years of age, deaths from accidents or acute complications and patients admitted in agony (signs of imminent death) were excluded.

The main cost variables analysed per patient in the last hospital admission are and include:

- Pharmacological treatment cost: enteral nutrition and drugs administered (calculated for each pre- scribed drug and patient through the administered drug regimen and the unitary cost).
- Other intervention cost: surgeries, transfusions, laboratory and imaging tests performed.
- Last admission cost: pharmacological treatment and other interventions.
- Total daily cost: last admission cost divided into the hospital stay length.

### Table 1. Study Population

**Characteristics of the study population and their distribution according to whether they were treated or not in the Palliative Care Units (PCU) of Infanta Elena Hospital.**

| | Total | PCU | Non-PCU | p-value* |
|---|---|---|---|---|
| **N** | 1370 | 442 (32.3%) | 928 (67.7%) | |
| **Age**†: median IQR | 85 (5) | 85 (16) | 86 (11) | **p<0.001** |
| **Age**†: N (%) | | | | |
| < 75 years | 288 (21.0%) | 136 (30.8%) | 152 (16.4%) | **p<0.001** |
| ≥ 75 years | 1082 (79.0%) | 306 (69.2%) | 776 (83.6%) | |
| **Sex:** N (%) | | | | |
| Male | 666 (48.6%) | 230 (52.0%) | 436 (47.0%) | p= 0.080 |
| Female | 705 (51.4%) | 212 (48.0%) | 593 (53.0%) | |
| Year of death: N (%) | | | | |
| 2016 | 430 (31.4%) | 145 (32.8%) | 285 (30.7%) | p=0.086 |
| 2017 | 473 (34.5%) | 164 (37.1%) | 308 (33.2%) | |
| 2018 | 468 (34.1%) | 133 (30.1%) | 335 (36.1%) | |
| Severity Index: N (%) | | | | |
| 2 | 59 (4.3%) | 14 (3.2%) | 45 (4.8%) | p=0.307 |
| 3 | 684 (49.9%) | 228 (51.6%) | 456 (49.1%) | |
| 4 | 628 (45.8%) | 200 (45.2%) | 427 (46.0%) | |
| Mortality risk: N (%) | | | | |
| 3 | 639 (46.6%) | 212 (48.0%) | 427 (46.0%) | p=0.499 |
| 4 | 732 (53.4%) | 230 (52.0%) | 501 (54.0%) | |
| Diagnosis (DRG)***: N (%) | | | | |
| Oncological | 177 (12.9%) | 130 (29.4%) | 47 (5.1%) | **P <0.001** |
| Sepsis | 470 (34.3%) | 166 (37.6%) | 304 (32.7%) | p=0.078 |
| Respiratory disease | 357 (26.0%) | 76 (17.2%) | 281 (30.2%) | **p=<0.001** |
| Cardiovascular disease | 153 (11.2%) | 38 (8.6%) | 115 (12.4%) | **p=0.038** |
| Other heart disease | 67 (4.9%) | 14 (3.2%) | 53 (5.7%) | **p=0.042** |
| Liver or kidney failure | 47 (3.4%) | 7 (1.6%) | 40 (4.3%) | **p=0.010** |
| Other GI disease | 48 (3.5%) | 5 (1.1%) | 42 (4.5%) | **p=0.001** |
| Others | 52 (3.8%) | 6 (1.4%) | 46 (5.0%) | **p=0.001** |
| Length of hospital stay (days): median IQR | 5 (7) | 4 (5) | 6 (7) | **p<0.001** |

DRG: Diagnosis Related Group that caused the hospital admission; GI: GastroIntestinal; IQR: Inter-Quartile Range.
† Patients age at the time of last hospital admission.
* p-value significance level <0.05.
*** DRG levels that caused last hospitalization includes: Oncological (oncology or hematology neoplasms, lymphomas and neo-formations), Sepsis (infection or sepsis), Respiratory (pneumonia, bronchitis, chronic obstructive disease. ..), Cardiovascular disease (acute myocardial infarction, cardiovascular events, transient ischemic attack, convulsions, nervous system vascular diseases), Other heart disease (congestive heart failure and other heart failure), Kidney and liver failure (also hepatobiliary disorders), Other gastrointestinal diseases and Other diagnosis (mainly endocrine disorders, musculoskeletal diseases and trauma).

