

C-49: National Trends in Surgical Management of T1N0 Well-Differentiated Pancreatic Neuroendocrine Tumors (PNET) and Age Specific Survival

Alan Su MD^{1,2}, John Creasy MD¹, Flavio Rocha MD³, Charles Lopez MD³, Guillaume Pegna MD³, James Regan MD¹, Erik Mittra³, Jin Yun DO¹, Hagen Kennecke MD³
1. Providence Cancer Institute Franz Clinic, 2. Earle A. Chiles Research Institute, 3. OHSU Knight Cancer Institute

Background

Prior studies on the surgical resection of T1N0 well-differentiated pancreatic neuroendocrine tumors (WD-PNET) remain controversial¹⁻³. The present study uses the Surveillance Epidemiology and End Results (SEER) dataset to explore association with surgical management on survival, factors that contribute to allocation of surgery, and subgroup analysis for younger and older cohorts.

Methods

This is a retrospective analysis of microscopically confirmed T1N0 WD-PNET. Inclusion and exclusion criteria are in the study schema (**Figure 1**).

The 12-year period was divided into 3-year blocks (P1-P4).

The analysis includes trends in surgical management, likelihood of surgical resection, and overall survival stratified by age group.

Figure 1. Study Schema

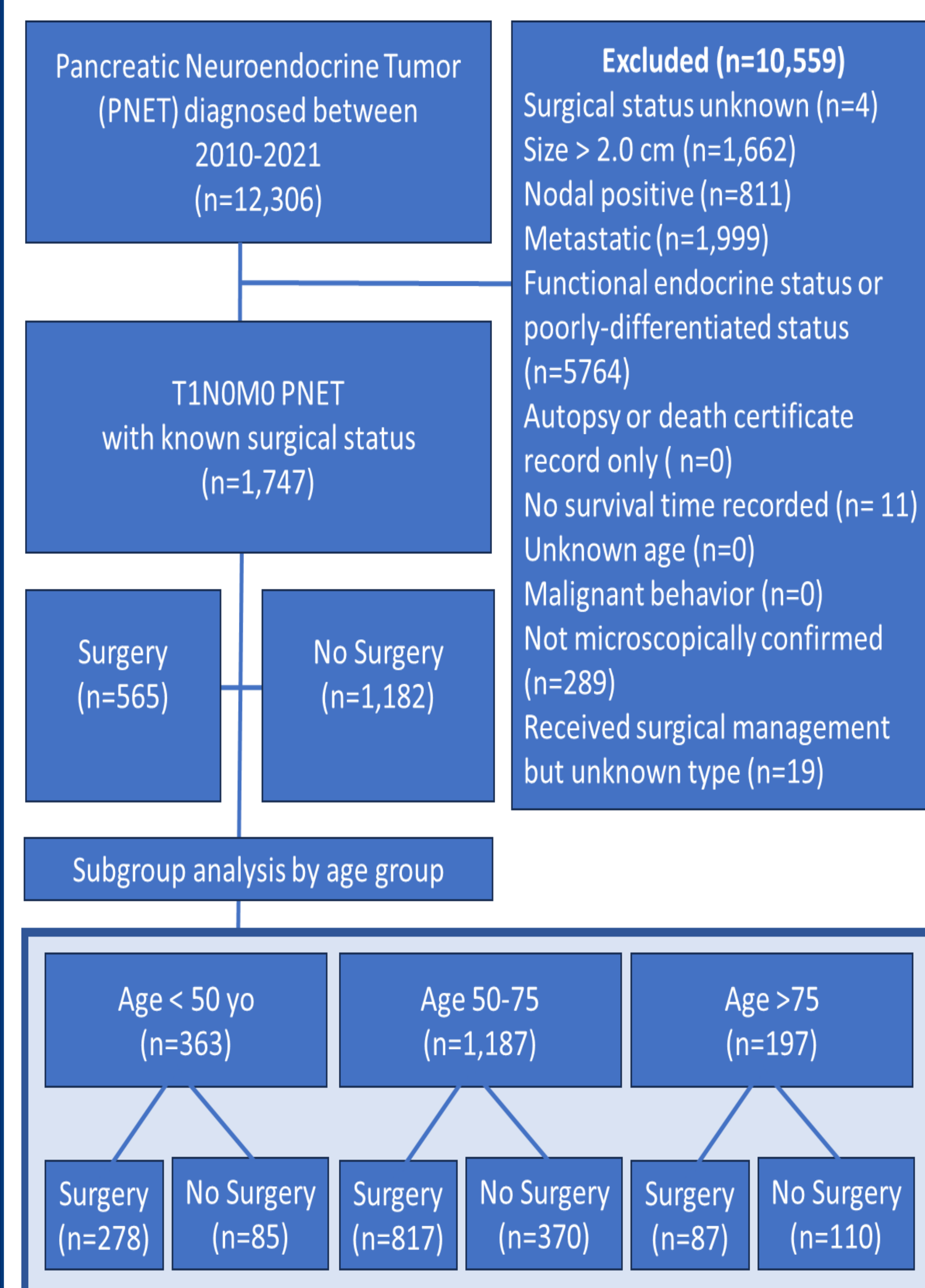


Table 1. Demographics/Tumor Characteristics

	N	No Surgery N (%)	Surgery N (%)
