Identifying Palliative Care Physicians using Health Administrative Data

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ABSTRACT

Background: Very little is known about the palliative care physician workforce in Canada or Ontario. The objective of this study was to develop a method of identifying palliative care physicians using administrative data and to validate it against a gold standard. This algorithm was then applied to all family physicians in Ontario to describe and quantify those identified by the algorithm.

Methods: We used the Ontario Health Insurance Plan (2008-2011) to identify palliative care related claims and divided this by all claims made to derive each physician's proportion of palliative care claims. We identified a data driven cut-off where physicians with a proportion of palliative care claims above the cut-off were defined as palliative care physicians. We validated the cut off against a reference sample of physicians who self-identified as doing "mostly" palliative care in a study specific survey. We then applied this algorithm back to the entire population of physicians.

Results: We empirically selected 10% as the cut-off. This had exceptional specificity and PPV and adequate sensitivity, 97.8%, 90.5% and 76.0%, respectively when compared to the reference sample (n=118). When applied back to all family physicians in Ontario, the algorithm identified 267 physicians as practicing mostly palliative care. Of these, 49% were women and 53% work part time and 96% practiced in urban locations.

Interpretation: We have developed a method to readily identify and quantify physicians who practice palliative care in Ontario. Such a tool has numerous applications for both health service planners and researchers.

INTRODUCTION

There is increasing recognition of the need to improve access to palliative care for patients with progressive life limiting illnesses. Practice-based models and research data support the need for early palliative care involvement[1,2]. Increasing cancer incidence, an aging population and increasing recognition for palliative care in non-cancer diagnoses are all drivers of the need for palliative care.

Physicians, as part of inter-professional teams, play a crucial role in the provision of palliative care. An adequate palliative care physician workforce with the necessary training and skill to manage complex cases and lead education, research, quality improvement and health services management is required[3,4]. However, other physicians including family physicians and specialists also have an important role to play, particularly providing generalist-level palliative care. This generalist approach is increasingly referred to as the "palliative care approach"[5].

Very little is known about the physician workforce providing palliative care in Canada or Ontario. The Canadian Partnership for Cancer Control report on the Cancer Workforce[6] describes a gap in human resources research and a need to better understand the current and future supply of physicians to provide cancer care, including palliative care. The Canadian data that is currently available is collected via surveys or interviews which are time consuming and subject to errors or bias[7-9]. A single US study identified on this issue also had difficulties identifying palliative care physicians to estimate the workforce[10]. Estimates from England vary considerably depending on the source[11].

The absence, until recently, of formal recognition of palliative care as a specialty or sub-specialty in Canada[12] has complicated the identification of physicians with advanced training and expertise in palliative care. Moreover, a lack of formal designation by the health ministries or regulatory bodies amplifies the challenge. Being able to identify palliative care physicians using administrative data would provide a rapid means of quantifying the palliative care physician workforce for policy purposes and provide a tool for other research studies.

The objective of this study was to develop a method of identifying physicians who provide palliative care using administrative health data and to validate it against a gold standard sample. Secondly, this algorithm was then applied to the all physicians in Ontario to describe and quantify those identified by the algorithm.

METHODS

Study Design

This study used administrative health care data to empirically create an algorithm for identifying physicians providing palliative care. This algorithm was then validated and applied to the entire population of physicians. This study was approved by the Research Ethics Board of Sunnybrook Health Sciences Centre. Standard protocols were followed to preserve physician privacy and confidentiality. All databases are housed at the Institute for Clinical Evaluative Sciences in Ontario.

Study Setting

The study setting was the province of Ontario, Canada whose population exceeds 13 million people. All physician care is provided by a government funded single payer health plan. Any patient who is felt to have need can receive palliative care regardless of whether they are still receiving anti-cancer therapy. Palliative care is typically provided by family physicians who have developed palliative care within their scope of practice (to greater or lesser degrees). For some, palliative care constitutes all or a major part of their practices. An unknown number have completed advanced training in palliative care, including an additional year of training with an accredited program.

Data Sources and Definitions

The Ontario Health Insurance Plan (OHIP) claims include the service date, service type and a unique provider number. Virtually all health services and physician visits are captured in this data. The OHIP Corporate Provider Database and the Ontario Physician Human Resource Data Centre database capture physician demographic and practice related characteristics. These administrative databases were linked through each physician's unique provider number. A physicians' full time equivalent (FTE) status was calculated by using total physician payments from all sources and assigning an FTE of 1.00 to physician who fell between 40th and 60th percentiles of their specialty[13,14].

