Journal of Integrative Nursing and Palliative Care (JINPC)

Original Article

Volume 4 | Page 75-83

Evaluating the Costs, Outcomes, and Efficiency of Three Models of Palliative Care Day Services in the UK: A Pragmatic Cohort Study

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Abstract

Palliative Care Day Services (PCDS) provide multidisciplinary support for individuals living with advanced or terminal illnesses. Although their use has expanded across the UK, limited empirical evidence exists on their cost implications and overall impact. Understanding their value is crucial to guide informed resource allocation in health and social care. This study investigates the financial and outcome-related aspects of three PCDS models implemented in England, Scotland, and Northern Ireland. A pragmatic, before-and-after cohort design was used to evaluate participants referred to PCDS between June 2017 and September 2018. Data on service use and related expenditures during the four weeks prior to attendance were collected using adapted Client Service Receipt Inventory (CSRI) tools. Costs per participant per day, alongside the monetary value of volunteer involvement, were calculated. Participant outcomes were assessed using the McGill Quality of Life–Expanded (MQOL-E), EQ-5D-5L, and ICECAP-Supportive Care Measure (ICECAP-SCM) instruments. Thirty-eight participants provided complete data at baseline and four weeks (centre 1: n = 8; centre 2: n = 8; centre 3: n = 22). Daily costs per participant ranged from £121–£190 without, and £172–£264 with, volunteer contributions. Volunteers accounted for 28–38% of the total cost of delivering PCDS. Across all centres, changes in mean costs and outcomes after four weeks were not statistically significant: total costs (centre 1: £570; centre 2: −£1127; centre 3: £65), MQOL-E (−0.48; 0.01; 0.24), EQ-5D-5L (0.05; 0.03; −0.03), and ICECAP-SCM (0.00; −0.01; 0.03). Scenario modelling indicated that unit costs per attendee could nearly double if attendance levels were constant between centres. Volunteers represent a substantial and often under-recognized component of PCDS delivery costs. However, across the three UK configurations studied, no conclusive evidence was found for improvements in cost efficiency or participant outcomes. The study outlines methodological insights and proposes directions for future evaluations of PCDS cost-effectiveness.

Keywords: Palliative care day services, Economic evaluation, Volunteer contribution, Health outcomes, End-of-life care

Introduction

Palliative Care Day Services (PCDS) have emerged as a model of support for individuals with life-limiting conditions who are able to regularly attend dedicated centres for assistance with symptom management, as well as emotional, psychological, and social needs [1, 2]. In addition to patient support, these services often provide respite opportunities for family members and caregivers [3]. Within the UK, the operation of PCDS falls under

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Received: 19 May 2023; **Revised:** 28 September 2023; **Accepted:** 04 October 2023; **Published:** 21 December 2023

How to Cite This Article: Topa G, Bona C, Molas-Tuneu M. Evaluating the Costs, Outcomes, and Efficiency of Three Models of Palliative Care Day Services in the UK: A Pragmatic Cohort Study. J Integr Nurs Palliat Care. 2023;4:75-83. https://doi.org/10.51847/zYiPqSa6ZS

the oversight of the respective Departments of Health in England, Scotland, Wales, and Northern Ireland; however, these services are not directly managed by government authorities. Instead, delivery is typically undertaken by charitable or voluntary sector organisations commissioned to provide care. Although professional standards and national care frameworks govern staffing, management, and facilities across the UK [4–6], the devolved nature of health and social care results in variation between the four nations, contributing to differences in how PCDS are structured and delivered [7, 8].

Despite steady growth over the last two decades, there remains limited evidence regarding the cost and impact of PCDS. Existing studies are geographically concentrated in London and the South East of England, and reported costs vary widely among different models of palliative care [9]. For instance, a 1999 study across five southern England centres estimated daily costs at approximately £79 per person (2018 value), increasing to £109 when volunteer input was factored in [10]. In contrast, a 2010–2011 single-centre study from London estimated a day hospice visit to cost £158 per person (2018 value), excluding volunteer time [11].

