Original Article

Transition Points for the Routine Integration of Palliative Care in Patients With Advanced Cancer

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Abstract

Context. Increasing emphases are being placed on early integration of palliative care for patients with advanced cancers, yet barriers to implementation in clinical practice remain. Criteria to standardize referral have been endorsed, but their application is yet to be tested at the population level.

Objectives. This study sought to establish the need for standardized referral by examining current end-of-life care outcomes of decedents with cancer and define transition points within a cancer illness course, which are associated with poor prognosis, whereby palliative care should be routinely introduced to augment clinician-based decision making.

Methods. Population cohort study of admitted patients with advanced cancer diagnosed with non-small cell lung cancer (NSCLC), small cell lung cancer (SCLC), prostate or breast cancer between 2000 and 2010 in Victoria, Australia, identified from routinely collected, linked, hospital discharge, emergency department, and death registration data. Descriptive statistics described quality indicators for end-of-life care outcomes for decedents. Kaplan-Meier analyses were used to test the predefined transition point that mostly accurately predicted survival of six months or lesser.

Results. About 46,700 cases (56% females) were admitted with metastatic NSCLC ($n = 14,759$; 31.6%), SCLC ($n = 2932$; 6%), prostate ($n = 9445$; 20.2%), and breast cancer ($n = 19,564$; 41.9%). Of the 29,680 decedents, most (80%) died in hospital, had suboptimal end-of-life care outcomes (83%), and 59% received a palliative approach to care, a median of 27 days before death. Transition points in the cancer illness course of all cases were identified as first admission with any metastatic disease (NSCLC: 3.8 months [interquartile range {IQR} 1.1, 16.0]; $n = 14,666$; and SCLC: 4.2 months [IQR 1.0, 10.6]; $n = 2914$); first multiday admission with any metastatic disease (prostate: 6.0 months [IQR 1.3, 26.4]; $n = 7174$); and first multiday admission with at least one visceral metastatic site (breast: 6.0 months [IQR 1.2, 29.8]; $n = 7120$).

Conclusion. Despite calls for integrated palliative care, this occurs late or not at all for many patients with cancer. Our findings demonstrate the application of targeted cancer-specific transition points to trigger integration of palliative care as a standard part of quality oncological care and augment clinician-based referral in routine clinical practice. J Pain Symptom Manage 2018;56:185–194.

Key Words

Palliative care, cancer, integration, health services research

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Introduction

Palliative care has demonstrated improvement in quality of life and symptom management, communication of information, and attainment of goals of care for patients with advanced cancer[1–6] and their family caregivers.[7–9] Benefits are also evident for health care systems with reduced health care expenditure resulting from less hospitalization and aggressive care at the end of life and increased numbers of people dying at home.[10–14] Death outside health care settings is also the preferred option for most people.[15,16] Despite such benefits, access to palliative care remains variable and for many patients, unavailable.[17,18] Based primarily on clinician judgment, uncertainty about the appropriate timing of when to refer remains among the key barriers to palliative care referral.[19,20]

In parallel, there is increasing emphasis being placed on early integration of palliative care.[21,22] Prospective randomized trials conducted with patients with advanced cancer have broadly defined the initiation of palliative care based on all comers within selected diagnostic groups with metastatic disease.[1–3,5] Yet the influence of different factors, such as possible long-term survival with metastatic disease and their influence on timing of palliative care referral have not received specific attention.[23] Identifying transition points within a cancer illness course that are not reliant on an individual clinician's judgment, but instead could be used by treating clinicians across health care systems, may be important to achieve integration of quality palliative care in routine clinical practice.

To reduce variation in care, recent studies have sought to define acceptable criteria to trigger referral to outpatient palliative care based on the consensus of international experts.[24] Importantly, the use of standardized criteria to augment clinician-based decision making and trigger automatic referral have been widely endorsed.[20] Yet, to our knowledge, transition points such as these have not been tested within large cohort studies to validate their application at the population level.

Using a large statewide population cohort of all admitted cancer cases ($n = 46{,}700$), the aims of this study were twofold. 1) First, to establish the need for standardized referral triggers, data on decedents from this cohort ($n = 29{,}680$) were used to describe the current patterns of end-of-life care using established international quality indicators, the timing of and access to hospital-based palliative care services, and the site of death. 2) Second, data on all cases ($n = 46{,}700$) were used to test transition points within a cancer illness course based on association with poor prognosis, which may act as triggers for palliative care introduction in a timely manner across a range of cancers.