We reviewed physician OHIP claims from January 01, 2008 to December 31, 2011. In order to identify palliative care physicians, we used a collection of palliative care specific feecodes within OHIP. These feecodes were identified by consulting the

Ontario Ministry of Health and Long Term Care Schedule of Benefits. This list of codes was vetted by a practicing palliative care physician to ensure it was complete (JP). Feecodes with few to no claims were removed (Appendix A).

Algorithm Definition

The algorithm for identifying palliative care physicians from administrative data was determined by evaluating each physician's proportion of palliative care claims. This was defined as the number of palliative care claims (numerator) over all claims made by the physician (denominator). We chose to use a proportion because it better characterizes practice patterns of palliative care physicians. Using absolute counts of palliative care claims would underestimate the number of palliative care physicians, as certain physicians are busier than others. Since the fee paid for any of the individual claims was within a narrow range, we did not use the proportion of billings from palliative care codes (by contrast, a surgeon would have procedure claims that are worth much more than a clinic visit). We evaluated the distribution of the data and empirically identified a threshold cut-off.

Validation Sample

A short survey was created asking physicians to self-identify as physicians that practice mostly palliative care versus occasionally or rarely and their FTE status. The Ontario Medical Association(OMA)[15] was then consulted to identify and contact all family physicians, general practitioners, and physicians with special interests in palliative care in Ontario. Physicians from across Ontario were surveyed from March to

November 2013. After the initial contact with physicians, they were given eight weeks to respond. The respondents to the survey were used as the reference standard.

Algorithm validation

Once the cut point was determined from the claims data, we extracted all claims data for the validation sample of physicians. We compared the proportion of palliative care claims billed by each physician in the reference sample to their self reported amount of palliative care from the survey (gold standard) to determine the performance of the algorithm. Those physicians that self-identified as practicing mostly palliative care were considered palliative care physicians, and those that indicated that they occasionally or rarely practice palliative care were considered non-palliative care physicians. If the algorithm worked perfectly, every physician with the percentage of palliative care claims above the cut off would also have self reported as practicing mostly palliative care and every physician below the cut off would have self reported as practicing palliative care only occasionally or rarely. We tested different cut offs to maximize sensitivity, specificity and positive predictive value (PPV). A binomial distribution was used to calculate 95% confidence intervals[16].

Algorithm application

Once the cut point was validated, the algorithm was applied to claims from all family doctors/general practitioners in the province. We then used administrative data to quantify and describe these doctors. When the algorithm was applied to the entire province the number of physicians identified was felt to be rather large. As a result, a secondary cut point was selected and data is presented for both cut points.

RESULTS

Primary Data Collection

A total of 125 physicians responded to the survey, and 7 were excluded because they could not be linked to the databases or had no recorded billings within the study period. A final cohort of 118 physicians was used in the analysis for the validation. A description of these physicians is provided in Table 1.

Validation of the Administrative Data Algorithm

All physician specialities (n=44) were evaluated for palliative care specific feecodes. The majority of palliative care claims (82%) were billed by general practitioners/ family practitioners, including family practitioners that also practice in the emergency department (Table 2). For this reason we restricted our analysis to family physicians only, recognizing that there are some palliative care physicians amongst specialists. Medical oncology billed the next largest proportion at 6%, most commonly using a weekly case management code. The other 41 specialties billed the palliative care codes infrequently. Counselling type codes were used most commonly among the family physicians/GPs.

We examined the distribution of the proportion of palliative care claims over the total claims and empirically selected 10% as the cut-off (data not shown). Performance of the 10% cut point and 3 additional different cut points are presented in Table 3. Having billed at least 10% of claims as palliative care claims was shown to have optimal performance with exceptional specificity and PPV and adequate sensitivity, 97.8%, 90.5% and 76.0%, respectively. Using a lower threshold of 5% and 3%, sacrificed

specificity and PPV while not improving sensitivity. A higher threshold of 50% greatly reduced the sensitivity with marginal increases to the specificity and PPV. A physician's full time equivalent status did not affect the algorithms (data not shown).

Using the ≥10% algorithm, we identified 276 physicians in Ontario that provided palliative care. Palliative care physicians were more likely to be female, more likely to practice in an urban setting and more likely to work part time compared to non-palliative care physicians (Table 4). When we stratified the palliative care physicians, those with ≥50% of their claims being palliative care (n=109) were younger compared to physicians with 10% to <50% of their claims being palliative care claims. There were more women in the ≥50% group but this was not statistically significant.

