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Access to care and outcomes for neuroendocrine tumours: does socioeconomic status matter?

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ABSTRACT

Introduction Neuroendocrine tumours (NETs) are a poorly understood malignancy lacking standardized care. Differences in socioeconomic status (SES) might worsen the effect of non-standardized care. We examined the effect of SES on NET peri-diagnostic care patterns and outcomes.

Methods In this population-based cohort study, NET cases identified from a provincial cancer registry (1994–2009) were divided into low (1st and 2nd income quintiles) and high (3rd, 4th, and 5th quintiles) SES groups. We compared peri-diagnostic health care utilization (–2 years to +6 months), metastatic recurrence, and overall survival (OS) between the groups.

Results Of 4966 NET patients, 38.3% had a low SES. Neither the primary NET sites ($p = 0.15$), nor the metastatic presentation ($p = 0.31$) differed. Patients with low SES had a higher mean number of physician visits (20.1 ± 19.9 vs. 18.1 ± 16.5, $p = 0.001$) and imaging studies (56 ± 50 vs. 52 ± 44, $p = 0.009$) leading to the NET diagnosis. Rates of primary tumour resection ($p = 0.14$), hepatectomy ($p = 0.45$), systemic therapy ($p = 0.38$), and liver embolization ($p = 0.13$) did not differ with SES. In the low-SES group, metastatic recurrence was more likely (41.1% vs. 37.6%, $p = 0.01$) during a median follow-up of 61.7 months, and the 10-year OS was inferior (47.1% vs. 52.2%, $p < 0.01$). Low SES was associated with worse OS (hazard ratio: 1.16; 95% confidence interval: 1.06 to 1.26) after adjustment for age, sex, comorbidity burden, primary NET site, and rural living.

Conclusions Low SES was associated with more physician visits and imaging before a NET diagnosis, but not with more advanced stage at presentation nor with an effect on the pattern of therapy. Long-term outcomes were inferior in the low-SES group. These data can help to inform the design of health care delivery for NETs.

Key Words Neuroendocrine tumours, carcinoids, socioeconomics, income, outcomes

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INTRODUCTION

Neuroendocrine tumours (NETs) are malignancies that are most commonly found in the gastrointestinal and bronchopulmonary tracts, but that can also arise in other locations such as the ovaries, thymus, or kidney[1,2]. Traditionally considered rare, these tumours have been rising in incidence in recent decades[1–4]. Because of their unique indolent biology, leading to prolonged survival even in the setting of metastatic disease, NETs are now more prevalent than better-known malignancies, including gastric, pancreatic, and esophageal cancers[2]. They represent a unique burden to the health care system by combining long survival and potentially significant systemic symptoms from hormone secretion in functional tumours[5,6].

Because of nonspecific signs and symptoms, lack of awareness and knowledge in the medical community, and the uncommon nature of the malignancy, a diagnosis of NET can be delayed for up to 7 years[5,6]. Tackling that lag in diagnosis has been identified as a priority in NET management to eventually improve outcomes[7]. Although clinical trials have recently been successfully conducted

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in the medical management of NETs, very little is currently known about how care is delivered for NETs and how that care affects outcomes, particularly in the pre-diagnostic period. To determine how best to design care strategies for NETs, identifying and understanding areas of potential disparities in management and outcomes is required.

Factors at both the population and delivery system levels can influence health care utilization for cancer[8,9]. Socioeconomic status (SES) is related to health services use, patterns of care, and outcomes for common malignancies such as head-and-neck, lung, colon, and breast cancers[10–13]. The influence of SES on NET diagnosis and outcomes remains undefined.

In this population-based study, we sought to define the effect of SES on health care utilization leading to a NET diagnosis and on long-term outcomes for NET patients. We hypothesized that low SES would be associated with a lesser use of health services before a NET diagnosis and inferior survival.