Methods

Study Design and Setting

We conducted a retrospective population cohort study using linked inpatient and emergency service use and death registry data sets (Table 1) in Victoria, Australia. These data sets capture all inpatient hospital admissions across public and private hospitals in the state and including both metropolitan and regional health services. Palliative care services are organized into three main areas: 1) acute hospital consultancy services, 2) specialist inpatient palliative care units, and 3) community palliative care services providing care in the patient's residence. The data sources used in this study documented the use of hospital-based palliative care services, namely 1 and 2. There are no population-level data documenting receipt of care from all community-based services available in Victoria, and thus, it is not possible to provide consistent information about palliative care provided in the community.

The research was approved by an institutional ethics review board. Stata 13 (Stata Corporation, College Station, TX; 2006) software was used for all statistical analyses. Data were guided and reported consistent with The REporting of studies Conducted using Observational Routinely-collected health Data statement.[25]

Identification of Cancer Cases

We identified patients admitted between July 1, 2000 and June 30, 2010 with a diagnosis of metastatic non-small cell lung cancer (NSCLC), small cell lung cancer (SCLC), breast, and prostate cancers. These were selected as exemplars for known poor prognostic disease (NSCLC and SCLC), likely response to chemotherapy (SCLC and breast), and potential for longer survival with metastatic disease (breast and prostate). Cancer diagnoses were identified in the hospital discharge data using codes from the *International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Australian Modification*.[26] Vital status and dates of death were obtained from the linked death registry data. Patients with multiple primary cancers were excluded from further analysis, given inadequate information contained within the data sets to classify which underlying cancer was their primary cause of death.

Baseline demographic and socioeconomic characteristics were obtained from the hospital data, including age group, gender, cancer diagnosis, marital status, private health insurance, country of birth, and

Table 1
Data Sources Used Within the Study

Characteristic	Details
Data sources	Hospital discharge and ED data linked to death certificate data
Description of data sources	Clinically coded hospital discharge data are recorded by all 310 Victorian hospitals, both public ($n = 131$) and private ($n = 179$), and are maintained by the Victorian Department of Health
	Clinically coded ED visit data are recorded by all emergency departments and are maintained by the Victorian Department of Health
	Death certificate data are maintained by the registry of births, deaths, and marriages
Population covered by data source	All people who attended a hospital in the Australian state of Victoria, which had a population of 5.6 million persons in 2010
Health insurance system	All residents have universal access to publicly funded medical care provided in both community settings and public hospitals. For approximately 51% of Australians, this public coverage is complemented by private health insurance, which allows access to private hospitals
Quality of data sources	The quality of hospital-level clinical coding is maintained using an independent audit program
	The quality of data linkage is monitored via a series of internal logic checks and manual review of randomly selected case groups
	The case identification was validated against reportable deaths recorded by the Victorian Cancer Registry

ED = emergency department.

area of residence. The relative disadvantage of residence was classified using the *Socio-Economic Indexes for Areas Index of Relative Socio-Economic Disadvantage*.[27] The *Socio-Economic Indexes for Areas* score is divided into quintiles based on the Victorian population and border regions that access the Victorian hospital system. The remoteness classification of the area of residence was based on the *Australian Statistical Geography Standard*.[28] Major comorbidities were identified based on *International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Australian Modification* codes and classified using the *Quan version of the Charlson Comorbidity Index*.[29]

Outcome Measures and Analyses

Care Outcomes at the End of Life. Consistent with the first aim of the study focused on care outcomes at the end of life, this analysis was restricted to those who died within the study period follow-up interval between July 1, 2000 and June 30, 2010 ($n = 29{,}680$). Descriptive statistics including medians, interquartile ranges (IQRs), frequencies, and percentages were used to describe outcome measures relating to the quality of end-of-life care, palliative care utilization, and site of death as described later.

Quality of End-of-Life Care. Indicators of quality of end-of-life care, as adopted from Earle et al.,[30] and available within these data sets, were defined by the following parameters in the last 30 days of life: 1) more than one emergency department presentation; 2) more than one hospital admission; 3) lengths of hospital stay of more than 14 days; 4) intensive care unit admission; and 5) inpatient chemotherapy administration (including same-day admissions) within 30 and 14 days of death. Consistent with the earlier literature,[31] a composite total score was also defined by summing the number of these indicators present.

