

Impact of Hospital Type and Location on Survival Outcomes for Patients with Well-Differentiated Pancreatic Neuroendocrine Tumors

Amber L. Collier, MD¹, Ahmed Alnajar, MD, MSPH¹, Mehmet E. Akcin, PhD¹, Alessia C. Cioci MD²,
Danny Sleeman MD¹, John. I. Lew, MD², Tanaz M. Vaghaiwalla, MD²

¹Division of Endocrine Surgery, Department of Surgery, University of Miami Miller School of Medicine, Miami, FL, U.S.A.

²DeWitt Daughtry Department of Surgery, University of Miami Miller School of Medicine, Miami, FL U.S.A.



BACKGROUND

- Well-differentiated nonfunctional pancreatic neuroendocrine tumors (WD PanNETs) frequently require multidisciplinary management.
- Management is often multi-modal and recommendations for optimal treatment and sequencing of treatment continue to evolve.
- Treatment decisions are further complex due to institutional differences and geographic barriers, with studies showing superior outcomes for patients treated at high-volume academic centers, and for patients traveling further distances for treatment.
- Facility type and location may have a significant impact on oncological outcomes for patients.
- The aim of this study is to examine whether treatment facility type and geographic factors are associated with survival outcomes for patients with WD PanNETs.

METHODS

- Patients with Grade 1 and Grade 2 nonfunctional WD PanNETs were identified from the National Cancer Database (NCDB) 2004-2021 using ICD-0-3 histology codes.
- Patients were grouped according to treatment facility and hospital distance.
- Primary outcomes were to identify factors associated with improved overall survival (OS).
- Treatment facilities were categorized as Community-hospitals and Non-Community-hospitals [integrated or academic].
- Hospital volume was divided into tertiles based on surgery case volume: High (≥ 81 cases/yr), Moderate (30-80 cases/yr), and Low (≤ 29 cases/yr).
- Geographic location effect was considered based on travel distance between the patient's zip code and that of the treating facility.
- Kaplan Meier survival curves and Cox regression analyses estimated the survival based on the factors studied.

PATIENT AND TREATMENT CHARACTERISTICS

Variable	Overall (n=7,556)	Community (n=1,582)	Non-Community (n=5,974)	P-value
Age at Diagnosis (median, IQR)	60 (51,69)	63 (55,71)	59 (49,68)	<0.001
Gender, n(%)				0.120
Female	3,555 (47)	717 (45)	2,838 (48)	
Male	4,001 (53)	865 (55)	3,136 (52)	
Private Insurance, n(%)	4,032 (53)	734 (46)	3,298 (55)	<0.001
High Volume Hospital, n(%)	4,168 (55)	343 (22)	3,825 (64)	<0.001
Charlson/Deyo Score, n(%)				<0.001
0	5,259 (70)	1,032 (63)	4,227 (71)	
1	1,615 (21)	385 (24)	1,230 (21)	
2	428 (6)	108 (7)	320 (5)	
3	254 (3)	57 (4)	197 (3)	
Pathological Stage, n(%)				<0.001
Stage 1	4,073 (54)	811 (51)	3,262 (55)	
Stage 2	1,933 (26)	375 (24)	1,558 (26)	
Stage 3	36 (0.5)	11 (0.7)	25 (0.4)	
Stage 4	1,514 (20)	385 (24)	1,129 (19)	
Hospital Distance (mi), n(%)				<0.001
0 – 12.49	2,484 (33)	762 (48)	1,722 (29)	
12.5– 249	4,803 (64)	802 (51)	4,001 (67)	
250 +	269 (4)	18 (1)	251 (4)	
Primary Tumor Resection, n(%)	6,517 (86)	1,295 (82)	5,222 (87)	<0.001
Radiotherapy, n(%)	148 (2)	35 (2)	113 (2)	0.400
Chemotherapy, n(%)	514 (7)	125 (8)	389 (7)	0.051
Hormonal Therapy, n(%)	439 (6)	136 (9)	303 (5)	<0.001
Immunotherapy, n(%)	38 (0.5)	5 (0.3)	33 (0.6)	0.200

RESULTS

- A total of 7,556 patients with WD PanNETs were included in the final analysis. Median age was 61 years (IQR: 52-69), 48% of patients were male, and 52% of patients were female. (**Table 1**)
- Majority of patients were treated at non-community hospitals (79% non-community vs. 21% community hospitals) – mostly within 250 miles of travel distance
- The rates of primary tumor resection were higher at non-community hospitals at 87% compared to community hospitals at 82%; $p < 0.001$
- Patients treated at community hospitals within 250 miles exhibited worse survival (**FIG 1**)
 - 15-year OS: 50% (CI: 40%–62%) vs 56% (CI: 48%–64%)
 - Median OS: 13 years vs Not Estimable
- Patients treated at high-volume hospitals exhibited improved survival (**FIG 2**)
 - 15-year survival rate: 62% (CI: 56%–69%) vs 48-41% (in moderate and low volume centers)
 - Patients treated at high-volume centers had a median survival of 17 yrs., compared to 14 yrs. at moderate-volume and low-volume treatment centers ($p < 0.001$)