Age			
< 50	363	85 (15)	278 (24)
50-75	1187	370 (66)	817 (69)
>75	197	110 (20)	87 (7.4)
Sex			
Male	951	295 (52)	556 (47)
Female	896	270 (48)	626 (53)
Race			
White	1343	443 (78)	900 (76)
Black	161	51 (9.0)	110 (9.0)
Other	243	71 (13)	172 (15)
Marital			
Married	1117	347 (61)	770 (65)
Unmarried	553	193 (34)	360 (31)
Unknown	77	25 (4.4)	52 (4.4)
Clinical Stage			
Localized	1730	560 (99)	1170 (99)
Regional	14	2 (0.4)	12 (1.0)
Unknown	3	3 (0.5)	0 (0.0)
Histologic Grade			
Well	1201	408 (72)	793 (67)
Moderate	103	29 (5.1)	74 (6.3)
Poor	1	0 (0.0)	1 (0.1)
Unknown	442	128 (23)	314 (27)
Tumor Size			
<1 cm	389	154 (27)	235 (20)
1-2cm	1358	411 (73)	947 (80)
Primary Site			
Head	374	122 (22)	252 (21)
Body/Tail	1096	327 (58)	769 (65)
Other	277	116 (21)	161 (14)
Year of diagnosis			
P1: 2010-2012	94	14 (2.5)	80 (6.8)
P2: 2013-2015	408	71 (13)	337 (29)
P3: 2016-2018	545	164 (29)	381 (32)
P4: 2019-2021	700	316 (56)	384 (33)

Table 2. Distribution of surgery type

Surgery Type	N (%)
Local excision	167 (10)
Partial pancreatectomy	640 (37)
Local or partial pancreatectomy and duodenectomy +/- gastrectomy	289 (17)
Total pancreatectomy	56 (3.2)
Total pancreatectomy and subtotal gastrectomy or duodenectomy	23 (1.3)
Extended pancreatoduodenectomy	7 (0.4)

Figure 2. Trends in surgical management (2010-2021)

