Diagnostic evaluation of patients with symptoms suggestive of cancer in a hospital ambulatory setting: Comparative analysis by micro-costing of quick diagnosis clinics

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Abstract

Rationale, Aims, and Objectives Quick diagnosis units, a paradigmatic innovative model of hospital ambulatory medicine in Spain, are suggested to be cost-effective. While former studies have been conducted as cost analyses of single units or comparative analyses between these patients and inpatients hospitalized for the same condition, how cost outcomes compare between units of different hospitals and different levels of complexity is unknown. Using micro-costing, the costs of patients managed at quick diagnosis units from a tertiary and a secondary hospital were compared. Methods The study population included 407 patients from each unit who were evaluated over 8 years. Through a bottom-up approach, we analyzed all single cost components that contributed to the mean total cost per patient in both units. Results Patients from the tertiary hospital unit were more likely than those from the secondary hospital to be referred for cancer suggestive symptoms, to have a diagnosis of cancer, and to be referred from the emergency department. Although the ratio of successive/first visits was 3.098 ± 0.6584 in the tertiary vs. 2.123 ± 0.2171 in the secondary hospital unit (P=0.0064), the time to diagnosis was significantly longer in the latter. With a similar mean cost per visit, the cost per patient was \euro577.5 ± \euro219.6 in the tertiary vs. \euro394.7 ± \euro92.58 in the secondary hospital unit (P=0.0559). Personnel and indirect costs including both the monetary estimate and their percent contribution to the mean cost per patient accounted for the main differences between units. Conclusion The ratio of successive/first visits was the main driver of cost differences. A greater complexity of patients from the unit of the tertiary hospital and the inherent characteristics of this type of hospital including volume of patients and staff and staff time justified the differences in the ratio of visits and the cost outcomes.

INTRODUCTION

Once an admirable model of universal healthcare, the Spanish public system suffered a severe financial downturn at the time of the last recession with repercussions at multiple levels. In addition to provision of basic health services, health outcomes of population were affected in a system already strained by many years of structural and financial debts and perpetually slanted toward acute inpatient care [1,2]. Yet public authorities did not take the opportunity to reorganize and improve public healthcare services and lessen the financial burden, with some notable exception. The realization that hospitalizations and hospital care were one leading cause of excessive healthcare expenses opened the way for a shift from traditional 'bed-based' inpatient care to hospital-based ambulatory and outpatient care services [3,4]. A systematic review recently published in*JAMA Internal Medicine* showed that alternative ambulatory approaches to inpatient care for patients with medical conditions were associated, as compared to traditional inpatient admission,

with similar health outcomes and similar or higher patient-reported satisfaction levels but at significantly lower costs [5]. These alternative models for conditions conventionally designed to require hospitalization include, to mention a few, observation units, hospital-at-home, daycare hospitals, and quick diagnosis units. While the former were developed decades ago and extended to additional medical conditions in recent years, quick diagnosis units became a new paradigm of innovation in hospital ambulatory medicine in the 2000s [3-5]. By sidestepping unnecessary and expensive admissions for purely diagnostic purposes, today these units represent a well-established healthcare delivery model conceived to achieve quick diagnoses for patients complaining of potentially severe diseases, most notably cancer [5-8].

Although limited, available reported data suggest that the quick diagnosis unit approach may be cost-effective. Studies evaluating the cost outcomes of these units have been reported as non-comparative cost analyses of single units [9,10] or with the standpoint of comparing the costs of these patients with those of inpatients hospitalized for the same condition [11-13]. These investigations have been valuable for the objective assessment of the actual costs incurred by quick diagnosis units of single centers. However, how cost outcomes compare between units of different hospitals is unknown. Such cost-comparison evaluation could add a broader and useful perspective to the economic potential of these units within the new model of hospital ambulatory medicine and hospital-based care in general.

The objective of this study was to investigate the costs incurred by patients with potentially severe diseases managed at two quick diagnosis units of hospitals with different levels of complexity in Barcelona. A micro-costing analysis based on resource consumption data from the two centers was applied.

