Validation of the V66.7 Code for Palliative Care Consultation in a Single Academic Medical Center

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Abstract

Background: Use of administrative data to study the effectiveness of specialized palliative care is limited by the lack of a reliable method to identify patients receiving palliative care consultation. The International Classification of Diseases, Ninth Revision (ICD-9) code V66.7 has been used, but its validity for this purpose is unknown.

Objective: To examine the validity of the ICD-9 code V66.7 for identifying whether hospitalized patients received palliative care consultation.

Design: Retrospective cohort study.

Setting/Subjects: All patients of age ≥ 18 years admitted to a single academic medical center between August 2013 and August 2015.

Measurements: Sensitivity and specificity of the V66.7 code for palliative care consultation for all patients and several *a priori* identified subgroups. The reference standard was the presence of a palliative care consultation note in the electronic medical record.

Results: Of 100,910 admissions, 1999 received a palliative care consultation (2.0%) and 1846 (1.8%) had usage of the V66.7 code. Sensitivity and specificity for the V66.7 code were 49.9% and 99.1%, respectively. Sensitivity was considerably higher for certain subgroups, such as patients with dementia (76.3%) and metastatic cancer (66.3%); addition of age restrictions further improved sensitivity while maintaining high specificity. Specificity was substantially lower for patients who died during hospitalization (sensitivity 53.9%, specificity 75.1%).

Conclusions: In a single center, the ICD-9 code V66.7 had poor sensitivity and high specificity for identifying hospitalized patients who received a palliative care consultation. Appropriate use of this code for this purpose should take these characteristics into consideration.

Keywords: end-of-life care; International Classification of Disease Codes; palliative medicine; validation studies

Introduction

THE EFFICACY OF SPECIALIZED PALLIATIVE CARE, or palliative care consultation, in improving patient outcomes has been demonstrated by studies conducted largely in single centers. Although these studies have varied in their methodology and approach, there has been a general trend toward specialized palliative care consultation being associated with better outcomes, with improvements in survival, documen-

tation of advance directives, and quality of life, as well as decreases in intensive care unit (ICU) admission, ICU length of stay, and the use of nonbeneficial life-sustaining therapies.¹⁻⁵ It seems that within single centers, it is possible to deliver specialized palliative care to affect the intended outcomes of improving quality of life and decreasing unnecessary treatment intensity; whether these benefits have translated outside of single-center settings is unknown. However, the ability to perform larger multicenter studies

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using administrative data to examine this question has been limited by the absence of accurate, efficient ways to identify patients who receive a palliative care consultation. Traditional methods of using physician billing codes are hampered by the fact that these codes are not specialty specific, and may be used by physicians whose primary specialty may not be palliative care (e.g., oncology).

Existing studies examining the effect of specialized palliative care have thus far relied on relatively time-consuming methods such as chart review to determine whether palliative care services have been delivered. Currently, there is no reliable method by which to identify patients as having had a palliative care consultation in administrative data. The International Classification of Diseases, Ninth Revision (ICD-9) does contain a diagnostic code, V66.7 “encounter for palliative care,” which is to be used in situations of “palliative care,” “end-of-life care,” “hospice care,” or “terminal care.” This code has previously been reported to have high sensitivity and specificity for identifying patients who underwent withdrawal of life-sustaining therapy,⁶ but there is concern that its use is not specific for patients who receive specialized palliative care, and that it is largely used to capture the subset of palliative care patients who are actively dying.^{7,8} Given the increasing use of this code and prior concerns about its utility,^{9,10} we performed a single-center validation study to determine the sensitivity and specificity of the V66.7 code for determining whether hospitalized patients did or did not receive specialized palliative care consultation.

Materials and Methods

Study population

The study protocol was reviewed and approved by Columbia University Medical Center (CUMC) (IRB-AAAP2112 New York, NY). Written informed consent was waived. Data for this retrospective study came from the Clinical Data Warehouse, a repository of electronic medical records, at CUMC in New York, NY. We included all patients of age ≥ 18 who were admitted to the medical center from August 1, 2013, to August 31, 2015. Repeat hospitalizations for patients were included in the study.