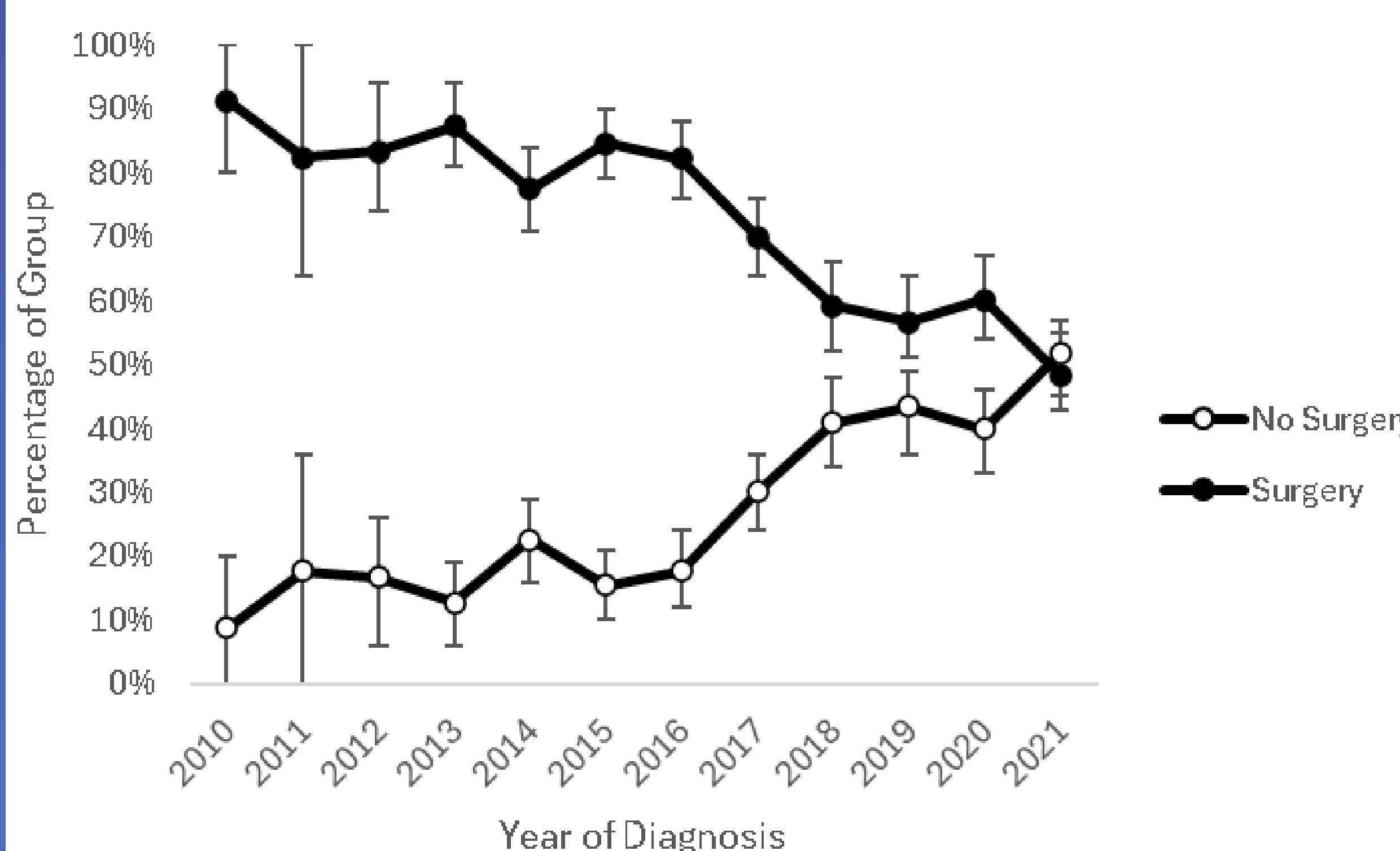


Table 3. Likelihood of surgical resection

Age	OR ^a	95%CI	P-Value
< 50 yo	Ref	Ref	Ref
50 – 75yo	0.62	0.47-0.83	<0.01*
> 75 yo	0.21	0.14-0.32	<0.001*

OR – Odds Ratio

a. Multivariable logistic regression adjusted by Sex, Race, Marital Status, Clinical Stage, Histologic Grade, Tumor Size, Primary Site, and Year of diagnosis.

