Predicting Need for Palliative Care in Chronic Disease Patients using Linked Claims and Electronic Health Records Data

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RWD5

Introduction

Palliative care is focused on improving quality of life (QOL) of patients with complex or life-threatening illnesses through prevention and management of pain and other physical and psychological problems. As a medical specialty, palliative care is shown to be both underutilized and initiated quite late in the course of disease management, resulting in suboptimal benefits. Identification of predictive factors for need of palliative care can facilitate reliable clinical triage, efficient resource utilization, and improved QOL and end-of-life patient care.

Objectives

1. To identify claims and electronic health records (EHR) data that are potential predictors of need for palliative care within 6 months among patients with chronic diseases in the US
2. To compare performance of claims vs. claims + EHR based palliative care prediction model

Methods

A retrospective study was conducted using **Optum® de-identified Market Clarity Dataset** (linked claims and EHR of patients) among adult patients (≥18 years). A predictive model was built using claims and EHR data for patients that required vs. didn't require palliative care.

- **Cases:** Patients with >=1 claims and/ or EHR with a diagnosis or procedure code for Palliative care during 1st Jan 2019 to 31st Mar 2022. Only patients requiring Palliative care for the following 8 chronic diseases were included – hypertension, neoplasms, diabetes mellitus, depression, anxiety, chronic ischemic heart disease, COPD, and chronic kidney disease. These diseases were identified using ICD10 diagnosis codes
- **Controls:** Patients with NO claims or EHR with a diagnosis or procedure code for Palliative care during 1st Jan 2019 to 31st Mar 2022. The controls were matched (using propensity score matching technique) with cases on demographics and the 8 chronic diseases considered in the study. Demographics considered: age, biological sex, race/ ethnicity, geographical region, and payor type (Commercial, Medicare, and Medicaid)
- **Index event:** The first claim or EHR with Palliative care diagnosis or procedure code. ICD10 diagnosis and HCPCS procedure codes were used for identification of Palliative care
- **Pre-index criteria:** All patients, both cases and controls, had at least 6 months of continuous claims and clinical (EHR) activity prior to the index date. Only patients with no palliative care code in claims or EHR during the 6 months pre-index period were included in the model
- **Predictive model:** The need for palliative care was predicted using data from 16-90 days and 91-180 days prior to index event. Logistic regression technique was used for modelling. A total of 25 claims and 67 clinical (EHR) variables were included in the prediction models
- Total study population used for building the model: **59,103 cases and 59,103 controls**

Results

- A total of 55% cases and controls were females, 80% were Caucasians, 67% were ≥65 years and 24% were 50-64 years, 51% resided in Midwest region, and 59% were Medicare and 26% were Commercial beneficiaries
- Claims-based models have an accuracy of ~79% in 16-90 days period and ~75% in 91-180 days period. **Claims + EHR based models have significantly higher accuracy**, ~91% in 16-90 days period and ~88% in 91-180 days period

ROC curve for 16-90 days claims-based model: AUC 0.79, Sp 83%, Sn 63%
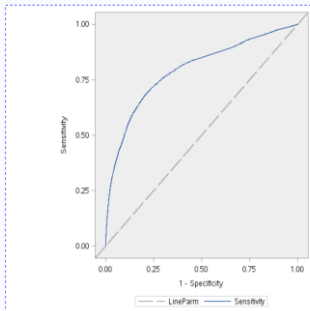
ROC curve for 16-90 days claims + EHR - based model: AUC 0.91, Sp 86%, Sn 80%
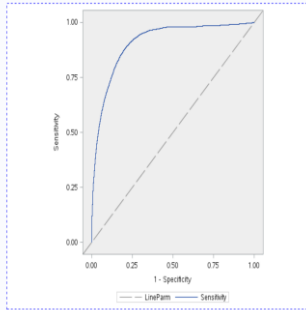
Key predictors identified in claims + EHR model for palliative care b/w both 16-90 days and 91-180 days pre-index period		16-90 days model: Odds ratio (95% Conf. Interval)	91-180 days model: Odds ratio (95% Conf. Interval)
Claims	History of inpatient hospitalization	2.22 (2.07 - 2.39)	1.95 (1.81 - 2.09)
Claims	History of radiological/ imaging scans	1.71 (1.61 - 1.81)	1.52 (1.44 - 1.61)
Claims	Filled prescriptions for pain medications	1.64 (1.56 - 1.73)	1.35 (1.28 - 1.42)
Claims	Healthcare visits >=8 (median value)	2.34 (2.21 - 2.47)	1.90 (1.80 - 1.98)
Claims	Comorbidity: Anemia	2.45 (2.21 - 2.73)	2.11 (1.91 - 2.34)
Claims	Comorbidity: Gastroesophageal reflux disease	1.16 (1.07 - 1.27)	1.25 (1.15 - 1.35)
Claims	Comorbidity: Metabolic disorders	2.02 (1.80 - 2.26)	1.81 (1.62 - 2.03)
Claims	Comorbidity: Pneumonia	1.53 (1.27 - 1.84)	1.56 (1.28 - 1.91)
Claims	Comorbidity: Sepsis	1.57 (1.21 - 2.03)	1.36 (1.04 - 1.77)
EHR	Clinical feature: Fever	1.09 (0.96 - 1.19)	1.18 (1.08 - 1.29)
EHR	Clinical feature: Bowel movement issues	1.44 (1.33 - 1.57)	1.29 (1.19 - 1.40)
EHR	Clinical feature: Fall/ injury	1.98 (1.81 - 2.16)	1.94 (1.79 - 2.10)
EHR	Clinical feature: Diminished or loss of memory	4.00 (3.54 - 4.53)	2.83 (2.53 - 3.16)
EHR	Clinical feature: Fatigue	1.37 (1.26 - 1.47)	1.22 (1.13 - 1.31)
EHR	Bedside positive pain assessment	3.51 (3.28 - 3.77)	3.24 (3.04 - 3.46)
EHR	Self-reported lack of social support	1.43 (1.31 - 1.56)	1.40 (1.29 - 1.52)
EHR	Self-reported alcohol/ substance/ drug abuse	1.37 (1.23 - 1.54)	1.38 (1.24 - 1.53)
EHR	High anion gap	1.60 (1.35 - 1.90)	1.36 (1.17 - 1.57)
EHR	Raised bilirubin levels	1.53 (1.24 - 1.89)	1.70 (1.38 - 2.07)
EHR	High C-reactive protein	1.76 (1.10 - 2.81)	1.04 (0.70 - 1.54)

Conclusion

The need for Palliative care can be reliably predicted among patients with chronic diseases using their claims and EHR data for preceding 6 months. The performance of prediction improves significantly by using both claims + EHR data. This demonstrates the importance of linked claims and clinical databases in research. There is need to integrate predictive modeling into healthcare delivery to ensure timely and effective delivery of palliative care to patients.

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