METHODS

Settings

This study was conducted in the quick diagnosis unit of a public tertiary university hospital with 855 beds and a reference population of 550,000 (Tertiary Unit) and the quick diagnosis unit of a second-level district hospital with 160 beds (Secondary Unit), both in Barcelona. The latter is the healthcare provider for a population of 140,000 inhabitants. Both units are integrated in the internal medicine departments of their respective hospitals.

The structure, indications for referral, and operating procedures of these units have been reported previously [6,10,14,15]. Briefly, they work as ambulatory clinics evaluating patients with suspected severe disorders whose general physical condition is acceptable enough to enable them to go to hospital for investigations and appointments, then back to home. The clinical indications for referral to both units are the same. The general working protocol of both consists of a rapid first appointment after referral from primary care centers or the emergency departments of the hospitals (usually within 5 days), followed by preferential programming of diagnostics tests and subsequent visits until a diagnosis is made. Staff at the unit of the tertiary hospital includes a consultant general internist, a senior internal medicine resident, nursing, and administrative staff. The unit is open 5 days a week [11,12]. In contrast, the unit of the secondary hospital is staffed with two part-time general internists as well as administrative personnel [10,15].

Population and data description

Data for analysis were collected from January 2009 to December 2016. The study base population consisted of 407 patients from each unit. While 407 was the actual number of consecutive patients evaluated at the Secondary Unit during the 8-year period, we selected a random sample of 407 from 6,960 consecutive patients evaluated at the unit of the tertiary center during the same period. By using online random sampling software (*https://www.randomizer.org/*), randomization was performed for each year of the study to match the annual number of patients of the secondary hospital unit.

Computerized medical records stored in the information systems of the hospitals were compiled. Demographic, clinical, and economic data were analyzed to determine the patient sample and calculate the costs. Data collected included age, gender, referral sources, time-to diagnosis, ratio of successive/first visits, clinical indications for referral, and final diagnosis. For the study purpose, indications for referral were dichotomized

into symptoms suggestive of cancer vs. other symptoms and final diagnosis was subdivided into malignant vs. nonmalignant diseases. The study was carried out in line with the principles of the Declaration of Helsinki. Approvals were granted by the research ethics committee of the tertiary university hospital and the network of hospitals to which the second-level hospital belongs to (Comitè d'Ètica de la Investigació Clínica [CEIC]-Unió Catalana d'Hospitals). Need for informed consent was waived due to the retrospective design of this study.

Cost determination and calculation

The costs generated during the diagnostic evaluation process of both units were analyzed based on a bottom-up approach (micro-costing) by which all services provided are collected exhaustively and corresponding prices are allocated. Micro-costing approaches stipulate all the resources spent in the provision of healthcare service [16,17]. The micro-costing analysis of this study was performed from the healthcare provider perspective and, for all included patients, relevant costs were obtained from the finance departments of the two hospitals.

The primary outcome variable of the study was the mean cost per patient. This cost was determined by summing all the single cost components that contributed to patient management until a diagnosis was made (i.e. from the first to the last visit). Personnel costs were calculated according to the staff time dedicated to each unit (clinicians, nursing, and administrative staff). These costs corresponded to the cumulative work time dedicated multiplied by the average hourly income of the staff category. The costs of diagnostic procedures including laboratory and pathology investigations, imaging examinations and endoscopies, and biopsy and cytology techniques were directly calculated using the unit cost of each test as provided by the respective finance departments. Direct costs attributable to specialist consultation and referral of patients were also incorporated. Indirect and structural costs were finally imputed to the computation. We determined the percentage distribution of direct, structural, and indirect costs relative to the mean total cost per patient. Another variable of interest for the study was the mean cost per visit. Neither costs borne by patients nor costs of referring agencies were included in the analysis. All costs were adjusted to the corresponding year (i.e. from January 2009 to December 2016) and were measured in Euros (\euro).