For physicians not meeting the criteria, only 0.5% of their claims were palliative care; whereas 21.2% and 82.8% of claims were for palliative care in the groups categorized by the 10% to <50% and ≥50% cut points respectively. There were approximately 3700 family physicians (3582-4147 depending on the year, about 40%) who did not bill a single palliative care code.

Physicians in the <10%, 10 to <50% and ≥50% groups relied on different feecodes. When the physicians in the <10% group did bill for palliative care, they more commonly used house call codes or the weekly supervision code. By contrast, the physicians in the ≥50% group primarily billed weekly supervision or counselling codes.

INTERPRETATION

We successfully developed an algorithm using billing claims to identify physicians practicing mostly palliative care with excellent specificity, an excellent positive predictive

value and modest sensitivity against the gold standard sample using a data driven threshold of 10% of claims being palliative care claims. Using this algorithm, we identified 276 physicians. Of these, 109 billed palliative care claims more than 50% of the time.

In spite of the high specificity and acceptable sensitivity of the 10% cut-off, the number of physicians identified across the province with this definition (n=276) appeared high to the authors. This may have occurred because the survey sent to ascertain palliative care practices was not specific enough, i.e. that “mostly” palliative care was not more specifically defined. It may be that the investigating team’s perspective under-appreciates the actual number of physicians practicing an intermediate amount of palliative care.

The reporting of 3 groups rather than two may deviate from the original intent but does provide additional insight that is useful from a policy perspective. For example, physicians in the >50% group are different from those in the 10-50% group. They are younger and clearly clustered in certain regions. By contrast, regardless of the cut-point, the physicians who are doing palliative care practice primarily in urban settings. Furthermore, it is clear that physicians billing more than 50% are practicing palliative care almost exclusively. The intermediate group who bill 10-50% likely run a regular family practice as well. These different groups reflect different models of providing palliative care. Care given in a palliative approach need not be given by specialists whose practice is exclusively in this area[5]. A recent study by Seow et al showed that different community based team models in Ontario reduced hospital admissions and ED visits provided certain key elements are present[17].

Perhaps most striking is that approximately 40% of the family physicians in the province did not bill a single palliative care code. If the intention is to increase primary palliative care capacity this may represent a target group and/or metric. For example, if policy measures are implemented to increase primary palliative care capacity, the patterns of billing for these physicians could be followed over time for change.

This algorithm does provide a tool to evaluate the number and distribution of palliative care physicians, to estimate the number of patients for whom they provide care and to use in forecasting estimates of human resource need. MD/population ratios from the UK[11] or Australia[18] range from 0.8 to 1.5 palliative care *specialists* per 100 000 population. Whether these estimates are applicable to Ontario is not known. In the US, Australia and England, shortages are feared[10,11,18]. An in depth examination of this issue for Ontario is beyond the scope of this paper, but the authors hope the algorithm is a significant step towards finding the answer.

The strength of this paper is that it begins to address a recognized gap in our knowledge of human health resources in palliative care in Ontario. While the specific feecodes or cut-off used in this study may not be generalizable to other settings, the methodological approach could be readily applied in other jurisdictions.

A limitation of the study is that the billing system is unable to accurately capture all possible types of palliative care activity. The types of claims used for the algorithm were specifically related to the provision of palliative care; however, it is common for palliative care physicians to bill other types of claims which are more generic, even if the nature of the care provided was still palliative. As such, the algorithm is not able to

quantify how much palliative care patients are getting and no physician would have 100% of their claims all specifically related to palliative care. Although specialists and other family doctors may be providing palliative care and billing with other feecodes, the lack of use of the specific codes indicates this is not the main focus of their practice.

We have developed a method to readily identify and quantify physicians who practice palliative care in Ontario. Such a tool has numerous applications for both health service planners and researchers. Until there is a more rigorous definition of “palliative care physician” paired with a robust identifier, this is the most useful tool available.