Palliative Care Utilization. Two indicators of access to hospital-based palliative care were defined. The first involved use of a palliative care or hospice bed, whereby the patient was principally under the care of a specialist inpatient palliative care service. The second was when the patient was receiving a palliative approach to care, whereby palliative care was provided by alternative hospital care teams with consultation from the specialist hospital-based palliative care service as appropriate. The timing of access to palliative care (as previously) was defined based on the number of days between the initiation of a palliative care approach to care and death.

Site of Death. Site of death was classified into four mutually exclusive groups: outside hospital, in an inpatient hospice/palliative care bed, in an acute care hospital bed, or in another inpatient bed.

Definition of Transition Points. For the analyses aiming to test the application of prespecified transition points within the cancer illness course, we included patients who were admitted with the included cancer types between July 1, 2000 and June 30, 2010. This included both cases who died within the study follow-up interval and cases who survived beyond the follow-up interval ($n = 46{,}700$).

Identification of Potential Transition Points. Potential transition points for routine integration of palliative care services were defined a priori by an expert panel whose clinical expertise included palliative care (J. P. and B. H. L.), medical oncology (L. M., B. H. L., and S. -A. M.), radiation oncology (J. M.), internal medicine (V. S.), nursing (M. K. and P. H.), and allied

health (A. C. and J. B.). Through a consensus-based approach, the panel nominated possible transition points for examination in the data that were clinically meaningful parameters identifiable within the data sets and useful in clinical care. These points included 1) first hospital admission (including single-day admission) where patient had metastatic disease; 2) first multiday hospital admission where patient had metastatic disease; and 3) first multiday admission where patient had metastatic disease including at least one visceral site.

Testing of Cancer-Specific Transition Points. The potential transition points as defined previously were tested sequentially for each cancer group using all cases. The point for each cancer group that predicted the longest survival time within six months of death was defined as the final cancer-specific transition point. This time frame was chosen based on data suggesting palliative care involvement at least several months before death confers benefits for patients and higher quality of end-of-life care[32,33] and because it is widely endorsed by international clinicians as an appropriate time for referral to palliative care.[24] Survival was estimated by the Kaplan-Meier method[34] and defined as the time (months) from the identified transition point to death or censored at the date of last follow-up.

Results

Description of the Sample

A total of 46,700 patients (females: n = 26,166; 56%) were identified with a diagnosis of NSCLC (n = 14,759; 31.6%), SCLC (n = 2932; 6.3%), prostate cancer (n = 9445; 20.2%), and breast cancer (n = 19,564; 41.9%) (Table 2). Just less than half of these patients (n = 22,340; 48%) were aged at least 70 years at their first admission. Most were Australian born (n = 30,225; 65%), partnered (n = 30,895; 66%), and 67% were known to live in a major city or inner regional (periurban) area. Of these, a total of 29,680 patients (males: n = 16,978; 57%) died within the study period. The cancer frequencies of decedents were NSCLC (n = 11,939; 40%), SCLC (n = 2693; 10%), prostate cancer (n = 7708; 26%), and breast cancer (n = 7340; 25%).

End-of-Life Care Outcomes of Decedents (n = 29,680)

Quality of End-of-Life Care. In the last 30 days of life, more than half of these patients (n = 15,568; 53%) had more than one hospital admission and were hospitalized for more than 14 days (n = 15,448; 52%) (Table 3). Nine percent (n = 2551) had more than one presentation to emergency department, whereas 4% had an intensive care admission (n = 1061). Sixteen percent (n = 4599) and 8% (n = 2269) received chemotherapy in the last 30 and 14 days of life, respectively. Overall, 83% of patients (n = 24,716) experienced at least one of these indicators, and more than a third had two or more indicators (n = 11,179; 38%).

Palliative Care Utilization and Site of Death. Of all the patients who died within the study period, 59% (n = 17,427) received a palliative approach to care, and this first occurred in a median of 27 days (IQR 10, 64) before their death. This included 39% (n = 11,696) who accessed care from a specialist inpatient hospice or palliative care bed during their illness, with a median stay of 10 days (IQR 5, 21). Of those patients who died in hospital, 61% first accessed palliative care in the final hospital admission during which they died. Of those who died in a palliative care bed, 21% had been transferred to palliative care within the three days before dying.