Statistical analysis

Categorical data were compared with the $\chi 2$ or Fisher's exact test, as appropriate, and results are reported as absolute and relative frequencies. Quantitative variables with a normal distribution were compared with t tests and results are reported as the mean and standard deviation (SD), while variables with a skewed distribution were compared with the nonparametric Mann-Whitney U test and results are expressed as the median and interquartile range (IQR). The threshold for significance was set at P <0.05 (all tests 2-tailed). All analyses were performed with GraphPad Prism v8 (GraphPad Software, San Diego, CA).

RESULTS

Study population

The general characteristics of the patients from both units are displayed in Table 1. No significant differences were observed in the mean age. Patients from the Tertiary Unit were significantly more likely than those from the Secondary Unit to be referred from the emergency department (61.2 vs. 17.0%, respectively;P <0.0001), to be referred with symptoms suggestive of cancer, and to have a final diagnosis of malignancy. While the ratio of successive/first visits in the Tertiary Unit was significantly higher than that in the secondary center unit (3.098 ± 0.6584 vs. 2.123 ± 0.2171, respectively;P =0.0064), the mean time to diagnosis was significantly shorter in the former (8 [IQR, 4-13] vs. 12 [1-28], respectively;P <0.0001) (Table 1).

Cost outcomes

Tables 2 and 3 show the primary outcomes of the study from the service-provider perspective. The mean total cost per patient of the Tertiary Unit was moderately higher than that of the Secondary Unit but the difference was not statistically significant (\euro577.5 ± \euro219.6 vs. \euro394.7 ± The mean cost per

visit of both units was quite similar (\euro182.8 ± \euro41.47 in the Tertiary vs. \euro184.6 ± Unit; P =0. 0.9056). An analysis of general costs revealed that direct and structural costs per patient of the two units were not significantly different. Conversely, indirect costs of the Tertiary Unit were significantly higher than those of the secondary center unit (\euro49.93 ± \euro19.90 vs. \euro12.42 ± \euro2.344, respectively; P =0.0018) (Table 2).

An individual assessment of the five single components of direct costs showed that personnel costs were significantly higher in the Tertiary (\euro68.75 ± \euro14.90) than in the Secondary Unit (\euro36.90 ± costs were slightly but nonsignificantly higher in the former (\euro197.6 ± \euro111.6 vs. direct cost components, namely imaging and endoscopy, biopsy and cytology techniques, and specialist consultation and referral were not significantly different (Table 3).

We further calculated the percentage contribution of each cost component to the mean cost per patient. In both units, direct costs accounted for the largest proportion of cost per patient without significant differences (79.13 percent [95% confidence interval, 77.12-81.14] in the Tertiary vs. 81.15 percent [77.53-84.76] in the Secondary Unit; P =0.3327). However, the percentage contribution of indirect costs to the mean cost per patient was significantly higher in the unit of the tertiary center (8.595 [8.377-8.813] vs. 3.284 percent [2.618-3.950], respectively; P <0.0001) (Table 2).

When looking at the rate of sharing of each fraction of direct costs in the mean cost per patient, laboratory and pathology and imaging and endoscopy costs accounted for the largest amount, with a significantly higher percentage contribution of imaging and endoscopy costs in the secondary vs. tertiary center unit. Whereas costs of biopsy and cytology techniques and specialist consultation and referral accounted for a tiny fraction of the cost per patient in both units without relevant differences, the average contribution of personnel costs was significantly higher in the Tertiary compared to the Secondary Unit (12.58 percent [10.64-14.51] vs. 9.746 percent [8.029-11.46], respectively;P =0.0373) (Table 3).