METHODS

Study Design

This population-based cohort study used health care administrative data and was approved by the Research Ethics Board at Sunnybrook Health Sciences Centre. The research was conducted and reported in accord with the RECORD statement[14].

Study Population

All patients benefited from universally accessible, publicly funded health care coverage through OHIP (the Ontario Health Insurance Plan). All residents of the province are eligible for OHIP coverage after 3 months of residency. The population in the province increased from 8,054,030 in 1994 to 10,004,048 in 2009. Our study considered all patients having a valid OHIP number during the period 1 April 1994 to 31 March 2009.

Data Sources

A study cohort was created by linking administrative datasets housed at the Institute for Clinical Evaluative Sciences (ICES). The Ontario Cancer Registry includes all patients with a cancer diagnosis (excluding non-melanoma skin cancer) in Ontario since 1964[15,16]. The reliability of its data has previously been ascertained and reported[16–18]. The Registered Persons Database contains vital status and demographic data for all individuals covered under OHIP[19]. Information about health services use is included in the Canadian Institute for Health Information's Discharge Abstract Database (acute inpatient hospitalizations), the National Ambulatory Care Reporting System (same-day surgery admissions, emergency room visits, and oncology clinic visits), and the OHIP Claims Database (billings from health care providers, including physicians, groups, laboratories, and out-of-province providers)[20]. The databases have all been validated for a variety of diagnoses and services[20]. The datasets were linked using unique encoded identifiers and analyzed at ICES. The research team's analyst (NL) had complete access to all datasets used in the study to create the study cohorts, proceed to linkage, and perform the analyses.

Study Cohort

For the study period, diagnoses were classified according to the International Classification of Diseases [9th revision (ICD-9)] for the primary disease site and to the International Classification of Diseases for Oncology (ICD-O) for morphology[21,22]. All adult patients with a new diagnosis of NET during the study period were identified by those codes in the Ontario Cancer Registry, using a strategy previously reported by our group (Appendix A)[1,23].

Outcomes Measures

Advanced stage at diagnosis was defined as metastatic disease at presentation (metastasis code in the same episode as the first NET diagnosis).

Pre-diagnostic health care resources utilization was captured based on three measures: physician encounters, emergency department visits, and imaging studies. Physician encounters were captured using OHIP billing claims and were subdivided into specialist and general practitioner encounters. Imaging studies were subdivided based on the type of imaging: simple radiography, ultrasonography, computed tomography imaging, magnetic resonance imaging, and nuclear medicine imaging. Those variables were defined for the 2 years preceding the NET diagnosis.

Initial therapy was captured as use of surgery (primary tumour resection, liver resection), systemic chemotherapy, radiation therapy, and liver embolization. The period from 60 days before to 60 days after the NET diagnosis was considered to capture therapies that might have been undertaken before a tissue diagnosis was made (for example, emergency surgery yielding a NET diagnosis on pathology). Visits to surgery and medical oncology services were also abstracted for that period.

Finally, overall survival (OS) from the date of NET diagnosis was computed using the date of death up to 31 March 2010. Patients with a diagnosis of non-NET cancer within 60 days of the NET diagnosis were excluded from the survival analysis. Patients were followed until date of death, date of last contact, 10 years after the NET diagnosis, or 31 March 2010, whichever came first.

Exposure

The main exposure of interest was SES. The patient's SES was assessed using an ecologic measure of income quintile based on the median income associated with the patient's postal code of residence in national census data[24,25]. Low SES was defined as the 1st and 2nd income quintiles, and high SES as the 3rd, 4th, and 5th income quintiles.

Covariates

Age and sex were abstracted from the Registered Persons Database. Rural living was determined as a postal code indicating residence in a rural area based on the national census definition of a community of fewer than 10,000 people[26]. Aggregated clinical groups were used to define major physical comorbidities (The Johns Hopkins ACG System: The Johns Hopkins University, Baltimore, MD, U.S.A.). The resource utilization band was computed based on aggregated clinical groups to assess expected health care requirements[27].

