Utilisation of hospital-based specialist palliative care in patients with gynaecological cancer

Temporal trends, predictors and association with high-intensity end-of-life care

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Utilisation of hospital-based specialist palliative care in patients with gynaecological cancer: Temporal trends, predictors and association with high-intensity end-of-life care

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HIGHLIGHTS

- Specialist palliative care utilisation for patients with gynaecological cancer has increased substantially in recent years.
- Predictors of hospital-based specialist palliative care included age, comorbidity, residential region and migrant status.
- Hospital-based specialist palliative care was associated with fewer high-intensity interventions at the end of life.

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ABSTRACT

Objective. To examine hospital-based specialist palliative care (SPC) utilisation among patients with gynaecological cancer, including temporal trends, predictors and associations with high-intensity end-of-life care.

Methods. We conducted a nationwide registry-based study for all patients dying from gynaecological cancer in Denmark during 2010–2016. We estimated the proportions of patients receiving SPC by year of death and used regression analyses to examine predictors of SPC utilisation. Use of high-intensity end-of-life care according to SPC utilisation was compared by regression analyses adjusting for type of gynaecological cancer, year of death, age, comorbidities, residential region, marital/cohabitation status, income level and migrant status.

Results. Among 4502 patients dying from gynaecological cancer, the proportion of patients receiving SPC increased from 24.2% in 2010 to 50.7% in 2016. Young age, three or more comorbidities, residence outside the Capital Region and being immigrant/descendant were associated with increased SPC utilisation, whereas income, cancer type and stage were not.

SPC was associated with lower high-intensity end-of-life care utilisation. Particularly, when compared with patients not receiving SPC, patients who accessed SPC >30 days before death had 88% lower risk of intensive care unit admissions within 30 days before death (adjusted relative risk: 0.12 (95% CI: 0.06; 0.24)) and 96% lower risk of surgery within 14 days before death (adjusted relative risk: 0.04 (95% CI: 0.01; 0.31)).

Conclusions. Among patients dying from gynaecological cancer, SPC utilisation increased over time and age, comorbidities, residential region and migrant status were associated with access to SPC. Furthermore, SPC was associated with lower use of high-intensity end-of-life care.

1. Introduction

Chemotherapy and short course radiotherapy play an important role in the palliative treatment of patients with gynaecological cancer [1].

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Even so, in terminally ill patients approaching death, these treatment interventions may by associated with pronounced side effects causing considerable discomfort and providing only little symptom control and improved quality of life to patients and their families [2]. In contrast, terminally ill patients have a great need of patient-centred palliative care. Palliative care seeks to ensure that patients suffering from life-threatening illness receive care that alleviate the symptom burden at the end of life in addition to any related psychological, social and spiritual challenges [3]. When palliative care needs are complex and symptom management cannot be resolved in general care settings, the patient may get access to specialist palliative care (SPC) services. SPC services are provided by multidisciplinary teams of highly qualified health professionals for whom palliative care is the main focus of their work, covering palliative care teams, palliative care hospital units and hospices [4]. Timely access to such services has been associated with improved quality of life in terminally ill patients [5] concomitantly with lower rates of high-intensity care during the end-of-life phase, including chemotherapy, hospital admissions, intensive care unit admissions and emergency room visits [5–8].

For patients dying from gynaecological cancers, however, only a few smaller studies, primarily from the United States, have examined the association between use of palliative care services and use of high-intensity care interventions at the end of life, including risk of dying in an acute care setting [9–13]. Hence, the role of palliative care on high-intensity interventions at the end of life in patients with gynaecological cancers has not been examined in large-scale studies within tax-financed healthcare systems.

Over the past years, as research has mounted for the benefits, palliative care has become recognised as an integrated and essential component of care for patients with cancer, whatever the prospects of cure [14]. However, it remains unclear whether increasing health policy attention has affected SPC utilisation among patients with gynaecological cancer over recent years. Furthermore, the knowledge is limited on factors affecting SPC utilisation in these patients [15–18].

Therefore, the purpose of this Danish nationwide registry-based study was to examine temporal trends in utilisation of hospital-based SPC according to the underlying type of gynaecological cancer causing death during 2010–2016. Additionally, we wanted to explore potential predictors affecting hospital-based SPC utilisation in patients with gynaecological cancers, as well as the association between hospital-based SPC utilisation and use of high-intensity care at the end of life.