We also examined the relevant costs of patients from both units according to clinical data (Tables 4 and 5). Patients referred for symptoms suggestive of cancer and those with a final diagnosis of cancer were more often referred from the emergency department to the unit of the tertiary center and from primary care centers to the Secondary Unit (P <0.0001 in both cases). For patients referred for symptoms suggestive of cancer, no significant differences were observed in the mean cost per patient between the Tertiary and the Secondary Unit (\euro782.52 ±P =0.0537) (Table 4). Likewise, there were no significant differences in the cost per patient between the Tertiary and the Secondary Unit with regard to a final diagnosis of malignancy (\euro1,069.17 ± \euro218.64 vs. \euro827.65 ± \euro151.83, respectively; P =0.0871) (Table 5). Consistent with the results of the main analysis, cost differences continued to lie in personnel and indirect costs both for patients referred for symptoms suggestive of cancer (Table 4) and for patients with a final diagnosis of cancer (Table 5).

DISCUSSION

We performed an analysis of costs using micro-costing techniques to determine and compare the costs associated with the diagnostic evaluation of ambulatory patients managed at two different quick diagnosis units in Barcelona. Our study showed that the mean cost per patient was moderately but nonsignificantly higher in the unit of the tertiary hospital compared to the unit of the secondary center. However, costs of personnel and indirect costs of the former were significantly higher, and this was true both for the monetary value and the percent contribution of these costs to the mean cost per patient.

Although quick diagnosis units have multiplied across tertiary and secondary Spanish hospitals during the last 15 years, reported investigations about their role as an alternative ambulatory care model to inpatient admission come just from a few centers [6,9,15,18,19]. A recent comparative study between the units reported in this study revealed that the overall clinical efficiency and performance of both in the diagnostic evaluation of patients with predefined referral criteria and suspected serious conditions were similar [15]. In general, observational studies have concluded that the clinical efficiency of quick diagnosis units is similar to that of conventional hospitalization for diagnostic purposes but that the costs associated with the ambulatory

management of these patients are lower than the costs applied to the same conditions in the inpatient setting [7,9,11-13,15,20,21]. Two systematic reviews by authors from the United States investigated all reported articles about quick diagnosis units and found that the average savings from fixed costs of hospitalization ranged from \euro1,764 to \euro2,514 per patient in the quick diagnosis unit model compared to inpatient matched controls. Further, an economic saving of 7 to 8.76 inpatient beds per day was reported [5,8]. As far as we can tell, ours is the first study to compare the costs associated with the diagnostic assessment of patients managed at different quick diagnosis units.

Though limited to the Spanish public system, a healthcare model similar to quick diagnosis units was implemented nationally in Scandinavian countries in the early 2010s. The differentiated approach consisted of an urgent referral pathway for patients with unspecific, serious symptoms, who were referred from primary care centers to the so-called 'diagnostic centre', a unit staffed with several specialists and equipped with a sort of facilities for diagnostic investigations. Although results from several studies of patients evaluated through this pathway showed high-quality indicators [22,23], no reports analyzing the associated costs have been published.

The differences in the costs of personnel and indirect costs observed in our study must be interpreted considering the similarities and differences of the two units and their respective hospitals. Patients managed at the tertiary hospital are often referred from smaller, secondary hospitals including the second-level hospital reported here. Unlike the latter, the tertiary hospital has a full complement of services, highly specialized staff, and high technological equipment. Although the clinical indications for referral and working procedures of both units are similar, the volume of patients evaluated, the number of staff, and the contribution of staff time in the unit of the tertiary center are considerably greater.

A salient finding of our study was the similarity of the mean cost per visit between the two units (\euro183 for the Tertiary vs. \euro185 for the Secondary Unit). Yet the mean ratio of successive/first visits was significantly higher in the former (3.1 vs. 2.1, respectively). Therefore, although not statistically significant, the reported differences in the mean cost per patient between the Tertiary and the Secondary Unit (577.5 $\pm$ 219.6 vs. 394.7 $\pm$ 92.58, respectively; P =0.0559) ought to be mainly ascribed to the higher number of total visits in the former. Despite these differences, however, patients from the tertiary center unit needed significantly less days to be diagnosed than those from the Secondary Unit (8 vs. 12 days, respectively; P <0.0001). As previously reported [5,8], time to diagnosis is considered an indicator of high-healthcare quality in quick diagnosis units.