Uncertainty persists regarding whether PCDS function as replacements for, or as complements to, other community or hospital-based services. This distinction is critical for understanding their overall economic impact. Findings from one quasi-experimental study in South East England indicated that PCDS tended to supplement, rather than reduce, other service use, without specifying the additional costs involved [12]. Earlier research, however, suggested that PCDS might substitute for home nursing or general practitioner care and that such services were not widely available in 1999 [10]. Quantitative evidence on PCDS effectiveness also remains sparse [2].

To address these evidence gaps, the present study aimed to estimate and compare the costs and effects of PCDS delivered across a wider geographical spread in the UK, contributing to a more comprehensive national understanding of their value.

Materials and Methods

Setting

Three centres were selected based on the availability of dedicated research staff and established collaborative links with the study team. Preliminary mapping of these services provided insight into operational characteristics, common features, and distinctions across sites, which informed study design. Recruitment was conducted through three hospices—one each in England, Scotland, and Northern Ireland—offering PCDS that combined medical, nursing, and allied health input with social and psychological support. Centres operated three to five days weekly, providing 12–15 places per day, with typical attendance averaging between 6 and 12 participants [13].

Study design

A pragmatic before-and-after descriptive cohort design was used to include both PCDS attendees and their nominated close persons—family members, friends, or informal carers [14]. Ethical and governance approvals were obtained from each participating hospice, and overall approval was granted by the NHS Health Research Authority West Midlands – Solihull Research Ethics Committee (Ref: 17/WM/0100).

Sample

Eligible participants were individuals newly referred to PCDS, either as outpatients or as part of broader supportive care pathways. Inclusion required sufficient physical and cognitive functioning, assessed by nursing staff during the first visit using clinical judgement and validated measures. Individuals were excluded if their Australian Karnofsky Performance Scale Index was ≤40 [15], their ECOG Performance Status ≥3 [16], or their Abbreviated Mental Test score ≤6 [17]. Participants could complete questionnaires independently, jointly with a nominated close person, or with researcher assistance. Exclusion criteria included inadequate English proficiency for consent and data collection, age under 18 years, or residence in a care home (as the focus was community-dwelling individuals).

All participants provided informed consent after reviewing study information sheets and discussing the research purpose with a team member. Consent was maintained throughout data collection using a continuous “process consent” approach [18]. Attendees were invited to identify a close person to participate, and were provided with an introductory letter to pass on; however, inclusion in the study was not contingent upon a close person’s participation.

Data

To fulfil the study objectives, a nine-month recruitment period was established, informed by previous reviews of PCDS attendance patterns. The intended sample size was 113 attendees and an equal number of nominated close persons across the three participating centres (centre 1: n = 45; centre 2: n = 27; centre 3: n = 41) at baseline, with around half of these participants (approximately 57) expected to remain in the study at the twelve-week follow-up. This target was based on what was considered practically achievable across the centres, drawing on recruitment experiences from comparable research settings, rather than on a formal power calculation [19, 20].

Both attendees and close persons completed a demographic questionnaire and provided information on their health and social care use during the preceding month. Data collection was undertaken using three modified versions of the Client Service Receipt Inventory (CSRI) [21], adapted to reflect local differences in service configuration and job role descriptions in England, Scotland and Northern Ireland. Attendance at PCDS ranged from eight to twelve weeks, and data were obtained at up to four points in time: baseline, four weeks, eight weeks and, where possible, at twelve weeks. Measures of quality of life, health status and capability wellbeing were collected using validated instruments.

Quality of life was assessed with the expanded McGill Quality of Life Questionnaire (MQoL-E), which measures the subjective wellbeing of people living with advanced illness across eight domains—physical, psychological, existential, social, burden, environmental, cognitive and healthcare—covering twenty items on a zero-to-ten scale, where higher scores indicate better quality of life [22]. General health status was evaluated using the EQ-5D-5L, which includes five dimensions (mobility, self-care, usual activities, pain or discomfort, and anxiety or depression), each rated across five levels of severity [23]. Index values were derived from the EQ-5D-3L UK crosswalk tariff [24, 25], anchored between zero (death) and one (perfect health) [26]. To capture aspects of wellbeing specific to the end of life, the ICECAP-Supportive Care Measure (ICECAP-SCM) was also employed. This measure includes seven domains reflecting decision-making, emotional and physical comfort, dignity, love and affection, support, and preparation for death [27]. Scores were generated using the UK general population tariff, with values ranging from zero (no capability) to one (full capability at the end of life) [28].