2. Methods

2.1. Study design and setting

This nationwide registry-based study included all adult decedents who died from a gynaecological cancer in Denmark between 1 January 2010 and 31 December 2016.

The Danish healthcare system provides tax-funded healthcare services to facilitate universal access for all Danish residents, including access to SPC [19]. Five Danish regions represent regional authorities, each responsible for managing of healthcare services provided in primary care, at hospitals and in hospices [19]. The Danish state aims to allocate healthcare resources equivalently to the five Danish regions. Even so, it is well-established that some regional variation exists in financial and human healthcare resources and in administration of healthcare services.

Using the unique Civil Personal Register number assigned to all Danish residents upon birth or immigration, the study was based on individual-level data from national registries [20].

We reported the study to the Danish Data Protection Agency (record number 2015-57-0002) by registration at Aarhus University (Aarhus University record number 2016–051-000001/977). According to Danish law, registry-based non-interventional studies do not require approval from an ethics committee.

2.2. Study population

We used the Danish Registry of Causes of Death to identify all adult decedents registered with cervical cancer (International Classification of Diseases, Tenth Revision (ICD-10) code: DC53), ovarian cancer (ICD-10 code: DC56) or endometrial cancer (ICD-10 codes: DC54–55) as the underlying cause of death. The Danish Registry of Causes of Death is a nationwide registry covering information on cause, date and manner of death from death certificates of approximately 97% of all Danish decedents [21].

Using the administrative registry, the Danish Civil Registration System, encompassing individual-level data on all Danish residents, we obtained data on the decedents' age at death, residential region, cohabitation status and migrant status [20].

We included data on patients' mean annual household income during five years before the year of death divided into low income level (<50% of national median), middle income level (50–100% of national median) and high income level (above national median). Data on national medians of household income in the year of death were obtained from central authority on Danish statistics, Statistics Denmark [22–24].

To measure comorbidities at time of death, we used the Charlson Comorbidity Index and computed comorbidity scores from weights of 19 selected diagnoses from hospital admissions and outpatient visits within 10 years before death [25]. Data on the selected diagnoses were obtained using the Danish National Patient Registry, a nationwide registry encompassing information from all hospital contacts since 1995 [26].

Furthermore, we used the Danish National Registry of Patient to estimate International Federation of Gynaecology and Obstetrics (FIGO) cancer stage from the data on the tumour, node and metastasis (TNM) staging system included in the registry at time of diagnosis [27]. Due to data availability for the current study, we were only able to extract information on cancer stage at time of diagnosis for decedents dying between 1 January 2010 and 31 December 2015.

2.3. Hospital-based specialist palliative care

We used the Danish National Patient Registry to obtain information on whether decedents received SPC care within at least five years before the date of death. We solely examined utilisation of hospital-based SPC, including SPC provided by specialised, multidisciplinary teams during hospital admissions, in outpatient hospital clinics or in the patient's own home. Thus, in order to make the results more comparable with other countries where hospice care is not always provided by SPC teams, we did not evaluate hospice care.

Hospital-based SPC utilisation data included information on whether and when the patient was seen by palliative care specialists.

2.4. High-intensity end-of-life care

We established measures of high-intensity end-of-life care by abstracting metrics from prior research on the intensity of end-of-life cancer care [28–30]. Thus, we defined high-intensity end-of-life care as use of the following healthcare services: 1) Chemotherapy within 14 days before death; 2) Radiotherapy within 14 days before death; 3) Surgery within 14 days before death; 4) More than one hospital admission within 30 days before death; 5) One or more intensive care unit admission within 30 days before death; 6) One or more emergency room visit within 30 days before death; 7) No hospice admissions in the year leading up to death; 8) Death in hospital. We used the Danish National Patient Registry to obtain information on these measures.

2.5. Statistical analysis

For patients with cervical cancer, patients with ovarian cancer and patients with endometrial cancer alike, we estimated and plotted the proportion of patients receiving hospital-based SPC at the end of life by calendar year of death.

We computed the proportion of patients receiving hospital-based SPC for each of the included potential predictors, that is, type of gynaecological cancer, year of death, age at death, comorbidity score, region of residence, marital/cohabitation status, income level, migrant status and FIGO cancer stage. Furthermore, we computed the unadjusted and adjusted relative chance of receiving hospital-based SPC using binary regression adjusting for age at death and comorbidity score.