The analysis of clinical data revealed some notable differences. The emergency department was the referral source of 61% of patients from the Tertiary but only 17% of patients of the Secondary Unit and these differences were more pronounced for patients referred for symptoms suggestive of cancer and patients with a diagnosis of cancer, with approximately 65% of them being referred from the emergency department in the Tertiary vs. 16% in the Secondary Unit. Compared to patients from the secondary center unit, those from the Tertiary Unit were more likely to be referred with cancer suggestive symptoms and have a final diagnosis of malignancy. In general, patients from the Secondary Unit presented with less severe and 'urgent' conditions than those from the Tertiary Unit including, among others, unexplained tiredness, laboratory test abnormalities, and osteoarticular symptoms. This different pattern was reflected by the fact that primary care centers and not the emergency department were the main source of referral of patients to the unit of the second-level hospital. A former study showed that, with a lower number of total visits and a longer time to diagnosis**,** patients from this unit required fewer investigations to achieve a diagnosis than patients from the unit of the third level center [15]. Taken together, these results suggest that a greater complexity of the medical disorders evaluated at the tertiary center unit most likely accounted for the differences in the mean ratio of successive/first visits and, consequently, the differences in the mean cost per patient between the two units.

Implications

Considering our results, we envisage some practical applications from a health policy perspective. Both

hospitals belong to the same health area in Barcelona and the tertiary hospital is the referral center for patients managed at the second-level hospital. However, their quick diagnosis units are independent and not interconnected. It is, however, feasible to design a functional model with integrated quick diagnosis units of the same health areas with shared working protocols and resources. Accordingly, patients could be referred to these units depending on the complexity of their disorders or the availability of spaces in the unit, or they could also be referred based on criteria of efficiency or cost optimization, irrespectively of whether they were referred from primary care centers or the emergency department.

Limitations

In addition to its retrospective nature, the study did not include the costs related to the miles driven by the patient or anyone accompanying them nor the contribution of patients' and caregivers' time (i.e., a societal perspective). Nonetheless, based on a former study of patients from the unit of the tertiary center that included costs of patient transportation to and from the unit and costs of accompanying personnel [9], this issue is unlikely to undermine the general levels of costs. An additional limitation of the study is the fact that the quick diagnosis unit care delivery approach seems unique to the Spanish National Health System, which precludes a generalizability of the results.

Conclusions

Our investigation found that the chief driver of the cost differences between the quick diagnosis units of a tertiary and secondary hospital was the ratio of successive/first visits. Although a higher total number of visits and successive/first visits ratio resulted in a higher mean total cost per patient in the unit of the tertiary hospital, statistical significance was not reached. Significant differences were only observed for costs of personnel and indirect costs, which were higher in the unit of the tertiary center. A greater diagnostic and clinical complexity of the patients managed at this unit added to the own characteristics of this type of major hospital such as the volume of patients and staff and the contribution of staff time were the leading factors contributing to the observed differences.

The results from this study justify additional research efforts to replicate and validate the favorable economic outcomes of these units in other healthcare settings and inform policy decisions on spending priorities that are relevant for hospital-based ambulatory care and quick diagnosis units.

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CONFLICT OF INTEREST

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Table 1. General characteristics of patients evaluated at the quick diagnosis unitsof the tertiary teaching hospital (Unit 1-HCB) and the second-level hospital(Unit 2-HP) during 8 years