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Table 1 Characteristics of physicians used to validate the palliative care algorithm (n=118)

Characteristic	
Age, mean (SD)	47.7 (10.2)
Sex, n (%)	
Female	65 (55.1%)
Male	52 (44.1%)
Missing	≤ 5 physicians
Practice location, n (%)	
Rural	18 (15.3%)
Urban	88 (74.6%)
Missing	12 (10.2%)
Practice location by health region, n (%)	
1	≤ 5 physicians
2	8 (6.8%)
3	≤ 5 physicians
4	16 (13.6%)
5	≤ 5 physicians
6	≤ 5 physicians
7	9 (7.6%)
8	≤ 5 physicians
9	12 (10.2%)
10	6 (5.1%)
11	25 (21.2%)
12	≤ 5 physicians
13	6 (5.1%)
14	≤ 5 physicians
Missing	12 (10.2%)
Full time equivalent, (%)[1]	
1 or more	95 (80.5%)
Less than 1	19 (16.1%)
Missing	≤ 5 physicians
Proportion of palliative care claims over total claims[2]	12.5%

Age and practice location as of March 31, 2011.
[1]FTE status based on self report, all other variables from administrative data
[2]Proportion of palliative care claims from calendar years 2008 to 2011.

Table 2. Distribution of specific feecodes by physician specialty.

		GP/FP			Medical Oncology			All other specialties			Total	
		Number of claims	Column %	Row %	Number of claims	Column %	Row %	Number of claims	Column %	Row %	Number of claims	Column %
Feecode	Description											
A901	GP/FP house call	16,197	1%	97%	2	0%	0%	429	0%	3%	16,628	0%
A902	Pronouncement of death in home	4,758	0%	95%	2	0%	0%	241	0%	5%	5,001	0%
A945	GP/FP special palliative care consultation	47,298	2%	91%	523	0%	1%	3,958	1%	8%	51,779	2%
B966	Travel premium-palliative care home visit	53,467	2%	94%	6	0%	0%	3,504	1%	6%	56,977	2%
B990	Special visit to patient's home, weekday/daytime	298,642	11%	94%	71	0%	0%	18,072	5%	6%	316,785	9%
B992	Special visit to patient's home, weekday/daytime, sacrifice office hours	23,527	1%	98%	2	0%	0%	453	0%	2%	23,982	1%
B994	Special visit to patient's home, non-elective, evening hours	181,541	7%	97%	57	0%	0%	6,463	2%	3%	188,061	6%
B996	Special visit to patient's home, night time (first patient)	8,226	0%	91%	7	0%	0%	769	0%	9%	9,002	0%
B997	Special visit to patient's home, palliative care, days, evenings (from 2009)	461	0%	94%	4	0%	1%	27	0%	5%	492	0%
B998	Special visit to patient's home, palliative care, days, evenings (from 2005)	146,806	5%	95%	31	0%	0%	7,342	2%	5%	154,179	5%
C882	GP/FP terminal care in hospital	436,998	16%	96%	330	0%	0%	19,573	5%	4%	456,901	14%
C945	Special palliative care consultation, hospital in patient	41,208	1%	90%	148	0%	0%	4,570	1%	10%	45,926	1%
C982	Palliative care, hospital in patient	4	0%	0%	4,013	2%	12%	29,688	8%	88%	33,705	1%
E083	Subsequent visit as most responsible physician	68,524	2%	89%	255	0%	0%	7,918	2%	10%	76,697	2%
K015	Counseling a relative on behalf of a patient	73,267	3%	33%	23,632	11%	11%	124,872	32%	56%	221,771	7%
K023	Palliative care support to individual, 30 min	777,085	28%	87%	29,465	14%	3%	82,098	21%	9%	888,648	26%
K700	Palliative Care Out-patient Case Conference	1,204	0%	93%	85	0%	7%	12	0%	1%	1,301	0%
W872	Terminal care in nursing home, GP/FP practice	6,487	0%	99%	0	0%	0%	94	0%	1%	6,581	0%
W882	Terminal care in chronic care hospital, GP/FP	69,694	2%	92%	2	0%	0%	6,292	2%	8%	75,988	2%
G511	Telephone management of palliative care at home	15,849	1%	92%	331	0%	2%	1,112	0%	6%	17,292	1%
G512	Weekly palliative care case management	519,220	19%	71%	147,755	71%	20%	68,889	18%	9%	735,864	22%
	Total	2,790,463		82%	206,721		6%	386,376		11%	3,383,560	

GP/FP: general practice/family practice. Physicians in the GP/FP column were used to create the algorithm. Medical oncologists and other specialists are shown for comparison in this table, but are not included in algorithm.

Column % allows within group comparison. Row % allows between group comparison.

