Healthcare Resource Utilization Among Hormone Receptor-Positive and Negative Breast Cancer Patients in the Real-World Setting

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BACKGROUND

- Breast cancer is the second most common cancer and the second leading cause of cancer death in women in the United States.[1]
- While various tumor biomarker statuses, including progesterone receptor (PR) and estrogen receptor (ER), influence morbidity, mortality, and treatment pathways in breast cancer, they are often not collected systematically in structured electronic health record (EHR) data.
- However, these tumor biomarker statuses may be collected as part of the unstructured clinical notes within EHR systems during routine care.

OBJECTIVES

- The objectives of this study were as follows:
  - To apply natural language processing (NLP) to extract tumor status from the unstructured clinical notes of breast cancer patients.
  - To compare healthcare resource utilization (HCRU) between hormone receptor (HR)-positive and negative breast cancer patients in the real-world setting.

METHODS

- Patients from an integrated delivery network within the OMNY Health Database were included if they had at least one diagnosis code for breast cancer (ICD-10: C50*) and accessible unstructured clinical notes from 2017 to 2022.
- HR status for progesterone and estrogen receptors was extracted from the unstructured clinical notes using an NLP pipeline that consisted of pretrained oncological named entity recognition and relation extraction models (Spark NLP for Healthcare; John Snow Labs).
- Patients were categorized as HR-positive if they ever had a positive HR status for at least 1 receptor type and as HR-negative if they never had a positive HR status for either receptor type.
- Descriptive statistics (median and quartiles 1 and 3 [Q1, Q3]) were generated by HR receptor status for the following HCRU variables:
  - Total number of encounters
  - Total gross charges per year of follow-up time

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RESULTS

- Data from 2,982 breast cancer patients was analyzed using the pipeline.
- HR status was resolved by the NLP pipeline for 399 patients (13.4%) comprising 298 HR-positive and 101 HR-negative patients.
- Demographic statistics for HR-positive and HR-negative groups are presented in Table 1.

Table 1: Demographic Statistics for HR-positive and HR-negative Groups

Statistic	HR-positive (n=298)	HR-negative (n=101)
Decade of birth		
1990s – 1980s	20 (7%)	7 (7%)
1970s – 1960s	108 (36%)	37 (37%)
1950s – 1940s	143 (48%)	51 (50%)
Before 1940	27 (9%)	6 (6%)
Gender		
Female	293 (98%)	101 (100%)
Race		
White	258 (87%)	78 (77%)
Black or African American	30 (10%)	18 (18%)
Other	10 (3%)	5 (5%)

- Number of encounters per year by HR status are presented in Figure 1:
  - Median (Q1-Q3) number of encounters were 15.0 (7.2-35.2) and 12.6 (6.5-28.9) for HR-positive and HR-negative patients, respectively.
  - A greater amount of variability was observed for HR-positive patients with a generally higher number of encounters per year.
- Total charges per year in United States dollars by HR status are presented in Figure 2:
  - Median (Q1-Q3) total charges were $202,039 ($81,927-$667,693) and $216,283 ($78,659-$638,535) for HR-positive and HR-negative patients, respectively.
  - Similar distributions by HR status were observed.

Figure 1: Number of Encounters Per Year by HR Status

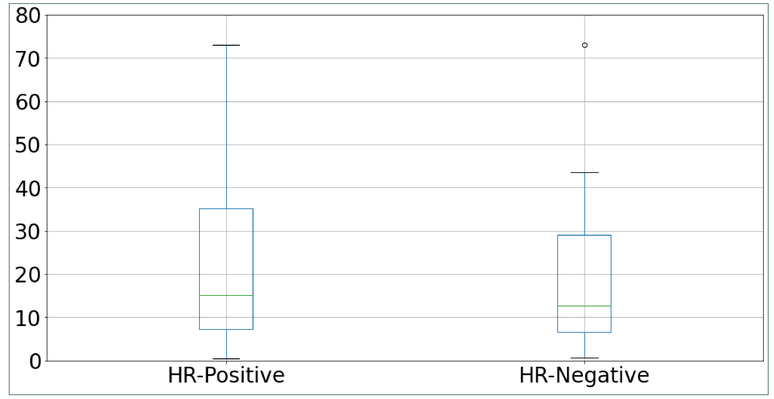
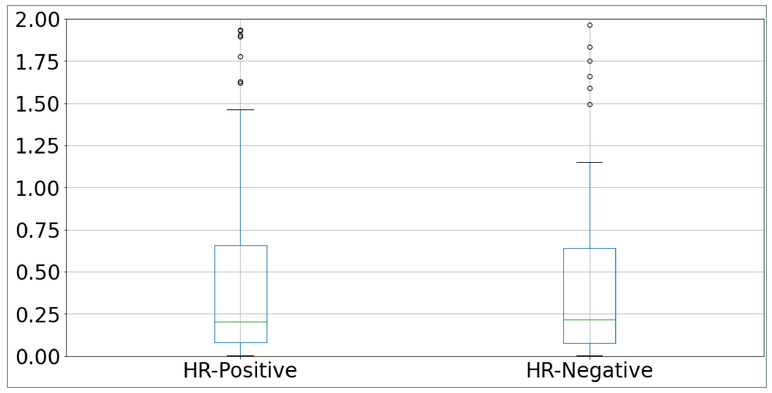


Figure 2: Total Charges ($M) per Year by HR Status



DISCUSSION AND CONCLUSIONS

- These results suggest that HR-positive patients may experience slightly more encounters per year and similar total charges per year compared to HR-negative patients in the real-world setting.
- Earlier mortality in HR-negative patients and other comorbidities may be reasons for the observed results.
- Further research is required to elucidate care differences between breast cancer patients having various cancer subtypes.

REFERENCES

1. American Cancer Society (2023). Breast Cancer Statistics | How Common is Breast Cancer? https://www.cancer.org/cancer/breast-cancer/about/how-common-is-breast-cancer.html.

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