### Table 3. Cost assessment

**Cost assessment of dying in the hospital comparing between PCU and Non-PCU departments.**

| | Total | | PCU | | Non-PCU | | PCU vs Non-PCU | |
|---|---|---|---|---|---|---|---|---|
| Cost per patient (€) | Median | IQR | Median | IQR | Median | IQR | Median Difference | p-value** |
| **Pharmacological treatment cost** | €123.9 | €370.5 | €65.8 | €157.3 | €159.1 | €452.9 | -€93.3 | **p<0.001** |
| **Other interventions cost** | €214.0 | €347.5 | €152.0 | €226.0 | €244.0 | €383.8 | -€92.0 | **p<0.001** |
| Last admission total cost | €430.8 | €799.6 | €262.8 | €470.1 | €515.3 | €980.9 | -€252.5 | **p<0.001** |
| **Total daily cost** | €101.17 | €142.9 | €74.3 | €127.4 | €115.8 | €127.4 | -€41.5 | **p<0.001** |
| **Patients (N)** | 1331 | | 442 | | 928 | | | |

PCU: Palliative Care Unit; €: euros; IQR: Inter-Quartile Range.
** p-value significance level <0.05.

### Table 4. Univariate & Multivariate analysis

**Univariate analysis and backward multivariate analysis between the independent variables (DRG, department type, age and gender) and cost higher or lower than the median population (€107.17).**

| | | Univariate | | | Multivariate | | |
|---|---|---|---|---|---|---|---|
| | N | ≥€101,17n (%) | > €101,17n (%) | p-value* | OR | 95% CI | p-value* |
| **Diagnosis (DRG)** | | | | **0.012** | | | |
| Oncological | 173 | 86 (49.7%) | 87 (50.3%) | | 1,31 | 0.67,2.55 | 0.426 |
| Sepsis | 457 | 251 (54.9%) | 206 (45.1%) | | 1,09 | 0.60,1.97 | 0.783 |
| Respiratory disease | 346 | 179 (51.7%) | 167 (48.3%) | | 1,13 | 0.62,2.06 | 0,682 |
| Cardiovascular disease | 143 | 54 (37.8%) | 89 (62.2%) | | 2,15 | 1.11,4.16 | **0.022** |
| Other heart disease | 67 | 32 (47.8%) | 35 (52.2%) | | 1,43 | 0.68,3.01 | 0.340 |
| Hepatic or renal failure | 47 | 19 (40.4%) | 28 (59.6%) | | 1,50 | 0.66,3.41 | 0.328 |
| Other GI disease | 47 | 18 (38.3%) | 29 (61.7%) | | 1,72 | 0.76,3.89 | 0.194 |
| Other diagnosis | 51 | 27 (52.9%) | 24 (47.1%) | | — | — | |
| **Department Type** | | | | **<0.0001** | | | |
| Non-PCU | 898 | 406 (45.2%) | 492 (54.8%) | | 2,07 | 1.59,2.68 | **0.000** |
| PCU | 433 | 260 (60.0%) | 173 (40.0%) | | — | — | |
| **Age** | | | | **<0.0001** | | | |
| < 75 years | 278 | 106 (38.1%) | 172 (61.9%) | | 2,16 | 1.60,2.91 | **0.000** |
| ≥ 75 years | 1,053 | 560 (53.2%) | 493 (46.8%) | | — | — | |
| **Gender** | | | | 0.826 | | | |
| Male | 643 | 324 (50.4%) | 319 (49.6%) | | 0,99 | 0.79-1.23 | 0.904 |
| Female | 688 | 342 (49.7%) | 346 (50.3%) | | — | — | |

OR: Odds Ratio; CI: Confidence Interval; GI: Gastrointestinal.
** p-value significance level <0.05.