Cancer-Specific Transition Points Based on All Cases (n = 46,700)

Using a threshold prognosis of six months and lesser (Table 4), the best transition points were obtained for each cancer type: first admission (including single-day admission) where patient had metastatic disease (NSCLC: Fig. 1a, SCL: Fig. 1b); first multiday admission with any metastatic disease (prostate: Fig. 1c); and first multiday admission with at least one *visceral* metastatic site (breast: Fig. 1d). Based on these transition points, the median survival and IQRs for each cancer were as follows: NSCLC 3.8 months (IQR 1.1, 16.0; n = 14,666), SCLC 4.2 months (IQR 1.0, 10.6; n = 2914), prostate cancer 6.0 months (IQR 1.3, 26.4; n = 7174), and breast cancer 6.0 months (IQR 1.2, 29.8; n = 7120) (Fig. 2).

Discussion

This large population study of patients with advanced cancer provided important data that demonstrated the following: 1) suboptimal end-of-life care patterns of decedents suggesting the need for standardized criteria that can trigger integration of palliative care and 2) the application of targeted cancer-specific transition points at the population level to augment clinician-based referral and address the question of timing of palliative care in routine clinical practice. In this study, most patients had at least one (83%) and more than a third (38%) had two outcomes considered to be indicators of lower quality of end-of-life care. The overwhelming majority of people (more than 80%) died in hospital; although all available evidence indicates that most people

Table 2
Description of Victorians Admitted With Advanced Cancers 2000–2010 (n = 46,700)

	Cases by Cancer Type				
	NSCLC	SCLC	Prostate	Breast	All Cases
Characteristic	n = 14,758	n = 2932	n = 9445	n = 19,564	n = 46,700
Age (yrs) at metastatic presentation					
<50	747 (5)	122 (4)	58 (<1)	5021 (26)	5948 (13)
50–59	2070 (14)	479 (16)	437 (5)	4897 (25)	7883 (17)
60–69	3955 (27)	917 (31)	1570 (17)	4085 (21)	10,527 (23)
≥70	7986 (54)	1414 (48)	7379 (78)	5561 (28)	22,340 (48)
Gender of patient					
Male	9265 (63)	1824 (62)	9445 (100)	0 (0)	20,534 (44)
Female	5494 (37)	1108 (38)	0 (0)	19,564 (100)	26,166 (56)
Country of birth					
Australia	8896 (60)	1688 (58)	6483 (69)	13,158 (67)	30,225 (65)
Other English speaking	1586 (11)	375 (13)	883 (9)	1783 (9)	4627 (10)
Other, NESB	4276 (29)	869 (30)	2078 (22)	4623 (24)	11,846 (25)
Remoteness (home residence)					
Major city	6120 (42)	1056 (36)	3620 (38)	7626 (39)	18,422 (40)
Inner regional	4088 (28)	879 (30)	2528 (27)	5283 (27)	12,778 (27)
Outer regional or remote	1518 (9)	320 (11)	1156 (12)	1615 (8)	4609 (10)
Missing	3033 (21)	677 (23)	2141 (23)	5040 (26)	10,891 (23)
Socioeconomic disadvantage					
Highest	1057 (7)	222 (8)	639 (7)	1069 (6)	2987 (6)
Second quintile	1390 (9)	286 (10)	843 (9)	1540 (8)	4059 (9)
Third quintile	1906 (13)	407 (14)	1308 (14)	2195 (11)	5816 (13)
Fourth quintile	2705 (18)	514 (18)	1533 (16)	3379 (17)	8131 (17)
Lowest	4782 (32)	844 (29)	3069 (33)	6453 (33)	15,148 (32)
Missing	2919 (20)	659 (22)	2053 (22)	4928 (25)	10,559 (23)
Marital status					
Married or living with a partner	5266 (36)	1050 (36)	2555 (27)	6934 (35)	15,805 (34)
Single	9493 (64)	1882 (64)	6890 (73)	12,630 (65)	30,895 (66)
Any private hospital use	5504 (37)	886 (30)	4881 (52)	9920 (51)	21,191 (45)
Site(s) of metastases at first admission					
Bone	4435 (30)	727 (25)	7491 (79)	4328 (22)	16,981 (36)
Brain & CNS	2738 (19)	734 (25)	289 (3)	718 (4)	4479 (10)
Lymph nodes	5133 (35)	997 (34)	1295 (14)	13,245 (68)	20,670 (44)
Liver	2520 (17)	1136 (39)	808 (9)	1908 (10)	6372 (14)
Lung and pleura	1522 (10)	211 (7)	675 (7)	1745 (9)	4153 (9)
Other	2641 (18)	586 (20)	825 (9)	1416 (7)	5468 (12)
>1 metastatic site	4755 (32)	1207 (41)	1670 (18)	3356 (17)	10,988 (24)
>2 metastatic sites	1732 (12)	494 (17)	467 (5)	1313 (7)	4006 (9)
Charlson Comorbidity Index at presentation					
No comorbidity present	11,155 (76)	2234 (76)	7044 (75)	17,992 (92)	38,425 (82)
At least one comorbidity	3604 (24)	698 (24)	2401 (25)	1572 (8)	8275 (18)