For patients with gynaecological cancer not receiving hospital-based SPC or accessing hospital-based SPC ≤30 days before death or >30 days before death, respectively, proportions of patients exposed to the included metrics of high-intensity end-of-life care were estimated. Thus, we estimated the proportions of patients receiving chemotherapy, radiotherapy or surgery within 14 days before death, having more than one hospital admission, having one or more intensive care unit admissions or having one or more emergency room visits within 30 days before death as well as having no hospice admission before death and dying in hospital.

Correspondingly, for patients accessing hospital-based SPC ≤30 days before death and patients accessing hospital-based SPC >30 days before death alike, we computed an adjusted relative risk of receiving each of the included measures of high-intensity end-of-life care compared with patients who did not receive hospital-based SPC. The adjusted relative risk was adjusted for type of gynaecological cancer, year of death, age at death, comorbidity score, region of residence, marital/cohabitation status, income level and migrant status using binary regression.

Data were analysed on a secure remote server at Statistics Denmark using Stata 17 software (StataCorp. 2021. *Stata Statistical Software: Release 17*. College Station, TX: StataCorp LLC).

3. Results

During 1 January 2010 to 31 December 2016, we identified 4502 adult individuals dying from cervical cancer ($n = 708$), ovarian cancer ($n = 2595$) or endometrial cancer ($n = 1199$) of whom 1799 patients (40.0%) accessed hospital-based SPC (Table 1). Thus, 557 of these patients (31.0%) accessed hospital-based SPC ≤30 days before death, whereas 1242 patients (69.0%) accessed hospital-based SPC >30 days before death.

3.1. Trends in hospital-based specialist palliative care utilisation

During the 2010–2016 period, the overall proportion of patients dying from gynaecological cancer receiving hospital-based SPC before death increased from 24.2% in 2010 to 50.7% in 2016 (Fig. 1).

Table 1
Predictors associated with hospital-based specialist palliative care utilisation.

	Hospital-based specialist palliative care, % (n/N)	Unadjusted relative chance (95% CI)	Adjusted relative chance (95% CI)[a]
Gynaecological cancer	40.0 (1799/4502)		
Cervical cancer	43.5 (308/708)	1.00 (ref.)	1.00 (ref.)
Ovarian cancer	40.9 (1062/2595)	0.94 (0.85; 1.03)	0.97 (0.89; 1.07)
Endometrial cancer	35.8 (429/1199)	0.82 (0.73; 0.92)	0.95 (0.85; 1.07)
Year of death			
2010–2013	34.2 (873/2550)	1.00 (ref.)	1.00 (ref.)
2014–2016	47.4 (926/1952)	1.39 (1.29; 1.49)	1.42 (1.32; 1.52)
Age at death			
18–59 years	58.8 (469/844)	1.00 (ref.)	1.00 (ref.)
60–69 years	44.6 (469/1051)	0.76 (0.70; 0.83)	0.76 (0.69; 0.83)
70–79 years	37.8 (493/1306)	0.64 (0.59; 0.70)	0.65 (0.60; 0.72)
80+ years	26.2 (341/1301)	0.45 (0.40; 0.50)	0.48 (0.43; 0.53)
Charlson Comorbidity Index score			
Low (score 0)	34.8 (443/1274)	1.00 (ref.)	1.00 (ref.)
Moderate (score 1–2)	28.5 (258/907)	0.82 (0.72; 0.93)	0.89 (0.79; 1.01)
Severe (score ≥3)	47.3 (1098/2321)	1.36 (1.25; 1.48)	1.23 (1.13; 1.34)
Geographical region of residence			
Capital Region	31.2 (415/1332)	1.00 (ref.)	1.00 (ref.)
Zealand Region	43.0 (297/691)	1.37 (1.23; 1.55)	1.31 (1.17; 1.47)
Region of Southern Denmark	38.5 (392/1017)	1.24 (1.11; 1.38)	1.22 (1.10; 1.36)
Central Denmark Region	46.2 (440/953)	1.48 (1.33; 1.65)	1.37 (1.23; 1.52)
North Denmark Region	50.1 (255/509)	1.61 (1.43; 1.81)	1.58 (1.41; 1.77)
Marital/cohabitation status			
Living alone	34.3 (842/2457)	1.00 (ref.)	1.00 (ref.)
Living with a partner	46.8 (957/2045)	1.37 (1.27; 1.47)	1.11 (1.04; 1.20)
Income level			
Low	28.9 (245/848)	1.00 (ref.)	1.00 (ref.)
Middle	38.0 (820/2158)	1.32 (1.17; 1.48)	1.20 (1.06; 1.35)
High	49.1 (734/1496)	1.70 (1.51; 1.91)	1.26 (1.11; 1.42)
Migrant status			
Non-immigrant	39.4 (1686/4284)	1.00 (ref.)	1.00 (ref.)
Immigrant including descendants	51.8 (113/218)	1.32 (1.15; 1.50)	1.29 (1.14; 1.46)
FIGO cancer stage[b]			
I	40.5 (90/222)	1.00 (ref.)	1.00 (ref.)
II	34.5 (68/197)	0.85 (0.66; 1.09)	0.82 (0.64; 1.04)
III	41.5 (392/944)	1.02 (0.86; 1.22)	0.97 (0.82; 1.15)
IV	39.5 (510/1289)	0.98 (0.82; 1.16)	0.94 (0.79; 1.11)