	Tertiary Unit (n=407)	**Secondary Unit (n=407)**	*P* **value**
Age (years), mean ± SD	60.9 ± 17.54	62 ± 20.00	0.1524
Sex, n (%)			0.0351
Female	208 (51.1)	228 (56.0)	
Male	199 (48.9)	179 (44.0)	
Referral departments & centers, n (%)			
Emergency department	249 (61.2)	69 (17.0)	<0.0001
Primary care	130 (31.9)	281 (69.0)	
Outpatients clinics	20 (4.9)	49 (12.0)	
Other	8 (2.0)	8 (2.0)	
Indication for referral, n (%)			0.0012
Symptoms suggestive of cancer	135 (33.2)	106 (26.0)	
Other symptoms	272 (66.8)	301 (74.0)	
Ratio of successive/first visits, mean ± SD	3.098 ± 0.6584	2.123 ± 0.2171	0.0064
Final diagnosis, n (%)			0.0020
Malignancy	80 (19.7)	58 (14.3)	
Non-malignant disease	327 (80.3)	349 (85.7)	
Time-to-diagnosis (days)			<0.0001
Mean ± SD	11.40 ± 6.75	23 ± 34	
Median (interquartile range [IQR])	8 [4-13]	12 [1-28]	

Table 2. Generalcost s and percent contribution to mean cost per patient by center

	Tertiary Unit (n=407)	**Secondary Unit (n=407)**	*P* **value**
Total cost/patient (\euro)**,** mean ± SD	577.5 ± 219.6	394.7 ± 92.58	0.0559

	Tertiary Unit (n=407)	**Secondary Unit (n=407)**	***P* value**
Total cost/visit (\euro), mean ± SD	182.8 ± 41.47	184.6 ± 29.41	0.9056
Direct costs/patient (\euro)			
Mean ± SD	459.8 ± 183.2	321.7 ± 85.05	0.0750
Percentage contribution to mean total cost/patient, mean (95% confidence interval [95% CI])	79.13 [77.12-81.14]	81.15 [77.53-84.76]	0.3327
Structural costs/patient (\euro)			
Mean ± SD	67.78 ± 19.17	60.51 ± 16.18	0.4793
Percentage contribution to mean total cost/patient, mean [95% CI]	12.28 [10.05-14.51]	15.57 [12.24-18.90]	0.1285
Indirect costs/patient (\euro)			
Mean ± SD	49.93 ± 19.90	12.42 ± 2.344	0.0018
Percentage contribution to mean total cost/patient, mean [95% CI]	8.595 [8.377-8.813]	3.284 [2.618-3.950]	<0.0001

Table 3. Distribution of direct cost components and their percent contribution to mean cost per patient by center

	Tertiary Unit (n=407)	**Secondary Unit (n=407)**	***P* value**
Personnel (\euro)			
Mean ± SD	68.75 ± 14.90	36.90 ± 3.276	0.0011
Percentage contribution to mean total cost/patient, mean [95% CI]	12.58 [10.64-14.51]	9.746 [8.029-11.46]	0.0373
Laboratory & Pathology (\euro)			
Mean ± SD	197.6 ± 111.6	96.63 ± 34.44	0.0729
Percentage contribution to mean total cost/patient, mean [95% CI]	32.60 [22.63-42.56]	25.78 [18.22-33.33]	0.2098
Imaging & Endoscopy (\euro)			
Mean ± SD	169.5 ± 81.80	157.4 ± 73.94	0.5956

	Tertiary Unit (n=407)	**Secondary Unit (n=407)**	***P* value**
Percentage contribution to mean total cost/patient, mean [95% CI]	29.36 [23.44-35.28]	38.36 [30.73-45.99]	0.0060
Biopsy & cytology techniques (\euro)			
Mean ± SD	19.67 ± 10.48	23.34 ± 26.54	0.6042
Percentage contribution to mean total cost/patient, mean [95% CI]	3.678 [2.152-5.203]	5.478 [1.551-9.404]	0.3524
Specialist consultation & referral (\euro)			
Mean ± SD	4.273 ± 2.780	7.503 ± 4.854	0.2227
Percentage contribution to mean total cost/patient, mean [95% CI]	0.9188 [0.3693-1.468]	1.789 [1.148-2.430]	0.0804

Table 4 . General characteristics and costs in patients referred for symptoms suggestive of cancer