The NETs were subdivided by primary tumour site into bronchopulmonary (ICD-9 code 162), gastroenteric (ICD-9 codes 151–154), pancreatic (ICD-9 code 157), and others. Recurrent metastatic disease was defined as metastases occurring after the initial diagnosis (metastasis code after the episode of the first NET diagnosis, Appendix A).

Relevant demographic and clinical characteristics were identified *a priori* as potential confounders of the relationship between SES and outcome. The variables were selected based on clinical relevance (markers of complexity of cancer care) and existing literature (known relationship with variation in health care delivery). The most parsimonious set of covariates was selected to maintain adequate study power. The covariates ultimately included were these: age, sex, rural living, major comorbidity, and primary tumour site.

Statistical Analysis

Descriptive analysis was used to define baseline characteristics and outcomes. Categorical variables are reported as absolute numbers and proportions, and continuous variables are reported as means with standard deviation. Use of health services was reported as the proportion of patients using a service and as the mean use of that service per patient during the relevant period. Comparison testing used the chi-square test or *t*-test as appropriate. The Kaplan–Meier method was used for OS analysis[28], and OS curves based on SES were compared using the log-rank test. Multivariable regression models were constructed to assess the effect of SES on advanced disease presentation (logistic regression) and OS (Cox regression), while adjusting for other baseline characteristics defined *a priori* as previously described.

Statistical significance was set at $p \leq 0.05$. All analyses were conducted using the SAS Enterprise Guide software application (version 6.1: SAS Institute, Cary, NC, U.S.A.).

RESULTS

A first NET diagnosis was identified in 4966 patients during the period of interest. Table I presents the characteristics of the included patients, stratified by SES. No difference in rural living or resource utilization band was observed between the low- and high-SES groups. Major comorbidity was statistically more likely in patients with a low SES ($p = 0.002$).

The proportion of patients diagnosed with an advanced-stage NET did not differ between the low-SES and high-SES groups (19.2% vs. 18.0%, $p = 0.307$). After adjusting for age, sex, primary tumour site, rural living, and major comorbidity, low SES was not associated with advanced stage at presentation [odds ratio: 1.05; 95% confidence interval (CI): 0.91 to 1.22].

Figure 1 shows the number of physician encounters in the 2 years preceding the NET diagnosis by SES group. The mean number of visits to any physician was higher for patients with a low SES ($p = 0.001$). That number was driven by more frequent visits to general practitioners ($p < 0.001$). More patients with a low SES visited the emergency department (63.6% vs. 58.0%, $p < 0.01$).

Overall, patients with a low SES underwent more imaging studies, with the mean number of studies in the low-SES group being 56.1 ± 50.0 compared with 51.9 ± 44.5 in the high-SES group ($p = 0.003$). Figure 2 depicts, in detail, the use of imaging studies. Magnetic resonance imaging was used less often in patients with a low SES than in those with a high SES ($p = 0.042$).

TABLE I Characteristics of the study patients

Variable	Patient group [*n* (%)]		*p* Value
	Low SES	High SES	
Patients	1901	3065	
Age group			
19–50 Years	459 (24.1)	819 (26.7)	0.027
51–60 Years	428 (22.5)	745 (24.3)	
61–70 Years	488 (25.7)	734 (23.9)	
≥71 Years	526 (27.7)	767 (25.0)	
Male sex	921 (48.4)	1521 (49.6)	0.42
Rural living	283 (14.9)	387 (12.6)	0.092
Resource utilization band			
0	16 (0.8)	13 (0.4)	0.13
1	17 (0.9)	33 (1.1)	
2	74 (3.9)	147 (4.8)	
3	850 (44.7)	1416 (46.2)	
4	547 (28.8)	868 (28.3)	
5	397 (20.9)	588 (19.2)	
Major comorbidity	1478 (77.7)	2261 (73.8)	0.002
Primary tumour site			
Bronchopulmonary	484 (25.5)	734 (23.9)	0.15
Gastroenteric	873 (45.9)	1480 (48.3)	
Pancreatic	177 (9.3)	312 (10.2)	
Other	367 (19.3)	539 (17.6)	

SES = socioeconomic status.