NSCLC = non-small cell lung cancer; SCLC = small cell lung cancer; NESB = non-English speaking background; CNS = central nervous system.

prefer to die at home.[15,16] Although approximately 60% had some access to palliative care, this occurred late, within the last 30 days of life. Based on patients' interaction with the health system and heralding subsequent poor prognosis, the transition points identified in this study provide a means to address these issues with quality of care at the end of life.

The findings from this study have novel and direct implications for the standardized integration of palliative care into quality oncological care. The identified transition points address the need of determining timing of such integration,[23] responding to recent consensus studies endorsing the use of such triggers.[20] After the transition point determined in this study, each of these individual cancers follow a remarkably similar survival trajectory. Based on these transition points, if not already in place, palliative care integration should occur for lung cancer (both SCLC and NSCLC) at first admission (including single day) in the presence of any metastases; for prostate cancer at multiday admission in the presence of any metastases; and for breast cancer at multiday admission and the presence of visceral metastases.

Importantly, these transition points, generated from service use data sets, are based on parameters within most hospital information systems and easily available to clinicians providing care. The inpatient admission is an identifiable point that translates across health systems and is readily understood by all involved in care. Hence, they represent points that are not reliant on an individual clinician's judgment about a person's wishes for palliative care, yet are meaningful in clinical terms as representing times when a clinician may already perceive that increased needs are emerging.

Table 3
Characteristics of End-of-Life Care for Victorians Who Died From Included Advanced Cancers 2000–2010 ($n = 29,680$)

End-of-Life Characteristic	Whole Group $N = 29,680$	NSCLC $N = 11,939$	SCLC $N = 2693$	Prostate $N = 7708$	Breast $N = 7340$
Quality of end-of-life care					
>1 ED presentation in the last 30 days of life	2551 (9)	1210 (10)	267 (10)	562 (7)	512 (7)
>1 acute hospital admission in the last 30 days of life	15,568 (53)	6466 (54)	1539 (57)	3673 (48)	3890 (53)
LOS ≥14 days in the last 30 days of life	15,448 (52)	6308 (53)	1375 (51)	4187 (54)	3578 (49)
Intensive care admission in the last 30 days of life	1061 (4)	498 (4)	92 (3)	166 (2)	305 (4)
Chemotherapy in the last 14 days of life	2269 (8)	734 (6)	255 (10)	395 (5)	885 (12)
Chemotherapy in the last 30 days of life	4599 (16)	1471 (12)	509 (19)	848 (11)	1771 (24)
≥1 indicator	24,716 (83)	9955 (83)	2276 (85)	6325 (82)	6160 (84)
≥2 indicators	11,170 (38)	4580 (38)	1117 (42)	2499 (32)	2974 (40)
Access to palliative care, *n* (%)					
No palliative care referral	12,287 (41)	4632 (39)	1014 (38)	3209 (42)	3432 (47)
Adoption of a palliative approach to care	17,427 (59)	7315 (61)	1680 (62)	4509 (58)	3923 (53)
Use of specialist palliative care/hospice bed	11,696 (39)	4908 (41)	1131 (42)	3033 (39)	2624 (36)
Timing of palliative care					
First initiation of palliative approach to care to death, median days (IQR)	27 (10, 64)	25 (10, 54)	23 (9, 56)	31 (11, 77)	28 (10, 74)
First palliative care in death admission, if died in hospital	10,667 (61)	4610 (63)	1071 (64)	2616 (58)	2370 (60)
LOS three days or lesser, if died in palliative care bed	1420 (21)	645 (23)	142 (22)	318 (19)	315 (20)
Site of death					
Outside hospital	5859 (20)	2061 (17)	483 (18)	1672 (22)	1643 (22)
In hospital	23,855 (80)	9886 (83)	2211 (82)	6046 (78)	5712 (78)
In hospital, acute bed	17,085 (57)	7039 (59)	1552 (58)	4326 (56)	4168 (57)
In hospital, palliative care bed	6770 (23)	2847 (24)	659 (25)	1720 (22)	1544 (21)

NSCLC = non-small cell lung cancer; SCLC = small cell lung cancer; ED = emergency department; LOS = lengths of stay; IQR = interquartile range.