FIG 1: KAPLAN-MEIER CURVES BY FACILITY AND DISTANCE

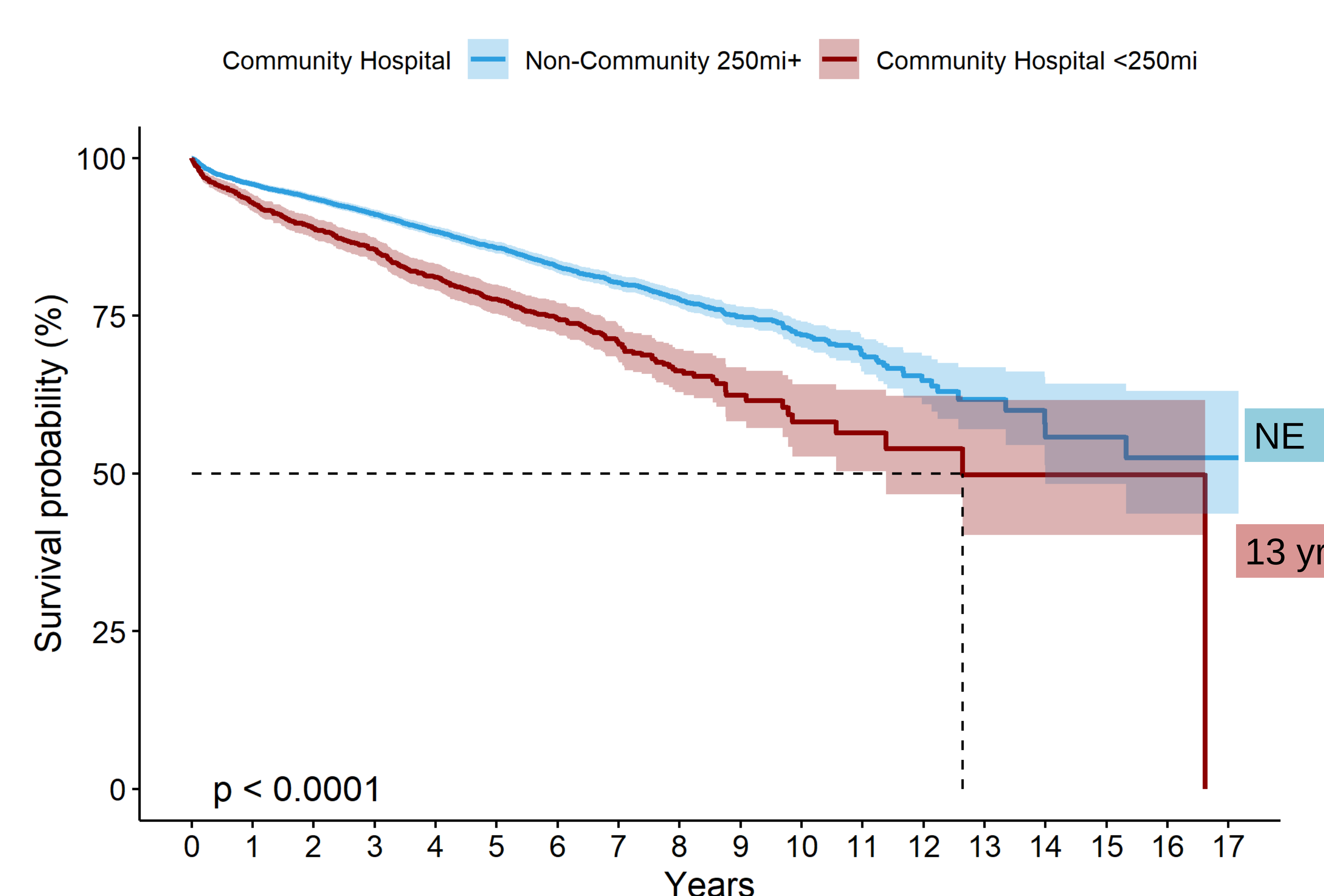
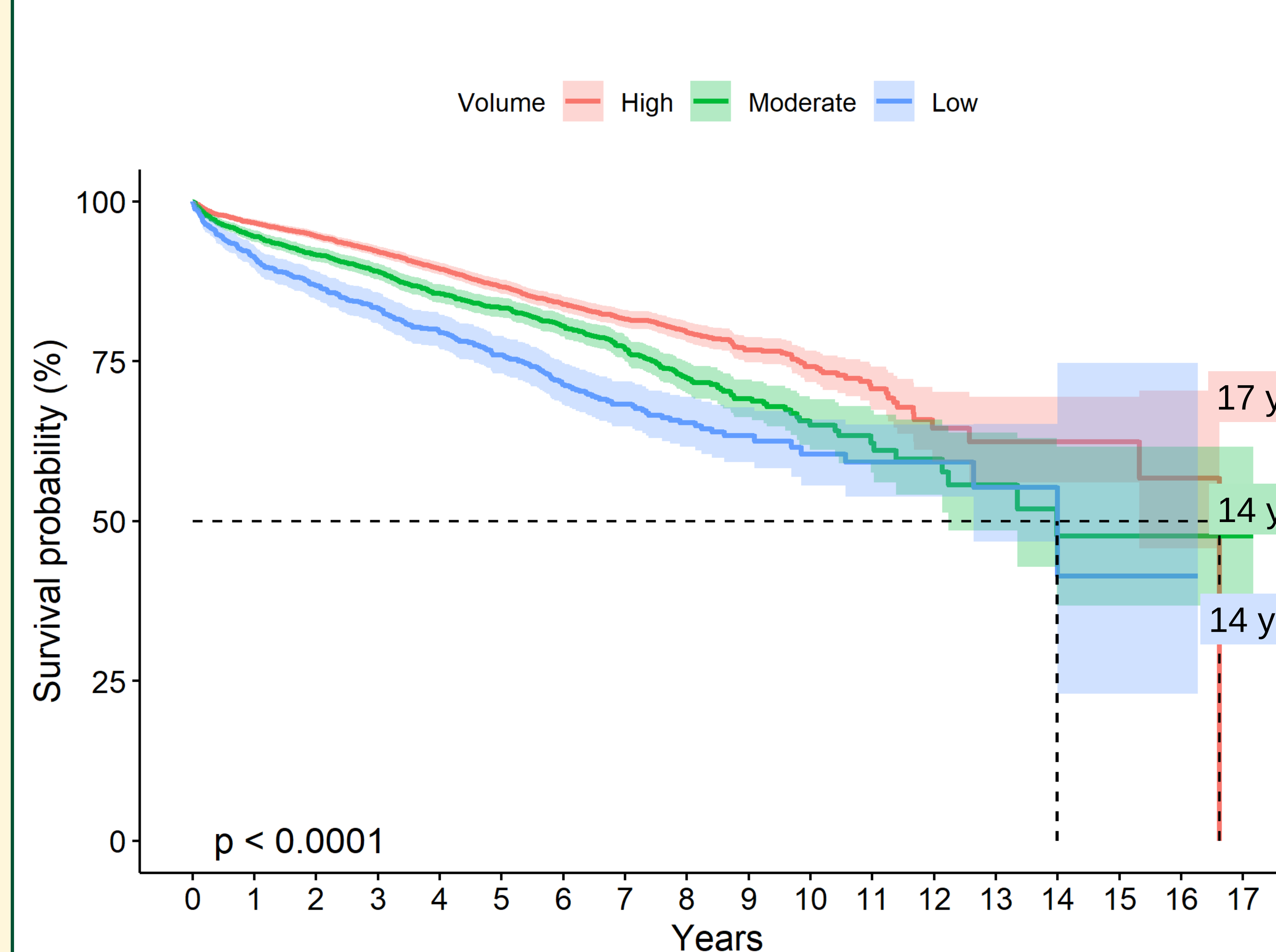


FIG 2: KAPLAN-MEIER SURVIVAL CURVES BY VOLUME



ADJUSTED COXREGRESSION RESULTS

- Patients treated at community hospitals within 250 miles of travel exhibited higher mortality, rates with an HR of 1.22 (95% CI: 1.08–1.39, $p=0.002$).
- Moderate and low-volume was associated with 34% and 88% increased mortality compared to high-volume centers.
- Surgical resection was associated with a 54% reduction in mortality risk (HR: 0.46, 95% CI: 0.40–0.53, $p < 0.001$).

RESULTS HIGHLIGHTS

Patients treated at high-volume hospitals had improved 15-year OS rates compared to moderate and low-volume hospitals

62% (High volume)
48% (Moderate volume)
41% (Low volume)

Survival rates differ significantly by hospital distance

Travelling >250mi was associated w/ a higher 15-yr OS rate of 72%

Advanced pathologic stage
Community-hospitals <250 miles
Higher grade (G2) tumors

Increased risk of mortality

CONCLUSIONS

- Traveling longer distances to specialized, high-volume centers is associated with improved overall survival.
- These results underscore the importance of centralized care, especially for patients with advanced disease.
- Future research is needed to explore these survival differences and bridge the gap in care for patients with WD PanNETs.