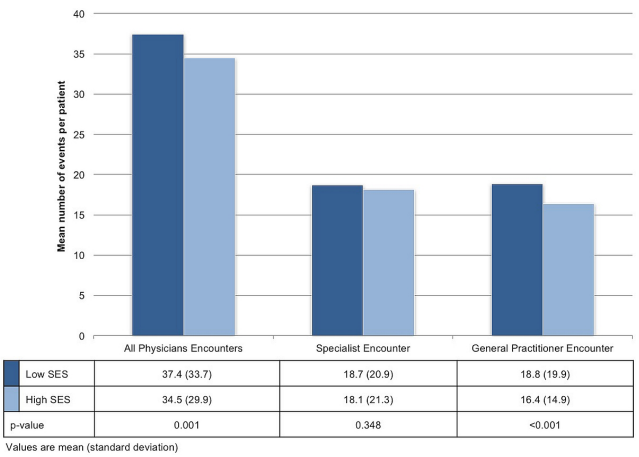
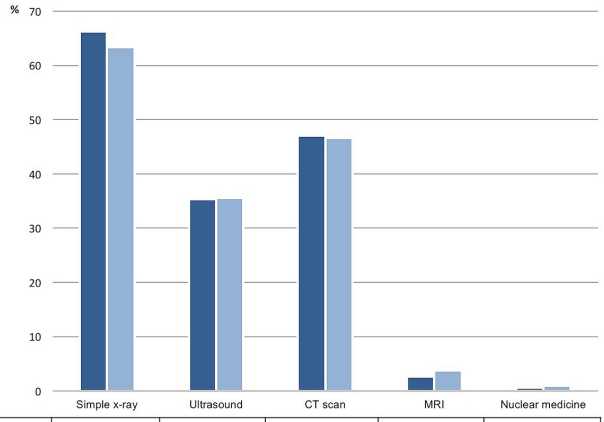


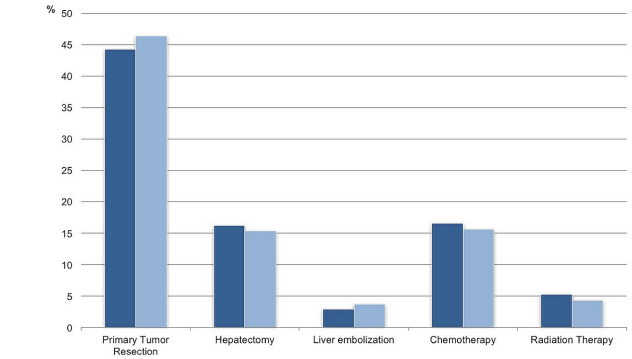
FIGURE 1 Mean number of physician encounters in the 2 years before the diagnosis of neuroendocrine tumour, stratified by socioeconomic status (SES).



	Simple x-ray	Ultrasound	CT scan	MRI	Nuclear medicine
Low SES	1,261 (66.3)	671 (35.3)	895 (47.1)	51 (2.7)	11 (0.6)
High SES	1,942 (63.4)	1,090 (35.6)	1,427 (46.6)	115 (3.8)	31 (1.0)
p-value	0.033	0.849	0.72	0.042	0.105

Values are n(%)

FIGURE 2 Use of imaging studies in the 2 years before the diagnosis of neuroendocrine tumour, stratified by socioeconomic status (SES). CT = computed tomography; MRI = magnetic resonance imaging.