Table 4. Age-specific 5-year overall survival

Age Group	N	Surgery % (CI)	No Surgery % (CI)	ASD ^a %	P - value ^b
All ages	1747	94 (92-95)	83 (78-88)	11	<0.001*
<50	363	97 (95-100)	97 (92-100)	0.0	0.66
50-75	1,187	86 (81-91)	93 (91-95)	7.6	<0.001*
>75	197	84 (76-94)	63 (48-82)	22	0.09

a. ASD – Absolute survival difference

b. Chi-square proportion test between surgical and non-surgical groups

Table 5. Age-specific overall survival following surgery

Age group	N	HR	95% CI	P-Value ^a	C-Index ^b
All ages	1747	0.49	0.34-0.71	<0.001*	0.719
< 50 yo	363	2.01	0.21-18.88	0.54	0.819
50 – 75yo	1,187	0.40	0.26-0.63	<0.001*	0.669
> 75 yo	197	0.53	0.24-1.16	0.11	0.765

HR – Hazard Ratio

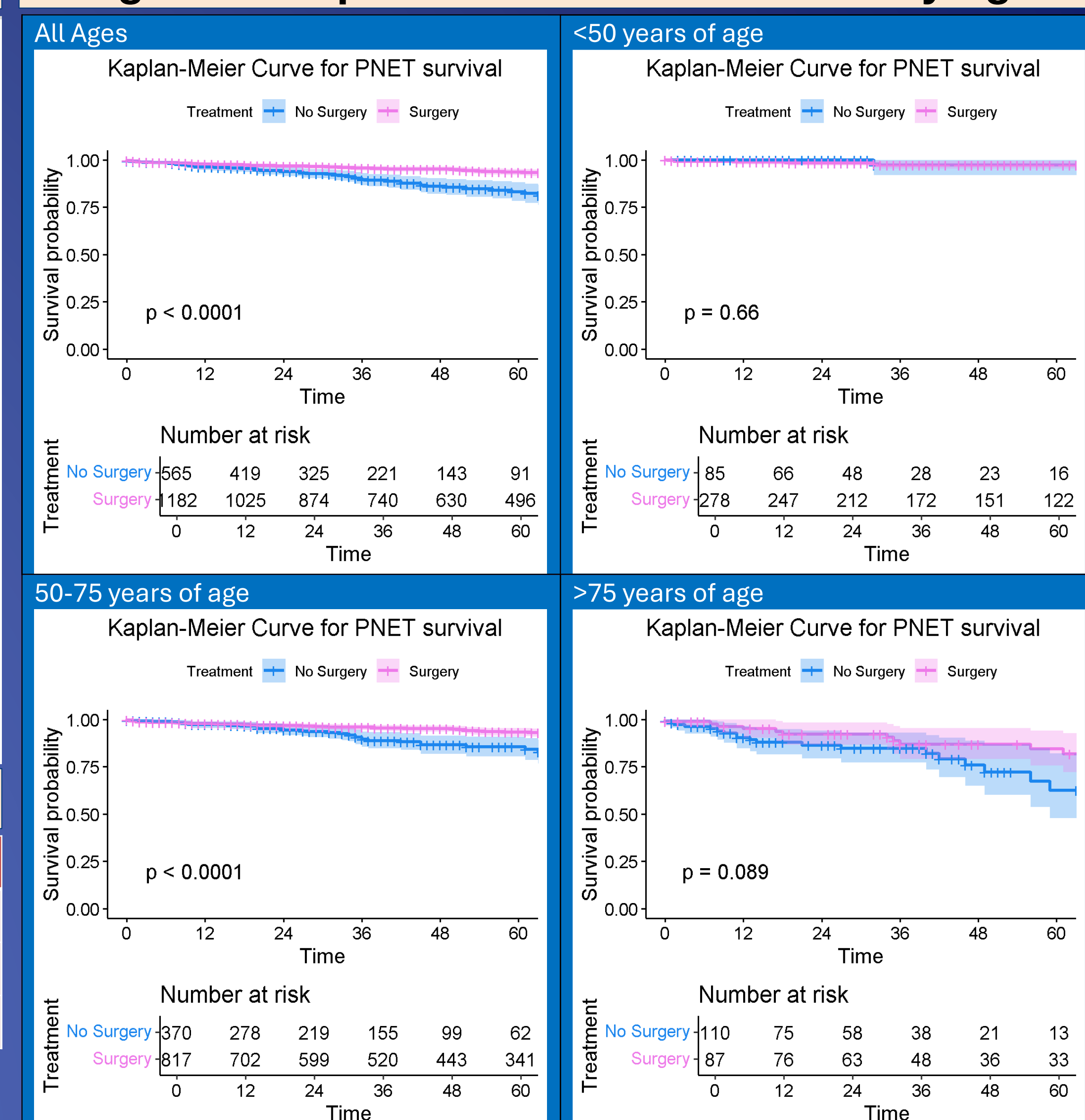
a. Multivariable cox-regression analysis adjusted by Age, Sex, Race, Marital Status, Clinical Stage, Histologic Grade, Tumor Size, Primary Site, and Year of diagnosis.