Two health economic instruments were incorporated because previous research has shown that the EQ-5D-5L often fails to capture outcomes most relevant to palliative care. Participants and close persons tend to regard broader aspects such as dignity and preparation for death, which are measured by the ICECAP-SCM, as more meaningful indicators of benefit [29, 30].

Two complementary costing approaches were applied: top-down and bottom-up. The top-down method calculates the total cost of delivering a service and allocates these costs across its constituent components, whereas the bottom-up approach involves identifying and valuing each input separately [31]. Owing to a smaller than expected sample size, prospective data alone were insufficient to estimate overall service costs. Consequently, data from a 2015 scoping exercise examining service provision at the three participating PCDS sites [13] were combined with cohort data and supplementary information obtained from key staff members at each centre. This enabled estimation of the total cost per attendee per day using the top-down approach. Meanwhile, data on health and social care use from the CSRI were analysed separately using a bottom-up costing method.

The economic valuation of resource use employed a combination of these methods. PCDS costs were calculated on a per-attendance basis using hospice resource data, including staffing levels and volunteer involvement. Costs relating to wider health and social care services, staff time, volunteer contributions and travel mileage were based on figures from the Unit Costs of Health and Social Care 2018 [32]. In cases where comparable market wages for volunteer roles were unavailable, the UK national minimum wage was used to assign an equivalent economic value, in line with established practice for costing voluntary input [33]. All costs were expressed in 2018 British pounds (GBP).

Data analysis

Given the smaller than anticipated sample size, the analysis focused on complete cases from PCDS attendees across the three participating centres. Comparisons were made between baseline and four-week follow-up data to assess differences in both costs and outcomes. Additionally, variations in the cost per day of attendance at the PCDS were examined across the centres to ensure that analyses were based on the most comprehensive data available.

Paired *t*-tests were employed to evaluate changes in mean outcome and cost measures between baseline and the four-week follow-up for each centre [34]. The level of statistical significance was set at 5%, and 95% confidence intervals were calculated for the paired differences in costs and outcomes at the centre level. To further explore the sensitivity of cost estimates, a scenario analysis was performed to estimate cost per attendee per day under three hypothetical attendance rate conditions—100%, 80%, and 60%. This analysis was designed to examine potential variability in service costs both within and between centres.

Results and Discussion

Table 1 presents a detailed overview of the staffing and volunteer structure at the three PCDS centres, as well as operational characteristics including the number of days the services were open, the number of available places for attendees per day, and the corresponding attendance rates recorded in 2015. The table also outlines updates to the staff and volunteer composition observed in 2018–2019, providing insight into the evolution of personnel and resource allocation over time.

Table 1. Composition of three Palliative Care Day Services (PCDS) centres in the UK

Category	Centre 1	Centre 2	Centre 3	Notes
PCDS Operation in 2015				A
Days of operation per week	5	3	5	A
Locations with PCDS services	3	1	1	A, B
Daily available slots	15	12	15	A
Attendance percentage	75%	56%	60%	A
Staff in 2018/19 (FTE Proportion)				C
Social Worker Manager			1.0	D
Nurse Manager	1.0			D
Allied Health Professional Manager		0.6		D
Associate Specialist Doctor	0.4			D
Nurse Consultant	0.2			D
Social Worker	0.6			D
Palliative Care Nurse			1.0	D
Occupational Therapist	1.0	0.6	0.2	D
Physiotherapist	1.0		0.2	D
Registered Nurse	1.0	0.6	1.0	D
Rehabilitation Assistant		0.6		D
Health Care Assistant	1.0			D
Secretary	1.0			D
Volunteers in 2018/19 (FTE Proportion)				
Complementary Therapists	2.0	0.2	0.4	D
Drivers	3.0	3.6	2.4	E
Hospitality Staff	3.0	1.8	2.8	E
Hairdresser		0.25		E