Data collection

We obtained demographic and clinical variables from the medical record through an electronic data extraction performed by the Clinical Data Warehouse. We obtained information on age, gender, race, discharge disposition, whether patients were admitted to an ICU, and all diagnoses that were received during the hospitalization. We used all ICD-9 diagnoses to identify comorbidities and calculated the Charlson Comorbidity Index using the method by Quan et al.¹¹

We identified (1) whether a patient had a palliative care note written and (2) whether a patient had a V66.7 code in the billing data. At CUMC, the palliative care service uses a specific template note for all consultations that is uniquely identifiable within the electronic health record; all patients who are seen by the palliative care service should have this documentation, and this note is not used by any other service. The reference standard for receipt of specialized palliative care consultation was having one or more palliative care consultation notes in the medical record for a given hospitalization.

All diagnosis fields were searched for the presence of the V66.7 code, and any use was counted. To validate our reference standard, we reviewed 100 charts that were labeled as having a palliative care consultation note to look for the physical presence of a note, and 100 charts that were labeled as not having had a palliative care consultation to confirm absence of a note. On review, 100% of patients labeled as having a palliative care consultation had a palliative care note in their medical record; 100% of patients labeled as not having a palliative care consultation did not have a note in their medical record.

We calculated the false positive rate and the false negative rate for all hospitalized patients. To further examine the population of patients receiving palliative care consultation that may not be captured by use of the V66.7 code (false negative patients), we compared characteristics between false negative patients and true positive patients, including number of overall diagnoses. To better understand ways in which the V66.7 code was being used, we reviewed 100 charts of hospitalizations with use of the code and searched for supporting documentation (e.g., palliative care consultation notes, use of the phrases “end-of-life care,” “palliative care,” “comfort care,” “terminal care,” or discussions of withholding or withdrawing life-sustaining therapies or referral to hospice by nonpalliative care providers). We focused in particular on false positive patients (patients with a V66.7 code who did not receive palliative care consultation).

Statistical analysis

We calculated sensitivity, specificity, positive and negative predictive values, positive and negative likelihood ratios, and the area under the receiver operating characteristics curve for the V66.7 code using all hospitalized patients. We also calculated these characteristics for several predefined subgroups to identify how the performance of the V66.7 code differed based on severity of illness during hospitalization. We examined metrics for (1) patients who did and did not die during hospitalization, (2) patients who were and were not admitted to the ICU, (3) patients stratified by Charlson comorbidity index, (4) patients with chronic diseases, including cancer without metastases, metastatic cancer, congestive heart failure (CHF), chronic obstructive pulmonary disease (COPD), moderate or severe liver disease and dementia, and (5) patients who were and were not discharged to a facility. Based on these initial subgroup results, we then generated other subgroups by taking those with sensitivity $>60\%$ and adding other patient characteristics to determine whether there were particular patient populations for which the V66.7 code had better performance. Because the number of available diagnosis codes can be truncated in large datasets (e.g., Medicare, Nationwide Inpatient Sample), we examined the number code that was used to bill the V66.7 code. Database management and analyses were performed using Microsoft Excel and Stata 13.1 (College Station, TX).

Results

Patient characteristics

Between August 2013 and August 2015, there were 100,910 hospitalizations at CUMC of 68,657 different patients. Of all hospitalizations, 1999 (2.0%) received a palliative care

consultation and 1846 (1.8%) had a diagnosis code of V66.7. In comparison with the overall cohort, patients who received palliative care consultation or had a diagnosis code of V66.7 were more likely to be older, male, have a higher number of comorbidities, have a cancer diagnosis, be admitted to an ICU, be discharged to hospice, or have died during their hospitalization (Table 1). Sepsis was the most common admission diagnosis for both patients who received palliative care consultation and patients with the V66.7 code, followed by CHF. Use of only the first 25 diagnosis codes captured 98.2% of patients with the V66.7 code.

Performance characteristics of the V66.7 code

The V66.7 code had high specificity (99.1%) but poor sensitivity (49.8%) for identifying patients with a palliative care consultation (Table 2). Performance of the code was worse for patients with a higher severity of illness during their hospitalization. For patients who died during hospitalization, specificity was lower (75.1%), whereas sensitivity was relatively unchanged (53.9%); a similar pattern was seen for patients who were admitted to the ICU during their hospitalization. For increasing comorbidity burden, as well as individual comorbidities, sensitivity was higher, whereas specificity was modestly lower. Throughout the different subgroups, specificity remained high (>90%) but sensitivity remained low (<60%), with the exception of patients with

dementia (76.3%), COPD (61.3%), nonmetastatic cancer (61.9%), and metastatic cancer (66.3%) (Table 2).