Table 3. Validation of administrative data algorithms against the physician survey data (n=118)

Algorithm description	Sensitivity (95% CI)	Specificity (95% CI)	PPV (95% CI)	NPV (95% CI)
≥50% are palliative care claims	24.0 (9.4 to 45.1)	100.0 (96.1 to 100.0)	100.0 (54.1 to 100.0)	83.0 (74.8 to 89.5)
≥10% are palliative care claims	76.0 (54.9 to 90.6)	97.8 (92.5 to 99.7)	90.5 (69.6 to 98.8)	93.8 (87.0 to 97.7)
≥5% are palliative care claims	76.0 (54.9 to 90.6)	95.7 (89.4 to 98.8)	82.6 (61.2 to 95.1)	93.7 (86.8 to 97.7)
≥3% are palliative care claims	76.0 (54.9 to 90.6)	88.2 (79.8 to 93.9)	67.9 (47.7 to 84.1)	93.2 (85.8 to 97.5)

PPV, positive predictive value; NPV, negative predictive value

Reference standard: physician survey in which they self-identified themselves as physicians that practice mostly palliative care.

Table 4. Characteristics of family physicians/general practitioners that practice palliative care, as identified by the algorithm.

Characteristic	Non-Palliative Care Physicians	Palliative Care Physicians		
		Overall[1]	10% to <50%[2]	≥50%[2]
Total	9456	276	167	109
Age, mean (SD)	50.4 (11.8)	50.6 (13.1)	51.9 (13.7)**	48.5 (11.9)
Sex, n (%)		*		
Female	3,665 (38.8%)	135 (48.9%)	75 (44.9%)	60 (55.0%)
Male	5,791 (61.2%)	141 (51.1%)	92 (55.1%)	49 (45.0%)
Practice location, n (%)		*		
Urban	8,250 (87.2%)	265 (96.0%)	159 (95.2%)	106 (97.2%)
Rural	1,077 (11.4%)	9 (3.3%)	7 (4.2%)	≤ 5
missing	129 (1.4%)	≤ 5	≤ 5	≤ 5
Practice location by health region, n (%)		*	**	
1	358 (3.8%)	7 (2.5%)	≤ 5	≤ 5
2	694 (7.3%)	13 (4.7%)	6 (3.6%)	7 (6.4%)
3	501 (5.3%)	18 (6.5%)	13 (7.8%)	≤ 5
4	969 (10.2%)	24 (8.7%)	16 (9.6%)	8 (7.3%)
5	444 (4.7%)	6 (2.2%)	6 (3.6%)	≤ 5
6	687 (7.3%)	17 (6.2%)	10 (6.0%)	7 (6.4%)
7	1,092 (11.5%)	73 (26.4%)	30 (18.0%)	43 (39.4%)
8	1,107 (11.7%)	28 (10.1%)	21 (12.6%)	7 (6.4%)
9	901 (9.5%)	22 (8.0%)	18 (10.8%)	≤ 5
10	435 (4.6%)	7 (2.5%)	6 (3.6%)	≤ 5
11	1,064 (11.3%)	39 (14.1%)	22 (13.2%)	17 (15.6%)
12	358 (3.8%)	7 (2.5%)	≤ 5	≤ 5
13	477 (5.0%)	10 (3.6%)	9 (5.4%)	≤ 5
14	240 (2.5%)	≤ 5	≤ 5	≤ 5
missing	129 (1.4%)	≤ 5	≤ 5	≤ 5
Full time equivalent		*	**	
1 or more	5,908 (62.5%)	118 (42.8%)	75 (44.9%)	43 (39.4%)
less than 1	3,496 (37.0%)	145 (52.5%)	89 (53.3%)	56 (51.4%)
missing	52 (0.5%)	13 (4.7%)	≤ 5	10 (9.2%)
Proportion of palliative care claims	0.5%	35.7%	21.2%	82.8%

[1]represents all palliative care physicians identified using the 10% algorithm.
[2]represents all palliative care physicians identified using the 10% algorithm, stratified by those with 10% to <50% and ≥50% of all their claims being palliative care claims.

*represents p<0.05 comparing non-palliative care physicians to palliative care physicians baseline characteristic
**represents p<0.05 comparing 10% to <50% to ≥50% palliative care physicians baseline characteristic

Appendix A. List of palliative feecodes used to create algorithm.

Final codes included in the algorithm:
A901 billed with B997 or B998
A902 billed with B997 or B998
A945
B966
B990
B992
B994
B996
B997
B998
C882
C982
C945 billed with C882 or C945 or C982
E083
K015
K023
K700
W872
W882
G511
G512

Feecodes considered, but excluded because there was no billing activity

K001
W972
W982
Z327
Z361
Z362
G063
G064