	Primary Tumor Resection	Hepatectomy	Liver embolization	Chemotherapy	Radiation Therapy
Low SES	842 (44.3)	308 (16.2)	55 (2.9)	315 (16.6)	100 (5.3)
High SES	1423 (46.4)	472 (15.4)	113 (3.7)	479 (15.6)	133 (4.3)
p-value	0.142	0.45	0.133	0.379	0.136

Values are n(%)

FIGURE 3 Initial therapy from 60 days before to 60 days after the diagnosis of neuroendocrine tumour, stratified by socioeconomic status (SES).

Around the time of NET diagnosis (60 days before and 60 days), 69.5% of patients with a low SES and 69.4% with a high SES had a surgical consultation ($p = 0.964$), and 26.8% and 27.6% respectively met with a medical oncologist ($p = 0.569$). Figure 3 presents treatments received during the period of interest. The most common treatment was resection of the primary tumour in 44.3% of patients with low SES and 46.4% of patients with high SES. No difference based on SES was observed in receipt of surgery for the primary tumour or liver metastases, liver embolization, chemotherapy, or radiation therapy.

Mean follow-up was 61.7 ± 42.8 months. A subsequent non-NET cancer occurred in 294 patients (5.9%), who were excluded from the survival analysis. During the follow-up period, metastatic recurrence was more likely in the low-SES group (41.1% vs. 37.6%, $p = 0.013$). Figure 4 presents the OS analysis. The 10-year OS was inferior in the low-SES group at 47.1% (95% CI: 44.6% to 49.7%) compared with 52.2% (95% CI: 50.2% to 54.4%) in the high-SES group. Low SES was independently associated with a higher likelihood of mortality after adjusting for age, sex, rural living, major comorbidity, and primary tumour site (hazard ratio: 1.16; 95% CI: 1.06 to 1.26).

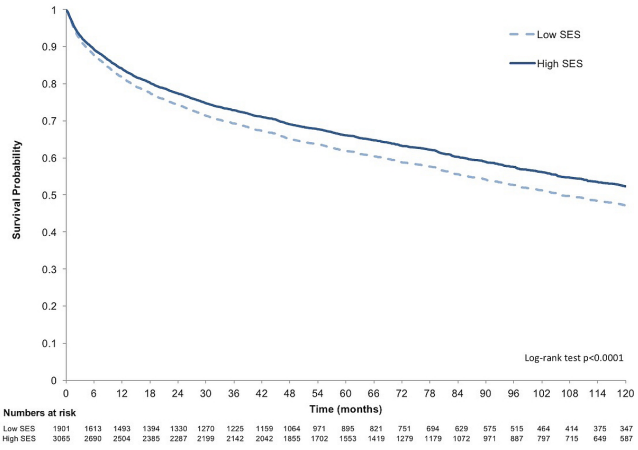


FIGURE 4 Overall survival for patients with neuroendocrine tumour, stratified by socioeconomic status (SES).

DISCUSSION

Better understanding of potential disparities underlying care and outcomes in NET is crucial for improving health care delivery in a malignancy lacking a clear pathway to diagnosis and a standard of care. Our study outlines, for the first time, the effect of the SES gradient on health care utilization and outcomes for this uncommon malignancy in a large comprehensive contemporary cohort. Low SES was associated with a higher number of physician encounters and imaging studies leading to the NET diagnosis—a circumstance that did not affect stage at diagnosis (advanced stage at presentation: 19.2% vs. 18.0%; $p = 0.307$) or the pattern of therapy (no difference in initial therapy). However, long-term outcomes were inferior for patients with a low SES, as evidenced by higher likelihoods of metastatic recurrence and inferior OS. Patients with a low SES experienced a 16% increased risk of death (hazard ratio: 1.16; 95% CI: 1.06 to 1.26).