We then added further characteristics (age ≤ 65 , age > 80 , having 0, 1–2, or ≥ 3 Charlson comorbidities, not being admitted to ICU, discharge to a facility, and surviving hospitalization) to restrict subgroups with sensitivity $> 60\%$ to try to improve performance of the V66.7 code. For patients with dementia with age > 85 years, sensitivity improved to 79.0%, and specificity continued to be high at 94.4%. Sensitivity was also higher for patients with dementia who were not admitted to the ICU (sensitivity 81.0% and specificity 96.4%). Similarly, for patients with metastatic cancer, adding an age cutoff improved the performance of the code (sensitivity 69.1% and specificity 95.4% for age ≤ 65 years) (Table 3).

Examination of false negative patients and false positive patients

The overall false positive rate was low (0.9%). When we performed a chart review to examine use of the V66.7 code in further detail, we found that, of 100 patients who had use of the V66.7 code, the majority of patients received a palliative care consultation (55%), whereas 26% of patients had documentation of being transitioned to comfort care, 9% had documentation of other generalist palliative care and end-of-life care decision making, and 10% of patients did not have clear documentation of the provision of end-of-life, palliative

TABLE 1. CHARACTERISTICS OF PATIENTS AT COLUMBIA UNIVERSITY MEDICAL CENTER, AUGUST 2013 TO AUGUST 2015

	Total (N=100,910), n (%)	Palliative care consultation (N=1999), n (%)	Use of V66.7 code (N=1846), n (%)
Age			
18–643	61,828 (61.3)	960 (48.0)	674 (36.5)
65–74	17,267 (17.1)	486 (24.3)	389 (21.1)
75–84	13,390 (13.3)	355 (17.8)	399 (21.6)
≥ 85	8425 (8.4)	198 (9.9)	384 (20.8)
Sex			
Female	58,578 (58.1)	961 (48.1)	964 (52.2)
Male	42,332 (42.0)	1038 (51.9)	882 (47.8)
Race			
White	38,442 (38.1)	855 (42.8)	739 (40.0)
Black	12,241 (12.1)	270 (13.5)	259 (14.0)
Asian	2778 (2.8)	66 (3.3)	42 (2.3)
Other/declined	47,449 (47.0)	808 (40.4)	806 (43.7)
Charlson comorbidity index			
0	48,567 (48.1)	335 (16.8)	189 (10.2)
1–2	29,177 (28.9)	494 (24.7)	511 (27.7)
≥ 3	23,166 (23.0)	1170 (58.5)	1146 (62.1)
Cancer diagnosis	10,830 (10.7)	829 (41.5)	840 (45.5)
ICU admission	11,741 (11.6)	860 (43.0)	659 (35.7)
Hospital length of stay, median (IQR)	3 (2–7)	14 (7–28)	9 (4–17)
Discharge destination			
Home	61,050 (60.5)	224 (11.2)	133 (7.2)
Home with health services	21,779 (21.6)	376 (18.8)	255 (13.8)
Skilled nursing facility	9203 (9.1)	214 (10.7)	180 (9.8)
Hospice	850 (0.8)	351 (17.6)	390 (21.1)
Other facility	861 (0.9)	99 (5.0)	60 (3.3)
Rehabilitation facility	2704 (2.7)	72 (3.6)	21 (1.1)
Other	1969 (2.0)	10 (0.5)	6 (0.3)
Died in hospital	2453 (2.4)	653 (32.7)	801 (43.4)

ICU, intensive care unit; IQR, interquartile range.