b. C-index : concordance index (ROC)

References

- 1) Sugawara T, Rodriguez Franco S, Kirsch MJ, et al. Evaluation of Survival Following Surgical Resection for Small Nonfunctional Pancreatic Neuroendocrine Tumors. *JAMA Netw Open*. 2023;6(3):e234096. doi:10.1001/jamanetworkopen.2023.4096
- 2) Howe JR, Merchant NB, Conrad C, Keutgen XM, Hallet J, Drebin JA, Minter RM, Lairmore TC, Tseng JF, Zeh HJ, Libutti SK, Singh G, Lee JE, Hopy TA, Kim MK, Menda Y, Halldanarson TR, Chan JA, Pommier RF. The North American Neuroendocrine Tumor Society Consensus Paper on the Surgical Management of Pancreatic Neuroendocrine Tumors. *Pancreas*. 2020 Jan;49(1):1-33. doi: 10.1097/MPA.0000000000001454. PMID: 31856076; PMCID: PMC7029300.
- 3) Cloyd J.M., Poultsides, G.A. The Landmark Series: Pancreatic Neuroendocrine Tumors. *Ann Surg Oncol* 28, 1039–1049 (2021). <https://doi.org/10.1245/s10434-020-09133-x>

Figure 3. Kaplan-Meier PNET survival by age



Results

- The median age was 60.0 years in Surgical groups vs 66.0 years in Non-surgical groups.
- While the number of T1N0 WD-PNET cases increased over time (P1: 94, P2:408, P3: 545, P4: 700), surgical resection decreased over time (**Table 1, Figure 2**).
- Partial Pancreatectomy (54%) was the most common resection method (**Table 2**).
- Tumor size >1cm (OR1.59[1.23-2.06], p <0.001) and body/tail location (OR 1.36[1.03-1.78], p<0.03) increased likelihood of proceeding to operating room, but older age decreased likelihood (50-75 years: OR 0.62[0.47-0.83], p<0.01; >75 years: OR 0.21[0.14-0.32], p<0.001) (**Table 3**).
- Survival benefit was observed only in the 50-75 year cohorts (**Figure 3, Table 5**) with modest 5-year absolute survival difference of 7.6% (**Table 4**)

Conclusion

- While the number of T1N0 WD-PNET cases increased over time, surgical resection decreased over time.
- Surgical resection of T1N0 WD-PNET remains an individualized discussion for 50-75 year old patients.
- Older patients (75+) face significant selection and may consider deferring surgery to be spared post-operative morbidity.
- Younger patients (<50 years) may opt for active surveillance in select cases.