A. Operational data from a mapping exercise of the three centres in 2015 - see [13]; B. Centre 1 operates 3 days a week at the main site and at two satellite units running one day a week each; Centre 2 now operates 5 days a week, with a satellite unit running two days a week; C. Staff and volunteer numbers providing from the three centres in 2018/19; D. From [32]; E. minimum wage rate for 2017/18 applied (£15,269 per year): source Office for National Statistics; FTE full-time equivalent

Participants

Recruitment for the study extended from June 2017 to September 2018 and was carried out across three palliative care day service (PCDS) centres. The timeline varied between sites due to local administrative processes and approval schedules. Centre 1 recruited participants in two separate periods—June to October 2017 and July to September 2018—while Centre 2 and Centre 3 conducted recruitment between January and March 2018, and January and June 2018, respectively. Data collection at Centre 1 was temporarily interrupted following staff turnover, which contributed to the uneven progress between centres. Persistent challenges in participant recruitment led the research team to amend the protocol midway, ceasing data collection for close persons and limiting follow-up for attendees to 12 weeks.

Across all centres, 56 attendees completed baseline measures (Centre 1 = 16; Centre 2 = 9; Centre 3 = 31). Of these, 38 participants provided data at four weeks (Centre 1 = 8; Centre 2 = 8; Centre 3 = 22), 31 at eight weeks (Centre 1 = 6; Centre 2 = 7; Centre 3 = 18), and 16 at twelve weeks (Centre 1 = 1; Centre 2 = 6; Centre 3 = 9). Many participants required direct assistance from the researcher to complete their questionnaires, highlighting the practical challenges of data collection in this population.

For close persons, participation was notably lower. Twenty-two individuals completed baseline assessments (Centre 1 = 9; Centre 2 = 5; Centre 3 = 8), declining to fourteen at four weeks, ten at eight weeks, and nine at twelve weeks. Given the small sample size and limited retention, the main analyses were restricted to attendee cases with complete data at both baseline and the four-week follow-up ($n = 38$).

Table 2 summarises the demographic characteristics of these 38 participants. The majority were over 65 years of age (Centre 1: 57–81 years; Centre 2: 51–91 years; Centre 3: 41–88 years), identified as white, were married, lived in their own homes, and did not live alone. Most participants had been diagnosed with cancer, a pattern typical of those referred to hospice-based services [35]. Although broad similarities were observed across the centres, the referral pathways and time elapsed between diagnosis and enrolment in PCDS varied substantially.

Here is the paraphrased table with the same structure and information:

Table 2. Characteristics of attendees from the three PCDS centres included in analysis

Category	Centre 1	Centre 2	Centre 3	Total (%)
Sample size (n)	8	8	22	38 (100%)
Average age (years)	66	75	68	69
Male (%)	7	4	9	20 (53%)
White ethnicity (%)	6	8	19	33 (87%)
Married (%)	5	4	11	20 (53%)
Living alone (%)	3	4	6	13 (34%)
Owner-occupied homes (%)	5	6	16	27 (71%)
Cancer diagnosis (%)	7	3	14	24 (63%)
Average years since diagnosis	1	5	4	4
Referral source (%)				
Hospital consultant	8			8 (21%)
Hospice community nurse		4	4	8 (21%)
Clinical nurse specialist		3	5	8 (21%)
General practitioner		1	1	2 (5%)
Respiratory service			5	5 (13%)
Specialist palliative care team			2	2 (5%)
Occupational therapist			2	2 (5%)
Internal hospice referral			2	2 (5%)
Data not available			1	1 (3%)

The mean cost per attendee/day ranged from £121 to £190 across the three centres **(Table 3)**. Including volunteer costs raises the average cost per attendee/day to £172 to £264 across the three centres. Volunteering constituted between 28 and 38% of the total costs of PCDS provision.