Therefore, these transition points can be used as standard universal times reached within a cancer illness trajectory where palliative care integration as a routine part of cancer care is likely to improve the quality of care.

It is an important note that these points are late in the illness course for most people, with median survival ranging from three to six months after this transition. The language around integration of palliative care has talked of early palliative care, typically defined on diagnosis of metastatic disease.[21] In proposing specific points in the trajectory of specific advanced cancers for referral to palliative care, we accept that these transitions are not always early. Nevertheless, it is apparent from these data that patients continue to be referred to palliative care even later in their illness than these suggested points, if at all. In this study, for 59% of patients referred to palliative care, such referral occurred at a median of 27 days before death. In other similar cohorts, survival after admission to selected hospice programs ranged from 22 to 42 days.[17,18,35]

We also accept that survival is just one determinant of whether a person may benefit from palliative care.

Table 4
Kaplan-Meier Survival Estimates From the Transition Points for all Admitted Cases ($n = 46,700$)

Cancer Cohort	Total Number of Admitted Cases	Total Number of Deaths	Survival from Transition Point Median (IQR)[a]: First Admission (Including Single Day) Where the Patient had Metastatic Disease	Survival from Transition Point Median (IQR)[a]: First Multiday Admission Where the Patient had Any Metastatic Disease	Survival from Transition Point Median (IQR)[a]: First Multiday Admission where the Patient had Metastatic Disease including at Least One Visceral[b] Site
NSCLC	$n = 14,666$	$n = 11,939$	$n = 14,666$; 3.8 months (IQR 1.1, 16.0)	$n = 14,003$; 2.8 months (IQR 0.9, 12.6)	$n = 9989$; 2.1 months (IQR 0.7, 7.5)
SCLC	$n = 2914$	$n = 2693$	$n = 2914$; 4.2 months (IQR 1.0, 10.6)	$n = 2761$; 3.1 months (IQR 0.8, 9.1)	$n = 2238$; 2.2 months (IQR 0.7, 7.4)
Prostate	$n = 9394$	$n = 7708$	$n = 9394$; 8.7 months (IQR 1.8, 34.2)	$n = 8891$; 6.0 months (IQR 1.3, 26.4)	$n = 2912$; 2.2 months (IQR 0.7, 10.5)
Breast	$n = 19,517$	$n = 7340$	$n = 19,517$; the median of survival has not yet been reached	$n = 17,904$; the median of survival has not yet been reached	$n = 7120$; 6.0 months (IQR 1.2, 29.8)

NSCLC = non-small cell lung cancer; SCLC = small cell lung cancer; IQR = interquartile range.
[a]Median survival represents first estimate below 0.50. In the case that 0.50 (or below) is not reached, this is indicated.
[b]Visceral: at least one metastatic site outside bones or lymph nodes.