	Tertiary Unit (n=135)	**Secondary Unit (n=106)**	***P* value**
Age (years), mean ± SD	64.34 ± 13.60	62.24 ± 19.71	0.1163
Sex, n (%)			0.2349
Female	61 (45.2)	51 (48.1)	
Male	74 (54.8)	55 (51.9)	
Referral departments & centers, n (%)			<0.0001
Emergency department	88 (65.2)	17 (16.0)	
Primary care	39 (28.9)	63 (59.4)	
Outpatients clinics	8 (5.9)	23 (21.7)	
Other	0 (0.0)	3 (2.8)	
Final diagnosis, n (%)			0.0499
Malignancy	55 (40.7)	37 (34.9)	
Non-malignant disease	80 (59.3)	69 (65.1)	
Time-to-diagnosis (days)			0.0001
Mean ± SD	10.22 ± 6.03	19.53 ± 26.12	
Median [IQR]	7 [5-9]	12 [5.00-25.75]	
Direct costs/patient (\euro), mean ± SD			
Personnel	76.50 ± 18.37	43.16 ± 4.34	0.0375

	Tertiary Unit (n=135)	**Secondary Unit (n=106)**	*P* **value**
Laboratory & Pathology	243.55 ± 120.45	119.10 ± 42.62	0.0683
Imaging & Endoscopy	311.65 ± 93.12	289.40 ± 108.71	0.7759
Biopsy & cytology techniques	36.24 ± 12.18	42.37 ± 35.20	0.8344
Specialist consultation & referral	6.70 ± 2.53	11.76 ± 5.80	0.1520
Structural costs/patient (\euro), mean ± SD	48.22 ± 15.78	43.05 ± 16.55	0.9315
Indirect costs/patient (\euro), mean ± SD	59.66 ± 21.13	14.84 ± 2.38	<0.0001
Total cost/patient (\euro), mean ± SD	782.52 ± 191.56	562.21 ± 94.55	0.0537

Table 5 . General characteristics and costs in patients with a final diagnosis of malignancy

	Tertiary Unit (n=80)	**Secondary Unit (n=58)**	*P* **value**
Age (years), mean ± SD	65.23 ± 15.77	68.28 ± 15.96	0.1425
Sex, n (%)			0.0410
Female	36 (45.0)	31 (53.4)	
Male	44 (55.0)	27 (46.6)	
Referral departments & centers, n (%)			<0.0001
Emergency department	52 (65.0)	9 (15.5)	
Primary care	23 (28.8)	35 (60.3)	
Outpatients clinics	4 (5.0)	12 (20.7)	
Other	1 (1.3)	2 (3.4)	
Indication for referral, n (%)			0.1311
Symptoms suggestive of cancer	55 (68.8)	37 (63.8)	
Other symptoms	25 (31.3)	21 (36.2)	
Time-to-diagnosis (days)			0.0586
Mean ± SD	9.52 ± 5.77	13.33 ± 14.81	
Median [IQR]	7.5 [4.5-11]	8 [2-21]	
Direct costs/patient (\euro), mean ± SD			
Personnel	78.30 ± 19.01	46.55 ± 3.89	0.0493
Laboratory & Pathology	250.62 ± 117.43	122.56 ± 49.72	0.1103
Imaging & Endoscopy	453.04 ± 110.20	420.70 ± 141.12	0.8253

	Tertiary Unit (n=80)	**Secondary Unit (n=58)**	*P* **value**
Biopsy & cytology techniques	61.16 ± 17.90	75.33 ± 51.86	0.4059
Specialist consultation & referral	9.03 ± 2.21	15.85 ± 6.44	0.2398
Structural costs/patient (\euro), mean ± SD	155.23 ± 68.39	138.58 ± 18.26	0.9072
Indirect costs/patient (\euro), mean ± SD	61.79 ± 29.30	15.37 ± 2.59	<0.0001
Total cost/patient (\euro), mean ± SD	1,069.17 ± 218.64	827.65 ± 151.83	0.0871