Table 3. Cost per attendee/day at three Palliative Care Day Services in the UK

Centre	Costs excluding volunteer contribution	Costs including volunteer contribution
1	£190	£264
2	£164	£263
3	£121	£172

Table 4 presents the variations in non-hospice health and social care resource utilization, as well as outcome changes observed over the four-week period. No statistically significant differences were detected in either costs or outcomes among the three PCDS sites at follow-up. Moreover, the direction of the mean changes across centres—each operating in distinct regions and with differing models of service delivery—showed no consistent or unified trend.

Table 4. Change in health and care resource use and attendee outcome at 4 week follow-up

Cost/outcome	Centre	n	Baseline	4 week	Change (95% CIs)
Health and care costs	1	7	£1508	£2078	£570 (−£1155, £2255)
	2	8	£1920	£793	-£1127 (−£2642, £388)
	3	22	£1187	£1252	£65 (−£946, £1076)
MQOL-E	1	8	7.11	6.64	−0.48 (−1.72, 0.76)
	2	8	6.88	6.89	0.01 (−0.70, 0.72)
	3	22	5.97	6.21	0.24 (−0.29, 0.77)
EQ-5D-5L	1	7	0.38	0.43	0.05 (− 0.19, 0.29)
	2	8	0.43	0.46	0.03 (−0.14, 0.19)
	3	22	0.59	0.56	−0.03 (− 0.17, 0.11)

ICECAP-SCM	1	8	0.87	0.87	0.00 (−0.07, 0.07)
	2	8	0.90	0.89	−0.01 (− 0.03, 0.02)
	3	22	0.80	0.83	0.03 (−0.02, 0.07)

CIs confidence intervals; MQOL-E is scored on a 0–10 worst-best quality of life scale; EQ-5D-5L is scored on a 0–1 dead-perfect health scale; ICECAP-SCM is scored on a 0–1 no capability at the end of life-full capability at the end of life scale

A scenario analysis of the cost per attendee/day esti- mated by varying attendance rates demonstrates a large variation in costs across scenarios and centres **(Table 5)**. The costs for centre 1 are almost twice those of centre 3, whether volunteer contribution is included or not.

Table 5. Scenario Analysis of cost per attendee/day

	Excluding Volunteer Costs			**Including Volunteer Costs**		
Attendance Rate	**Centre 1**	**Centre 2**	**Centre 3**	**Centre 1**	**Centre 2**	**Centre 3**
100%	£142	£91	£73	£199	£149	£107
80%	£177	£114	£91	£247	£185	£131
60%	£236	£152	£121	£327	£244	£172

The average cost of delivering Palliative Care Day Services across the three centres ranged from £121 to £190 per attendee per day. When the value of volunteer contributions was included, these costs rose considerably, ranging from £172 to £264 per attendee per day **(Table 3)**. Differences in how each centre organised its services also contributed to cost variation. In particular, Centre 1 had a higher staffing mix compared with Centres 2 and 3, resulting in the cost per attendee being nearly double that of the other centres when attendance rates were held constant **(Table 5)**. Scenario analysis indicated that increasing attendance rates within existing staffing and volunteer resources could reduce the per-attendee cost and expand service access. However, it is essential that any such adjustments do not compromise the quality of care provided.

The analysis from this cohort study is exploratory. Using generic health status measures (EQ-5D-5L), capability measures relevant to end-of-life care (ICECAP-SCM), and quality-of-life measures specific to life-threatening illness (MQOL-E), it was not possible to determine whether PCDS reduced other health and care costs or improved participant outcomes **(Table 4)** [22, 26, 27].

A key strength of this study is its inclusion of three centres with differing service configurations, collectively serving diverse communities across the UK. All sites were research-ready, with established governance structures and prior experience participating in research, which supported high-quality data collection. Nonetheless, the study was limited by its small sample size, which constrained comparisons between centres. Recruitment was further affected by unforeseen delays in appointing research staff, delays in securing ethical approval, and the broader challenges associated with enrolling participants in palliative care studies [36].