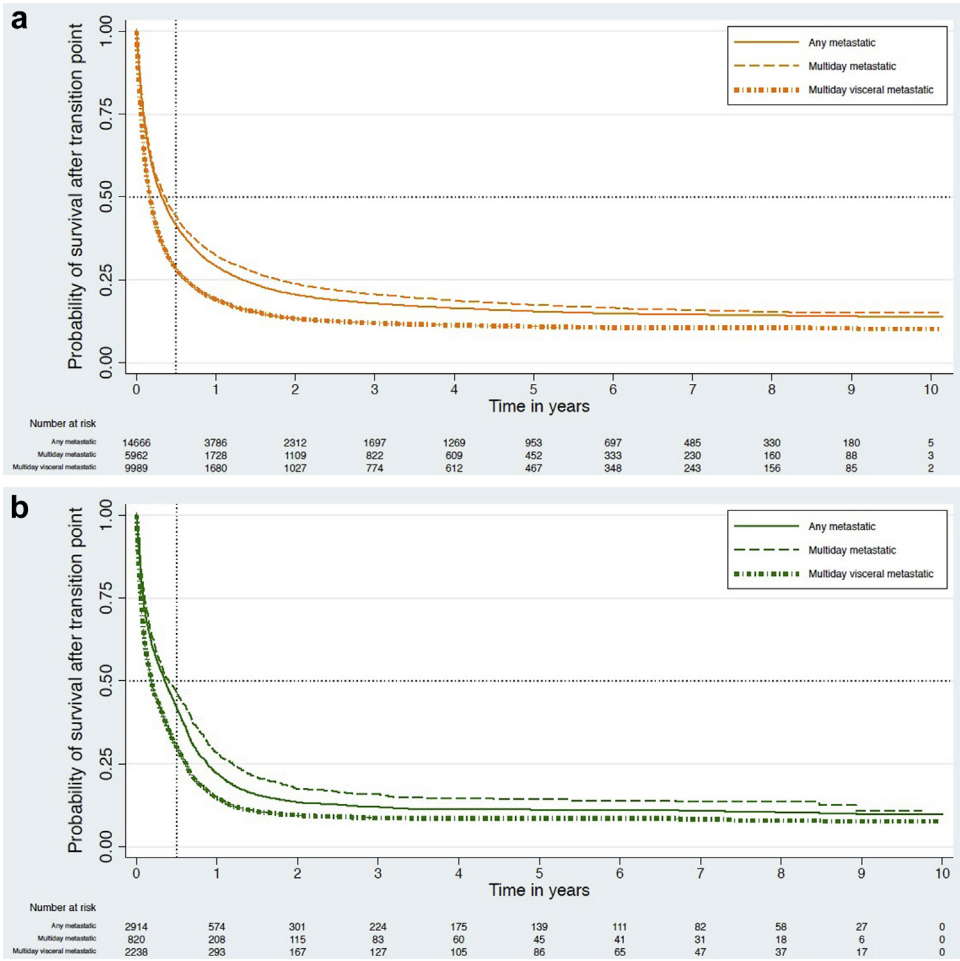

Fig. 1. a) Non-small cell lung cancer. b) Small cell lung cancer. c) Prostate cancer. d) Breast cancer.

First and foremost, the needs of patients and their carers should principally determine referral to palliative care. If earlier integration is available and clinical need identified, care must be guided by this need. Further work is warranted to develop routinized systems of needs assessment that are acceptable to clinicians and readily implemented into practice.[36] However, we believe that because most patients are in fact not receiving palliative care by this point in the illness that integration should occur at the proposed transition points as a minimum quality standard.

The feasibility of the use of triggers has been demonstrated by Adelson et al.[37] who used a combination of health service use and symptom prevalence for prompting palliative care referral. In their study, implementation of triggered referrals resulted in a significant reduction of hospital readmission and increase in hospice involvement.[37] Rocque et al.[38] demonstrated improved illness understanding after implementation of triggered palliative care for all hospitalized cancer patients with metastases but minimal impact on patient-reported symptoms, hospice utilization, and cost of care. A future hybrid effectiveness-implementation randomized trial of the cancer-specific transition points defined in this study is warranted to assess if their implementation can change both patient- and system-level outcomes.

This study had several limitations. The analysis relied on routinely collected administrative hospital data, so care events that took place outside hospital were not collected. This means that patients diagnosed with a metastasis as outpatients, and never admitted, were not part of this analysis. Similarly, community-based palliative care provision was not available in our data set, and therefore, receipt of palliative care is likely to be higher than reported in this study.

The availability of data for analysis and corresponding time frame of this study means that any potential changes to treatment paradigms during the last five