Socioeconomic disparities in cancer care and outcomes have been reported for other, more common malignancies[12,13]. Despite universal publicly funded health care systems designed to provide equitable care for all, SES is independently associated with health status, including oncologic treatment outcomes[11,29–32]. Lower SES is associated with an increased cancer incidence and worse cancer patient survival in North American, European, and Australian jurisdictions[12,32–37]. That association between SES and outcomes resists variation in SES definitions and study designs, and shows a risk of mortality that is increased by a factor in the range of 1.5–5[13].

The present study was not designed specifically to assess the numerous social and clinical determinants of

outcomes. Outcome disparities related to SES can originate from tumour, patient, and health system characteristics[13]. Our study did demonstrate different patterns in access to care: patients with a lower SES had more physician encounters and underwent more investigations before diagnosis.

It is unlikely that tumour biology differs solely based on SES. However, it could be associated with rural environments, which are known to be associated with a higher incidence of NETS[23]. However, no difference in rural living was observed in our SES groups. In the past, stage at diagnosis partly explained outcome differences in breast and colon cancers[13]. The influence of stage varies based on cancer site and population type, does not entirely explain disparities, and was refuted in more recent analyses[11,13,34,38]. Moreover, the stage issue becomes less relevant in NETS, for which no screening method is available and a lag in diagnosis is common[5]. There is no standardized pathway to a NET diagnosis, and earlier access to care might not result in faster diagnosis, as evidenced by the similar proportions of advanced-stage presentation in both SES groups in our study.

Patient characteristics such as comorbidities, nutrition status, social supports, the social stigma perception of cancer, and the individual perception of personal risk have all been suggested as potential explanations for disparities in outcomes with SES[13,39–41]. The application of resource utilization bands to capture expected health care needs based on baseline comorbidities did not identify differences between our SES groups. Differences in attitudes toward health care and support-seeking could be more relevant here, because those factors can affect access to care beyond the NET diagnosis[13,42].

Our results indicate potential disparities in maintenance therapy and follow-up. They echo findings in patients with acute myocardial infarction, for whom low SES was independently associated with compromised functional recovery and increased mortality despite similar initial access to care[24,43]. Beyond diagnosis and initial therapy, a focus on aftercare is required—an important factor in follow-up and longitudinal surveillance that could contribute to disparities in long-term outcomes. Beyond the effect of inequitable distribution of health facilities, patients with a low SES are also less likely to receive specific services[24,30,44]. Education, occupational stress, and social isolation can all contribute to outcome[42,45]. Access to and seeking specialized cancer care for a rare and unknown disease might be more difficult or not perceived to be needed in low-SES populations, adversely affecting outcomes[46–50]. Because of indolent biology, NETS have a unique requirement to spread therapy over a prolonged natural history—a requirement that is as crucial as the initial treatments received. For an optimal outcome, patients must have to access the health system, but also be retained within it for years. Differences in follow-up and ongoing therapy can therefore explain the worse recurrence pattern and OS associated with low SES. Those observations become even more critical as disparities between income quintiles gradually increase. Larger gaps between SES groups could worsen disparities in access to care and long-term outcomes if such issues are not addressed.

We acknowledge the limitations associated with using ICD-O codes to identify NETS, especially considering the heterogeneity of the disease. In addition, ICES does not maintain data about pathology characteristics, and thus the population could not be further refined by tumour grade. The datasets used were not specifically collected to answer our research questions. In the absence of individual data, SES was determined based on an ecologic measure; however, this proxy measure has been validated in previous population-based studies[24,51,52].

Looking past the inherent challenges associated with population-based studies, the present appraisal is the first of the effect of SES on care and outcomes in NET. The universal health care system setting allowed for a comprehensive examination of patterns of care. Our analysis furthers the understanding of and informs the care processes for NETS. It suggests that, to improve outcomes for this malignancy, efforts should be made both to facilitate access to specialized care and to ensure specialized longitudinal care in vulnerable populations with NETS. Future efforts will focus on ascertaining the variability in regional health care delivery for NETS and the relation of any variability with diagnosis patterns and outcomes.