TABLE 2. PERFORMANCE OF V66.7 CODE FOR IDENTIFYING RECEIPT OF PALLIATIVE CARE CONSULTATION FOR ALL PATIENTS AND ACROSS SUBGROUPS

	<i>Sensitivity, %</i>	<i>Specificity, %</i>	<i>AUC</i>	<i>PPV, %</i>	<i>NPV, %</i>	<i>LR+</i>	<i>LR-</i>
All patients	49.87	99.14	0.75	54.01	98.99	58.1	0.51
Died in hospital							
Yes	53.91	75.06	0.64	43.95	81.78	2.16	0.61
No	47.92	99.59	0.74	61.72	99.28	116.34	0.52
Admitted to ICU							
Yes	42.56	97.31	0.70	55.54	95.54	15.80	0.59
No	55.40	99.37	0.77	53.16	99.42	87.71	0.45
Charlson comorbidity index							
0	27.16	99.80	0.63	48.15	99.50	133.69	0.73
1–2	49.80	99.08	0.74	48.14	99.13	53.90	0.51
≥3	56.41	97.79	0.77	57.59	97.68	25.53	0.45
Nonmetastatic cancer							
Yes	61.88	97.09	0.79	60.39	97.26	21.27	0.39
No	44.12	99.35	0.72	50.42	99.16	67.66	0.56
Metastatic cancer							
Yes	66.28	94.13	0.80	66.67	94.03	11.29	0.36
No	44.08	99.30	0.72	49.06	99.14	65.57	0.56
CHF							
Yes	44.58	98.30	0.71	50.59	97.84	26.19	0.56
No	52.05	99.29	0.76	55.32	99.19	73.40	0.48
COPD							
Yes	61.28	97.59	0.79	50.97	98.41	25.45	0.40
No	32.53	99.80	0.66	65.15	99.23	163.59	0.68
Moderate to severe liver disease							
Yes	61.11	96.33	0.79	59.23	96.59	16.64	0.40
No	49.12	99.18	0.74	53.61	99.02	60.14	0.51
Dementia							
Yes	76.32	95.72	0.86	39.73	99.09	17.81	0.25
No	49.36	99.18	0.74	54.60	98.99	60.02	0.51
Discharged to a facility							
Yes	41.42	98.87	0.70	54.24	98.12	36.73	0.59
No	51.42	99.17	0.75	53.98	99.08	61.99	0.49

AUC, area under the curve; CHF, congestive heart failure; COPD, chronic obstructive pulmonary disease; LR+, positive likelihood ratio; LR–, negative likelihood ratio; NPV, negative predictive value; PPV, positive predictive value.

or comfort care. In these 10% of patients lacking specific documentation, 6% of patients had mention of the word “palliative” in their record but outside of the context of actual delivery of palliative care during the hospitalization (e.g., “consider palliative care,” “palliative radiation,” “palliative dialysis,” and “outpatient palliative care”). One patient had a do-not resuscitate order placed that was initiated by the family, one patient died in hospital unexpectedly, and two patients lacked clear provision of palliative, comfort, or end-of-life care.

The false negative rate was high (50.1%). In comparison with true positive patients, we found that false negative patients had fewer comorbidities, were less likely to have a

diagnosis of cancer, be discharged to hospice or die during hospitalization, and were more likely to be admitted to the ICU. The number of diagnoses was similar between true positive patients (median 19 diagnoses, interquartile range [IQR] 15–23) and false negative patients (median 18 diagnoses, IQR 11–23) (Table 4).

Discussion

In a single academic medical center, we found that the V66.7 ICD-9 code was highly specific but not sensitive for capturing hospitalized patients who received specialized palliative care consultation. The V66.7 code was used in

TABLE 3. PERFORMANCE OF V66.7 CODE FOR IDENTIFYING RECEIPT OF PALLIATIVE CARE CONSULTATION FOR SPECIFIC SUBGROUPS

	<i>Sensitivity, %</i>	<i>Specificity, %</i>	<i>AUC</i>	<i>PPV, %</i>	<i>NPV, %</i>	<i>LR+</i>	<i>LR-</i>
Dementia and age ≥85	78.95	94.35	0.87	34.88	99.15	13.99	0.22
Dementia, not admitted to ICU	80.95	96.41	0.89	34.00	99.55	22.54	0.20
Metastatic cancer and age ≤65	69.12	95.42	0.82	75.77	93.72	15.10	0.32