### Table 2. Resources Consumption

**Patients resource consumption in the last week of life depending on whether they were treated in palliative care units (PCU) or Non-PCU.**

| Total number of patients N (%) | PCU | Non-PCU 442 (32.3%) | p-value* 928 (67.7%) |
|---|---|---|---|
| **Hospital length stay (days)** Median (IQR) | 4 (5) | 6 (7) | **p<0.001** |
| **Laboratory Tests done:** Median (IQR) | 2 (3) | 4 (4) | **p<0.001** |
| **CT Scan**** N (%) | 63 (14.3%) | 241 (26.0%) | **p<0.001** |
| **X-ray test**** N (%) | 305 (69.0%) | 785 (82.9%) | **p<0.001** |
| **Parenteral Nutrition** N (%) | 69 (15.6%) | 195 (21.0%) | **p=0.018** |
| **Surgeries**** N (%) | 4 (0.9%) | 46 (5.0%) | **p<0.001** |
| **Transfusions**** N (%) | 47 (5.0%) | 14 (3.2%) | p=0.235 |
| **Total number of drugs prescribed in the last day of life:** Median (IQR) | 18 (11) | 20 (12) | **P<0.001** |
| - **Number of drugs as scheduled prescription:** | 14 (8) | 17 (9) | **P<0.001** |
| - **Number of "as needed" (PRN) drugs:** | 3 (2) max:11 | 3 (2) max:7 | **P=0.001** |

PCU: Palliative Care Unit; %: percentage; IQR: Inter-Quartile Range; CT-scan: Computerized Tomography Scan PRN: *pro re nata*.
* p-value significance level <0.05.
** Patients who had at least one.

## Results

Of the 1,833 patients who died at IEH between January 2016 and December 2018, 1,591 had palliative needs (NECPAL+), 1,370 met the inclusion criteria, 442 from PCU and 928 Non-PCU. 221 patients excluded, 202 Non-PCU because their mortality risk was ≤ 2 and 19 PCU because they were admitted with terminal sedation.

Univariate analysis to assess homogeneity of the groups of patients seen or not by the PCU showed no differences by severity index or mortality risk between the groups (Table 1).

Table 2 shows a lower consumption of resources when patients were attended by the PCU.

The cost assessment results demonstrates that cost are significantly lower in the PCU patients compared to Non-PCU (Table 3)

Table 4 shows the multivariate analysis results when we include DRG, department type, age group, and gender to determine which variables has a statistically significant influence on having a cost higher than the population median (€101,17) the cost per patient.


## Discussion

Although there are some different baseline characteristics per DRG and age, our study results indicate that patients who died between January 2016 and December 2018, hospitalized in the IEH PCU, **had lower direct hospital costs** during their last admission than patients with the same level of severity and mortality risk seen admitted in Non-PCU. This difference is clearly significant in both overall and daily costs, **with a total daily cost in the PCU of €74.3 compared to €115.8 in Non-PCU.**

Increasingly, patients in the last of life with multiple or complex diseases have palliative needs. This patient profile is usually admitted to units with high scientific and technical levels, but with a lack of training in palliative care, provide no benefits and incur high costs for the health-care system. For this reason, as it has already been initiated, we consider that knowledge of palliative care should be integrated into the training programs of these specialties.

Using all available means to prolong survival of patients under their care, **not taking an initial approach that considers the obtainable risk-benefit**, depending on the therapeutic effort of each intervention, could be the reason why patients not seen by the PCU have had a slightly longer survival, without achieving an objective benefit. In contrast, the approach focused on the suitability of therapeutic effort by the PCU is based on a clinical approach that is, from the viewpoint of the authors of this research, more appropriate and **whose clinical decision-making is based on avoiding using not proportional measures that prolong survival without improving quality of life when cure is not possible, fully applying the provisions of article 36.1 of the Code of Medical Ethics.**

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