CONCLUSIONS

The present study describes the effect of SES on care and outcomes in NETS. Low SES was associated with more physician visits and imaging to reach diagnosis, but not with advanced-stage presentation or differences in initial therapy. Long-term outcomes were inferior for low-SES patients, with more frequent metastatic recurrence and worse 10-year OS. That pattern of SES affecting outcomes seems to be multifactorial and to be underlined by health care–seeking behaviours and the ability to maintain access to care throughout surveillance and to receive prolonged active care for a chronic malignancy. The data provide further insight for future efforts to enhance health care delivery by focusing on access to specialized care and to long-term maintenance therapy and surveillance.

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CONFLICT OF INTEREST DISCLOSURES

We have read and understood *Current Oncology*'s policy on disclosing conflicts of interest, and we declare the following interests: DJH and SS have received speaker honoraria from Novartis Oncology and Ipsen. The remaining authors have no disclosures to make.

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APPENDIX A: INTERNATIONAL CLASSIFICATION OF DISEASES, REVISION 9, AND INTERNATIONAL CLASSIFICATION OF DISEASES FOR ONCOLOGY CODES USED FOR THE DATA ANALYSIS

Cohort Creation

A neuroendocrine tumour diagnosis was defined using the codes in the International Classification of Diseases, 9th revision (ICD-9), and the first 4 digits of the codes in the International Classification of Diseases for Oncology (ICD-O), as abstracted in the Ontario Cancer Registry (Tables AI–AIII). The population was defined using either of the criteria.

TABLE AI Inclusion criteria

ICD-9 codes			
259.2	Carcinoid syndrome	209.63	Benign carcinoid stomach
209.20	Malignant carcinoid primary site unknown	209.00	Malignant carcinoid small intestine NOS
209.25	Malignant carcinoid foregut NOS	209.01	Malignant carcinoid duodenum
209.26	Malignant carcinoid midgut NOS	209.02	Malignant carcinoid jejunum
209.27	Malignant carcinoid hindgut NOS	209.03	Malignant carcinoid ileum
209.29	Malignant carcinoid other site	209.40	Benign carcinoid small intestine NOS
209.60	Benign carcinoid primary site unknown	209.41	Benign carcinoid duodenum
209.65	Benign carcinoid foregut NOS	209.42	Benign carcinoid jejunum
209.66	Benign carcinoid midgut NOS	209.43	Benign carcinoid ileum
209.67	Benign carcinoid hindgut NOS	209.4	Benign carcinoid of the small intestine
209.69	Benign carcinoid other site	209.12	Malignant carcinoid appendix
209.29	Malignant carcinoid of other sites	209.0	Malignant carcinoid tumours of the appendix, large intestine, and rectum
209.3	Malignant poorly differentiated neuroendocrine carcinoma	209.10	Malignant carcinoid large intestine NOS
209.30	Malignant poorly differentiated neuroendocrine carcinoma, any site	209.12	Malignant carcinoid cecum
209.21	Malignant carcinoid bronchus/lung	209.13	Malignant carcinoid ascending colon
209.22	Malignant carcinoid thymus	209.14	Malignant carcinoid transverse colon
209.62	benign carcinoid bronchus/lung	209.15	Malignant carcinoid descending colon
209.61	benign carcinoid thymus	209.16	Malignant carcinoid sigmoid colon
157.4	Islets of Langerhans, any part of the pancreas	209.17	Malignant carcinoid rectum
211.7	Benign neoplasm of islets of Langerhans	209.24	Malignant carcinoid kidney
209.23	Malignant carcinoid stomach		
ICD-O codes			
8150	Islet cell carcinoma	8240	Carcinoid
8151	Insulinoma	8241	Enterochromaffin cell carcinoid
8152	Glucagonoma	8242	Enterochromaffin-like cell tumours
8153	Gastrinoma	8244	Composite carcinoid
8154	Mixed islet-cell/exocrine adenocarcinoma	8245	Adenocarcinoid
8155	VIPoma	8246	Neuroendocrine carcinoma
8156	Somatostatinoma	8249	Atypical carcinoid
8157	Enteroglucagonoma		

ICD-9 = International Classification of Diseases, Revision 9; ICD-O = International Classification of Diseases for Oncology; NOS = not otherwise specified.