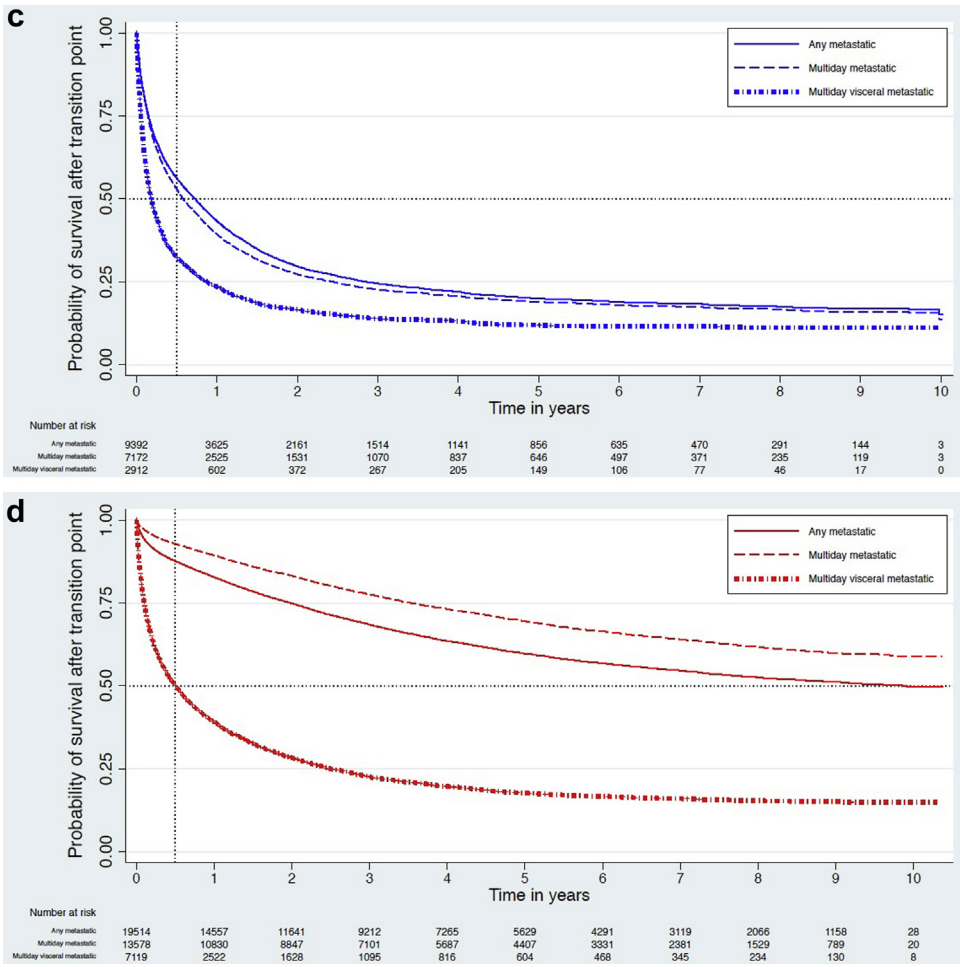

Fig. 1. (*continued*)

years affecting care patterns and overall survival are not represented. Similarly, other important prognostic factors such as clinical and biological characterization of the cancer cases were not available within the data sets. It is possible that any shifts in prognosis recently obtained, for example, through the introduction of targeted therapies, may alter the transition point if this methodology was repeated. Likewise, any changes to patterns of palliative care utilization that may have been seen after Phase III studies in more recent years[1–6] are not captured through this study.

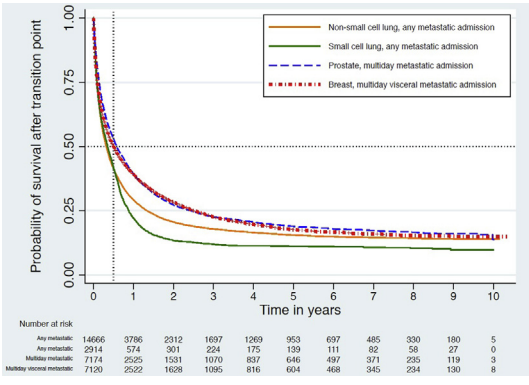

Fig. 2. Survival after the selected transition point for each solid tumor.

However, this large statewide approach has enabled us to document care of the whole illness period for those included, facilitating the identification of transition points in care. Furthermore, this methodology can be repeated in future studies to ascertain the true effect of any potential changes in treatment paradigms, including patterns of integration of palliative care, demonstrating the utility of routinely collected population-level data for the monitoring of health care use and quality of care.

Our findings provide an important step to take forward ideas of palliative care integration that have faltered in the reliance solely on individual recognition of the appropriate time to refer. The impact of individual clinician judgment has meant that referral to palliative care is highly variable and

inequities of access and patient outcomes continue to confound this area of care. Using predefined transition points that are universally recognizable, and acting as triggers, means that palliative care can be integrated as a standard part of quality oncological care. It also represents an opportunity for benchmarking of such quality outcomes. Changes to patterns of care that may result from key palliative care integration trials may now be mapped and compared with these data. Future research is required to document patterns of change and to confirm these transition points using analogous international cohorts and their relevance to patients and family members themselves.

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A. C., V. S., J. B., and J. P. had full access to all the data used in the study. A. C. and J. P. led the writing of the article. All authors contributed to the study design, interpretation, and write up of the results. A. C. had final responsibility for submission. This work was supported by the Victorian Cancer Agency (ECSG14019). The funder of the study had no role in study design, data collection, data analysis, interpretation of findings, or writing of the report. The authors declare no conflicts of interest.

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