[a] Adjusted for age at death, comorbidity score and region of residence.
[b] International Federation of Gynaecology and Obstetrics (FIGO) cancer stage for patients dying between 1 January 2009 and 31 December 2015 (n=2652).

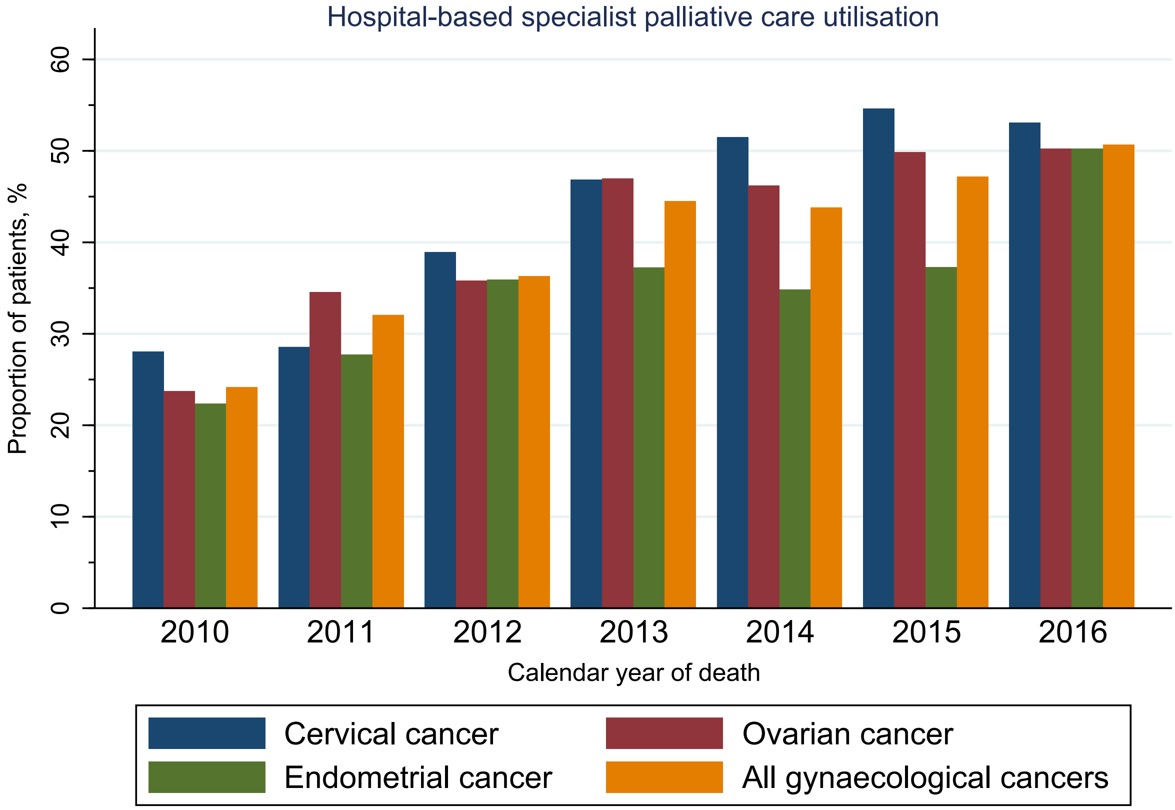

Fig. 1. Proportion of patients with gynaecological cancer receiving hospital-based specialist palliative care at the end of life according to calendar year of death.