The study encountered five main challenges, reflecting common issues in palliative care research [37]. First, identifying participants who met inclusion criteria required careful clinical judgment. Second, the data collection process imposed a substantial burden on participants, particularly given the repeated measures design. Third, limited staff availability affected recruitment and support. Fourth, some participants experienced clinical deterioration during the study. Finally, involving close persons proved difficult due to caregiver stress, logistical barriers in obtaining dual consent, and limited recognition of the study's value, with many unable to participate.

The design of PCDS itself also influenced recruitment. Services typically involve repeat visits from existing attendees rather than new referrals. To capture each episode of care from the beginning, this study included only new attendees at their first visit, which slowed recruitment since existing caseloads were not eligible. While participant deterioration and data collection burden were largely unavoidable, staff shortages and clinical decline were not seen as compromising service provision in these relatively well-resourced, early-stage interventions. Despite these challenges, the study provides important insights into the costs, operational variations, and practical difficulties associated with delivering PCDS in the UK.

The precision of cost estimates in this study was constrained by the small sample size, particularly in Centres 1 and 2. To address this limitation, data from the 2015 PCDS service models were incorporated to supplement the limited contemporary data [13]. Caution is therefore required in interpreting the findings, as missing data may introduce bias [38]. Although several methods exist for handling missing data in economic evaluations [39], the sample size in this study precluded their application, and analyses were conducted using complete-case approaches.

Previous research has highlighted considerable variability in the costs of palliative care across the UK [9]. Consistent with this, our study demonstrates that costs for PCDS vary between centres and regions, influenced by differences in staffing composition, volunteer engagement, and attendance rates. These findings suggest that earlier cost estimates may have underestimated the true economic burden of providing PCDS [10, 11].

Nevertheless, our results confirm the significant contribution of volunteers in delivering PCDS [10], despite the fact that volunteer input is not routinely accounted for in health and social care economic evaluations in the UK [40]. Volunteers perform a wide array of roles, including complementary therapies, beauty and hairdressing services, and pastoral or faith-based support [41]. In many cases, their contribution approximates that of paid staff [42]. Excluding volunteer time from costing analyses therefore underestimates both the economic value of PCDS and the essential role volunteers play in service delivery.

Workforce pressures in health and social care are projected to intensify, with England alone potentially facing a shortfall exceeding 350,000 staff by 2030 if early departures continue and recruitment of new and international staff does not increase [43]. These trends have implications for hospice services and are a priority for Hospice UK, which is actively seeking sustainable solutions to workforce challenges [44]. Against this backdrop, volunteer contributions may become increasingly critical. In our study, including the value of volunteering indicated that 28–38% of the cost per attendee per day across the three centres was attributable to volunteer input. Understanding whether this represents a sufficient complement to professional staff, or whether further expansion is possible, is an important consideration. Recent studies have highlighted opportunities for hospices to enhance volunteer engagement strategically, including through stronger community involvement [45]. Despite recognition of the need to expand and deploy volunteers more effectively [46], current workforce policy guidance does not clearly indicate how these objectives will be achieved [44]. Our findings provide granular evidence that can inform policy and operational decisions related to workforce planning in PCDS.

While no significant changes in costs or outcomes were observed at four-week follow-up in any of the three centres **(Table 4)**, these results should be interpreted as exploratory. A key question that remains is whether PCDS represents a cost-effective investment, either by improving outcomes for attendees or by reducing overall health and social care expenditure. Addressing this question is critical not only for commissioners and service providers seeking value for money, but also for ensuring that staff and volunteer resources are optimally deployed to benefit attendees. Future research employing quasi-experimental designs, similar to those used in other palliative care evaluations where randomized controlled trials are not feasible [12], may help to better assess the costs and effects of PCDS. Additionally, studies examining outcomes for close persons of attendees would clarify whether the benefits of PCDS extend beyond the individual receiving care [47].

Conclusion

This study underscores the substantial role of volunteers in delivering Palliative Care Day Services. The current evidence is insufficient to draw definitive conclusions regarding whether different service configurations improve outcomes or reduce costs. Future research is needed to overcome the methodological and operational challenges identified here, to provide robust evidence on the cost-effectiveness of PCDS and guide both policy and practice.

Acknowledgments: None

Conflict of interest: None

Financial support: None

Ethics statement: None

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