TABLE AII Exclusion criteria

ICD-O codes			
8002	Malignant tumour, small cell type	8000	Neoplasm
8040	Tumorlet	8010	Epithelial tumor
8041	Small cell carcinoma NOS	8070	Squamous cell carcinoma
8042	Oat cell carcinoma	8140	Adenoma
8043	Small cell carcinoma NOS, fusiform cell type	8341	Papillary carcinoma
8044	Small cell carcinoma NOS	8481	Mucinous adenocarcinoma
8045	Combined small cell carcinoma	8500	Ductal carcinoma
8013	Large cell neuroendocrine carcinoma of the lung	9364	Peripheral neuroectodermal tumor
8700	Pheochromocytoma	9370	Chordoma
8680	Paraganglioma	9990	No microscopic neoplasm
8693	Extra-adrenal paraganglioma	8243	Goblet cell carcinoid
8510	Medullary carcinoma of the thyroid		

ICD-O = International Classification of Diseases for Oncology; NOS = not otherwise specified.

TABLE AIII Definition of metastatic disease

ICD-9 codes			
196.0	Malignant neoplasm lymph–head/neck	198.1	Secondary malignant neoplasm urinary NEC
196.1	Malignant neoplasm lymph–intrathor	198.2	Secondary malignant neoplasm skin
196.2	Malignant neoplasm lymph intra-abd	198.3	Secondary malignant neoplasm brain/spine
196.3	Malignant neoplasm lymph–axilla/arm	198.4	Secondary malignant neoplasm nerve NEC
196.5	Malignant neoplasm lymph–inguin/leg	198.5	Secondary malignant neoplasm bone
196.6	Malignant neoplasm lymph–intrapelv	198.6	Secondary malignant neoplasm ovary
196.8	Malignant neoplasm lymph node–mult	198.7	Secondary malignant neoplasm adrenal
196.9	Malignant neoplasm lymph node NOS	198.81	Secondary malignant neoplasm breast
197.0	Secondary malignant neoplasm lung	198.82	Secondary malignant neoplasm genital
197.1	Secondary malignant neoplasm mediastinum	198.89	Secondary malignant neoplasm NEC
197.2	Secondary malignant neoplasm pleura	199.0	Malignant neoplasm disseminated
197.3	Secondary malignant neoplasm resp NEC	199.1	Malignant neoplasm NOS
197.4	Secondary malignant neoplasm small bowel	209.70	Secondary neuroendocrine tumour, unspecified site
197.5	Secondary malignant neoplasm large bowel	209.71	Secondary neuroendocrine tumour of distant lymph nodes
197.6	Secondary malignant neoplasm peritoneum	209.72	Secondary neuroendocrine tumour of liver
197.7	Secondary malignant neoplasm liver	209.73	Secondary neuroendocrine tumour of bone
197.8	Secondary malignant neoplasm GI NEC	209.74	Secondary neuroendocrine tumour of peritoneum
198.0	Secondary malignant neoplasm kidney	209.79	Secondary neuroendocrine tumour of other sites

ICD-10 codes			
C77	Secondary and unspecified malignant neoplasm of lymph nodes	C79	Secondary malignant neoplasm of other and unspecified sites
C78	Secondary malignant neoplasm of respiratory and digestive organs		

ICD-9 = International Classification of Diseases, Revision 9; ICD-O = International Classification of Diseases for Oncology; NEC = neuroendocrine carcinoma; NOS = not otherwise specified.