For patients dying from cervical and ovarian cancer, respectively, the steadily increasing proportions of patients receiving hospital-based SPC followed comparable patterns. However, the proportion of patients dying from endometrial cancer who received hospital-based SPC before death, increased most rapidly from 2015 to 2016, i.e. 37.3% of endometrial cancer patients received hospital-based SPC in 2015, whereas this was 50.2% of the patients in 2016 (Fig. 1).

3.2. Predictors associated with hospital-based specialist palliative care

All the included potential predictors were associated with receiving hospital-based SPC at the end of life (Table 1). After adjustment, however, the association with hospital-based SPC was primarily evident for year of death in the 2014–2016 period, young age at death, three or more comorbidities, residence in other Danish regions than the Capital Region and being immigrant or descendant (Table 1). Thus, being 60–69 years of age was associated with a 24% lower chance of receiving SPC compared with patients aged 18–59 years (adjusted relative chance: 0.76 (95% CI: 0.69; 0.83) whereas being 70–79 years of age was associated with a 35% lower chance of receiving SPC (adjusted relative chance: 0.65 (95% CI: 0.60; 0.72) and being 80 years of age or more was associated with a 52% lower chance of receiving hospital-based SPC (adjusted relative chance: 0.48 (95% CI: 0.43; 0.53) (Table 1).

Conversely, patients with three or more comorbidities had a 23% higher chance of receiving hospital-based SPC before death compared with patients with no comorbidities (adjusted relative chance: 1.23 (95% CI: 1.13; 1.34)), whereas immigrants, including descendants, were 29% more likely to receive hospital-based SPC compared with non-immigrants (adjusted relative chance: 1.29 (95% CI: 1.14; 1.46)). Moreover, we found considerable geographical variation in use of hospital-based SPC. Particularly, patients residing in the North Denmark Region had an increased chance of receiving hospital-based SPC compared with patients in the Capital Region (adjusted relative chance: 1.58 (95% CI: 1.41; 1.77)) (Table 1).

3.3. Role of hospital-based specialist palliative care

Particularly when accessed >30 days before death, hospital-based SPC utilisation was associated with lower use of high-intensity care at the end of life (Table 2).

Thus, when compared with patients not receiving hospital-based SPC, patients who accessed hospital-based SPC >30 days before death had a 59% lower risk of chemotherapy (adjusted relative risk: 0.41 (95% CI: 0.27; 0.62)), a 59% lower risk of radiotherapy (adjusted relative risk: 0.41 (95% CI: 0.21; 0.78)) and a 96% lower risk of surgery within 14 days before death (adjusted relative risk: 0.04 (95% CI: 0.01; 0.31)) (Table 3). Correspondingly, the risk of more than one hospital admission within 30 days before death was 18% lower (adjusted relative risk: 0.82 (95% CI: 0.74; 0.92)), the risk of being admitted to an intensive care unit within 30 days before death was 88% lower (adjusted relative risk: 0.12 (95% CI: 0.06; 0.24)) and the risk of visiting an emergency room within 30 days before death was 23% lower (adjusted relative risk: 0.67 (95% CI: 0.55; 0.81)) (Table 3). Furthermore, compared with patients not receiving hospital-based SPC, patients who accessed hospital-based SPC >30 days before death had a 20% lower risk of having no hospice admissions at the end of life (adjusted relative risk: 0.80 (95% CI: 0.76; 0.85)) as well a 25% lower risk of dying during a hospital admission (adjusted relative risk: 0.75 (95% CI: 0.68; 0.84)) (Table 3).

4. Discussion

During the 2010–2016 period, the proportion of patients with gynaecological cancers receiving hospital-based SPC before death increased substantially in Denmark. Furthermore, we found young age at death, three or more comorbidities, residence outside the Capital

Table 2
Measures of high-intensity care at the end of life.