TABLE 4. CHARACTERISTICS OF TRUE POSITIVE PATIENTS AND FALSE NEGATIVE PATIENTS

	True positive patients (N = 997), n (%)	False negative patients (N = 1002), n (%)
Age		
18–64	474 (47.5)	486 (48.5)
65–74	227 (22.8)	259 (25.9)
75–84	191 (19.2)	164 (16.4)
≥85	105 (10.5)	93 (9.3)
Sex		
Female	505 (50.7)	456 (45.5)
Male	492 (49.4)	546 (54.5)
Race		
White	428 (42.9)	427 (42.6)
Black	140 (14.0)	130 (13.0)
Asian	30 (3.0)	36 (3.6)
Other/declined	399 (40.0)	409 (40.8)
Charlson comorbidity index		
0	91 (9.1)	244 (24.4)
1–2	246 (24.7)	248 (24.8)
≥3	660 (66.2)	510 (50.9)
Cancer diagnosis	521 (52.3)	308 (30.7)
ICU admission	366 (36.7)	494 (49.3)
Hospital length of stay, median (IQR)	12 (7–21)	18 (9–39)
Discharge destination		
Home	79 (7.9)	145 (14.5)
Home with health services	169 (17.0)	207 (20.7)
Skilled nursing facility	88 (8.8)	126 (12.6)
Hospice	248 (24.9)	103 (10.3)
Other facility	40 (4.0)	59 (5.9)
Rehabilitation facility	17 (1.7)	55 (5.5)
Other	4 (0.4)	6 (0.6)
Died in hospital	352 (35.3)	301 (30.0)
Number of diagnoses, median (IQR)	19 (15–23)	18 (11–23)

situations of terminal and end-of-life care even when a formal consultation by the palliative care team had not been sought; thus, its specificity for identifying consultations was substantially lower for patients who died in hospital. However, we were able to identify select subgroups (patients with dementia and metastatic cancer) with higher sensitivity of the V66.7 code, although sensitivity remained less than 90%. When we examined false negative patients, some markers of severity of illness were more likely to be present in comparison with true positive patients (i.e., ICU admission), whereas others were less likely (e.g., number of Charlson comorbidities and dying in hospital).

A prior study validating use of the V66.7 code to identify patients as having had withdrawal of life-sustaining therapy demonstrated a sensitivity of 81% and a specificity of 99.7%⁶; however, this is the first study to our knowledge to examine the use of the V66.7 code for identifying patients receiving specialized palliative care. Our findings are similar to other validation studies of ICD-9 diagnosis codes, in which the codes have high specificity but low sensitivity for a given condition.^{12–16} Our findings also mirror results of a recent

multicenter study examining the prevalence of palliative care consultation, in which only 50% of patients who received consultation had a diagnosis code of V66.7.¹⁷

Our findings suggest that studies using this code as a proxy for palliative care consultation will identify patients who have a high likelihood of having received consultation, but will not capture all patients who receive specialist palliative care. Depending on the purpose of the study, such performance characteristics may be acceptable. For example, use of the code for an observational cohort study delineating outcomes of patients who received palliative care consultation during hospitalization or comparing outcomes of such patients across hospitals may be acceptable, recognizing that such an approach may be more likely to miss patients receiving palliative care consultation with fewer comorbidities or who are less likely to die during hospitalization. However, using the code for a study that compares outcomes for patients who did and did not receive palliative care consultation would be difficult, as the code's poor sensitivity makes the potential for misclassification high. Similarly, studies using the V66.7 code to identify rates of palliative care consultation will likely underestimate actual use.

Our study does have several limitations. First, our findings arise from a single center. Both the use of palliative care consultation and billing practices may vary highly from center to center, and consequently, the positive and negative predictive values of the V66.7 code may be highly variable. Also, both availability and awareness of palliative care consultation have increased over time; we used relatively recent data and our findings may not be applicable to older data. Lastly, several countries (including the United States starting in October of 2015) have moved to using the ICD-10 coding scheme that has a different code, Z51.5 “Encounter for palliative care.” Although the description of the ICD-10 code is identical, and it is considered to be interchangeable with the V66.7 code,¹⁸ the new code may be used differently and our results may not apply.

Overall, we found that the performance of the V66.7 code was highly specific, but not sensitive for identifying patients who received a palliative care consultation. Future efforts to enhance the validity of the V66.7 code may include identifying coding algorithms to further improve its sensitivity, validating its use across multiple centers, and examining whether use of the new ICD-10 code is comparable. Given the reported performance metrics, the appropriateness of solely using the V66.7 code to classify patients as having received a palliative care consultation will largely depend on the aims of the particular study.

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