	Died of gynaecological cancer		
	No hospital-based specialist palliative care	Hospital-based specialist palliative care accessed ≤30 days before death	Hospital-based specialist palliative care accessed >30 days before death
Chemotherapy			
Used within 14 days before death, *n (%)*	134 (5.0)	26 (4.7)	29 (2.3)
Radiotherapy			
Used within 14 days before death, *n (%)*	55 (2.0)	16 (2.9)	12 (1.0)
Surgery			
Used within 14 days before death, *n (%)*	49 (1.8)	<5 (<0.2)	<5 (<0.2)
Hospital admissions			
Admitted >1 within 30 days before death, *n (%)*	794 (29.4)	236 (42.4)	332 (26.7)
Intensive care unit admissions			
Admitted within 30 days before death, *n (%)*	121 (4.5)	8 (1.4)	8 (0.6)
Emergency room visits			
Visiting within 30 days before death, *n (%)*	371 (13.7)	66 (11.9)	128 (10.3)
Hospice admissions			
Not admitted before death, *n (%)*	2034 (75.3)	408 (73.3)	702 (56.5)
Death in hospital, *n (%)*	974 (36.0)	197 (35.4)	344 (27.7)

Region and being immigrant or descendant to be associated with a greater chance of receiving hospital-based SPC before death in patients dying from gynaecological cancer.

Early access to hospital-based SPC was associated with fewer high-intensity interventions at the end of life, as well as an improved chance of being admitted to hospice and dying out of hospital.

Aligning with the political strategies throughout the study period aiming to improve palliative care in Denmark [31], the level of SPC utilised for patients dying from gynaecological cancer has increased over the recent years. This is consistent with national figures on utilisation rates for all patients dying from cancer described by the Danish Palliative Care Database during the 2010–2016 period [32,33]. However, the SPC capacity in Denmark does not comply with the recommendations from the European Association for Palliative Care [34]. Thus, terminally ill patients in Denmark may still not receive appropriate level of SPC at the end of life. Consequently, the interpretation of our findings contextualised with previous studies may be hampered by the substantial variability that exists in the organisation and development of palliative care between countries [35]. Even so, few studies from the United States have also demonstrated increasing general palliative care utilisation over the past years for patients with gynaecological cancer [15,36].

Healthcare systems are challenged with limited resources and healthcare policies aiming to control healthcare-related costs prompt prioritisation of healthcare utilisation, including utilisation of hospital-based SPC. Thus, healthcare interventions are targeted those patients in highest need and those patients most likely to benefit, which may explain some of the differences in access to hospital-based SPC found in the present study.

In contrast to results from a smaller study by Milki et al. (2014) [15], we found that the youngest patients with gynaecological cancer were more likely to receive hospital-based SPC than were older patients. However, in line with our results, Lindemann et al. (2020) established from population-based registry data of 3940 patients with gynaecological cancer that older patients were less likely to receive SPC at the end of life [16].

It has been suggested that young patients with gynaecological cancer endure greater symptom burden than their older counterparts [37]. Hence, the results from the present study may reflect that SPC is offered to those patients in highest need. However, gynaecological cancer-related death in older women may be anticipated by health professionals to be somewhat expected and not as traumatic and complex and therefore these patients are not offered SPC. Hence, older women being less likely to receive hospital-based SPC in the present study

Table 3
Adjusted relative risk of high-intensity care at the end of life.

Adjusted relative risk (95% CI)[a]	Died of gynaecological cancer No hospital-based specialist palliative care	Hospital-based specialist palliative care accessed ≤30 days before death	Hospital-based specialist palliative care accessed >30 days before death
Chemotherapy within 14 days before death	1.00 (ref.)	0.82 (0.53; 1.25)	0.41 (0.27; 0.62)
Radiotherapy within 14 days before death	1.00 (ref.)	1.29 (0.72; 2.31)	0.41 (0.21; 0.78)
Surgery within 14 days before death	1.00 (ref.)	0.10 (0.01; 0.70)	0.04 (0.01; 0.31)
Hospital admissions >1 within 30 days before death	1.00 (ref.)	1.29 (1.15; 1.46)	0.82 (0.74; 0.92)
Intensive care unit admission within 30 days before death	1.00 (ref.)	0.27 (0.13; 0.53)	0.12 (0.06; 0.24)
Emergency room visits within 30 days before death	1.00 (ref.)	0.79 (0.61; 1.01)	0.67 (0.55; 0.81)
No hospice admission before death	1.00 (ref.)	1.02 (0.96; 1.08)	0.80 (0.76; 0.85)
Death in hospital	1.00 (ref.)	0.98 (0.87; 1.12)	0.75 (0.68; 0.84)

[a] Adjusted for type of gynaecological cancer, year of death, age at death, comorbidity score, region of residence, marital/cohabitation status, income level and migrant status.

may also reflect inappropriate end-of-life care that is not accordance with patients' needs and wishes.

Furthermore, we found that patients with three or more comorbidities were more likely to receive hospital-based SPC at the end of life than were patients with none or few comorbidities. This may be an expected finding since considerable comorbidity burden adds to the complexity of care at the end of life. Thus, these patients may have an increased need to consult specialists in palliative care to alleviate their symptom burden.

Patients who are immigrants or descendants may also represent a potentially vulnerable population with complex needs. Low health literacy can exacerbate the burden for these particular patients, and perceptions of patients and healthcare professionals on diagnosis and symptoms may be misaligned and create a barrier for accommodating the palliative care needs in general care settings. Hence, immigrants or descendants may have an increased need for SPC services. This may, to some extent, explain the findings from the present study in which we found that being an immigrant or descendant was associated with increased access to hospital-based SPC. However, the possibility that immigrants or descendants receive less active treatment approach than their native-born counterparts and, therefore, are more likely to receive SPC cannot be ruled out. Furthermore, a closer connection with social protection services in immigrants or descendants may also facilitate SPC utilisation.

Our findings are in line with previous studies from Denmark among cancer patients [17,38]. However, in other countries with considerable differences in structure and financing of healthcare systems, this pattern of immigrants being more likely to receive SPC services was not found.

Place of residence was also associated with access to hospital-based SPC in the present study. Consistent with these findings, we found, in a previous study, that patients living in other Danish regions than the Capital Region were more likely to receive all prescription medicine free of charge at the end of life which is considered a marker of initiated palliative care [39]. Accordingly, studies exploring hospital-based SPC utilisation among patients dying from cancer in Denmark found lower chance of receiving SPC living in the Capital Region [18]. This regional variation in access to hospital-based SPC in Denmark may be caused by extensive differences in SPC capacity across the five Danish regions. Of note, the Capital Region of Denmark has the lowest number of hospice beds per inhabitant which may indicate an overall lower SPC capacity [39]. However, cultural differences may also exist and vary across the regions such as the organisation of SPC and health professionals' attention and attitude towards terminally ill patients in the general care settings.

In the present study, we demonstrated that access to early hospital-based SPC was associated with less high-intensity end-of-life care for patients dying from gynaecological cancer.

To date, we are not aware of previous large-scale studies examining the association between hospital-based SPC utilisation and use of high-intensity care at the end of life in patients with gynaecological cancers conducted in a tax-financed healthcare system. However, few smaller studies have examined the association between palliative care services and use of high-intensity care interventions at the end of life for patients with gynaecological cancer. Hence, a study by Bercow et al. (2021) analysed 153 cervical cancer decedents and reported that palliative care referral was associated with fewer intensive care unit admissions, emergency room visits and hospital admissions and that women receiving palliative care were less likely to die in an acute care setting [12].

Similar findings were established by Paulsen et al. (2022) analysing 163 patients dying from gynaecological cancer [13]. Thus, early referral to palliative care was associated with reduced intensive care unit admissions and use of chemotherapy at the end of life as well as an increase in deaths at home [13]. Nevandunsky et al. (2014) also demonstrated, among 100 patients dying from gynaecological cancer, how palliative care consultations were associated with decreased high-intensity care interventions using a composite measure of high-intensity metrics such as, e.g., hospital admissions, intensive care unit admissions, emergency room visits and chemotherapy in the end-of-life phase [10].

Despite the well-intentioned nature of high-intensity end-of-life care, these interventions are generally believed to be associated with poor quality of care at the end of life [28–30]. In addition, a mounting body of evidence describes that palliative care improves quality of life and reduces healthcare costs at the end of life, regardless of the disease causing death [5–7]. Hence, our results add to the existing knowledge, that patients with gynaecological cancer receiving SPC, may also be spared some costly, potentially futile, high-intensity interventions at the end of life, which may improve the quality of life for these patients and their families.

In particular, we found that early hospital-based SPC, that is, hospital-based SPC accessed >30 days before death, was associated with fewer high-intensity interventions at the end of life than hospital-based SPC accessed ≤30 days before death. This may reflect that SPC has been offered alongside life-prolonging curative treatment or that prediction of the decline in in the illness trajectory was simpler in these patients. Thus, this may have resulted in a better focus on enhancing the quality of the remaining life through patient-centred holistic care as death was approaching. Moreover, it remains unclear whether patients who receive hospital-based SPC very close to death or do not receive it at all reflects a desire from patients and healthcare professionals to pursue all medical treatment options, a lack of patient understanding of their disease or limited access to SPC.

Even so, patients' desires to undergo high-intensity care interventions at the end of life should be discussed with them. Palliative care consultations have been suggested to increase advance care planning documentation in patients with gynaecological cancer which is important in establishing end-of-life care in accordance with patients' wishes [40]. This may explain why we demonstrated that the risk of high-intensity interventions at the end of life was lowest for patients who received early hospital-based SPC. Thus, the present study suggest that early access to hospital-based SPC may optimise comfort by diminishing high-intensity interventions at the end of life.

Strengths of the present study include the nationwide population-based design in a healthcare system with universal coverage, which enabled individual-level linkage between national and medical registries with prospectively collected data.

Using virtually complete nationwide data registered for several decades in the Danish Registry of Causes of Death to identify patients dying from gynaecological cancers renders selection bias unlikely [21]. Validation of the registration of cause of death in the registry is sparse [21], but we sought to reduce the uncertainty about classification by including only well-defined gynaecological cancers.

The administrative data concerning hospital admissions and procedures in the Danish National Patient Registry are generally believed to be highly complete and valid, reducing the risk of misclassification of hospital-based SPC utilisation (96% complete in 2010 [39], 100% complete in 2016 [32]) and metrics of high-intensity end-of-life care [41,42].

Even so, it warrants consideration that registration of hospital-based SPC in the Danish National Patient Registry solely includes information on whether and when the patient was initially seen by health professionals from a SPC unit. Hence, the association with high-intensity end-of-life care may vary according to the level of hospital-based SPC given.

Control for various confounding factors in the analyses of potential predictors of hospital-based SPC utilisation and the association with high-intensity end-of-life care was endeavoured by adjusting for relevant factors using regression analyses. Even so, some influence from residual confounding may remain and confounding from unmeasured factors on which information was not available may also exist. For example, differences in psychosocial health or rapid progression of the underlying disease that may confound the associations found in the present study. Yet, it is hardly probable that these confounding factors could explain the entire association between hospital-based SPC and decrease in high-intensity end-of-life care utilisation in patients with gynaecological cancer.

5. Conclusion

During the study period, hospital-based SPC was increasingly provided to patients dying from gynaecological cancer in Denmark. Furthermore, various demographic and clinical characteristics of the patients were associated with hospital-based SPC utilisation, which may reflect differences in complexity of needs but also differences in health care professionals' attention and attitude towards these patients. We also demonstrated that early access to hospital-based SPC was associated with fewer high-intensity interventions at the end of life. Hence, increased attention to improve implementation of early hospital-based SPC seem crucial when aiming for less high-intensity end-of-life care for patients dying from gynaecological cancer. This may secure appreciable palliative care interventions according to patients' needs and improve quality of the remaining life.

CRediT authorship contribution statement

Anne Høy Seemann Vestergaard: Conceptualization, Methodology, Software, Validation, Formal analysis, Investigation, Data curation, Writing – original draft, Writing – review & editing, Visualization, Project administration, Funding acquisition. **Mette Asbjoern Neergaard:** Conceptualization, Investigation, Writing – original draft. **Lars Ulrik Fokdal:** Investigation, Writing – review & editing. **Christian Fynbo Christiansen:** Conceptualization, Investigation, Writing – review & editing. **Jan Brink Valentin:** Methodology, Software, Validation, Formal analysis, Visualization. **Søren Paaske Johnsen:** Conceptualization, Methodology, Investigation, Writing – review & editing, Supervision, Funding acquisition.

Declaration of Competing Interest

The authors declare that there is no conflict of interest.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ygyno.2023.02.019.

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