Epidemiology, Healthcare Resource Utilization, and Costs of Unresectable Locally Advanced or Metastatic Gastric and Gastroesophageal Junction Adenocarcinoma in China

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INTRODUCTION

- Gastric cancer is the fifth most common cancer and third leading cause of cancer-related death in China[1,2]
  - In 2022, the age-standardized incidence rate of gastric cancer was 13.7 per 100,000 persons, and the age-standardized mortality rate was 9.4 per 100,000 persons[1]
- Epidemiologic data for gastroesophageal junction (GEJ) cancer is limited,[3] but 12.6% of newly diagnosed patients with gastric cancer in China had GEJ cancer, with a 5-year relative survival rate of 29%[4]
- Among Chinese patients with newly diagnosed gastric cancer, 12.4% and 13.8% were classified as stage III and stage IV, respectively (total: 26.2%), although 58.4% of cases were reported as "unknown stage"[4]
  - Median overall survival of stage IV gastric cancer is 4–14 months[5]
- The recommended treatment for gastric cancer in China is surgery with adjuvant combination chemotherapy for locally advanced disease and surgery with neoadjuvant chemotherapy for stage III and IV disease; chemotherapy or concurrent chemoradiotherapy may be considered for unresectable disease[6]
  - Treatment for metastatic disease is comprehensive based on systemic drug therapy[6]
- Although gastric cancer continues to have a significant impact on the Chinese healthcare system, data pertaining to healthcare resource utilization (HCRU) and costs for patients with locally advanced or metastatic (la/m) gastric cancer, including GEJ cancer, are lacking

OBJECTIVE

- This study aimed to understand the epidemiology, HCRU, and costs of unresectable la/m gastric and GEJ adenocarcinoma in China

METHODS

Study design

- An observational, descriptive study of patients with unresectable gastric and GEJ adenocarcinoma was performed using curated electronic medical records (EMR) from the Chinese National Cancer Center Oncology Information Database (NCCOID)
  - NCCOID is a longitudinal EMR-based oncology database with patient-level data from >1400 hospitals across 31 provinces in China, including >15 million patients
  - NCCOID data include demographics, clinical characteristics, inpatient admissions, outpatient visits, laboratory and imaging tests, treatment, surgery, and healthcare costs
- Data from 53 hospitals, generated from January 2015 to December 2022, were used in this study; data quality standards (eg, continuity, integrity, and correlation) were applied

Patients

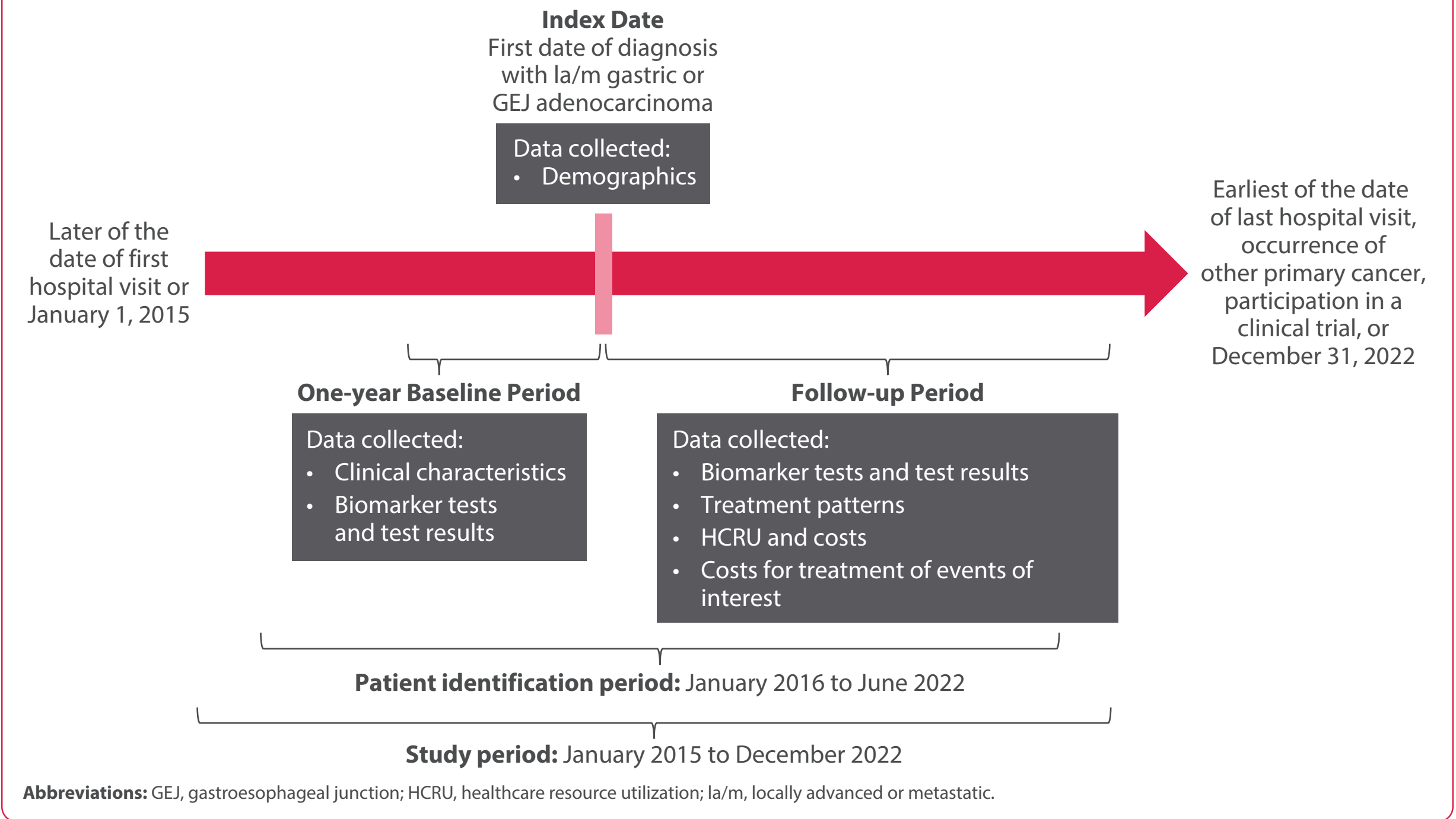- Eligible patients had la/m gastric or GEJ adenocarcinoma diagnosed between 2016 and 2022 (Table 1)

Table 1. Inclusion and Exclusion Criteria

Inclusion Criteria	Exclusion Criteria
Adults (≥18 years on the index date)	Other primary forms of cancer or clinical trial participation during the 1-year period prior to diagnosis of gastric or GEJ adenocarcinoma
Pathologically confirmed diagnosis of gastric or GEJ adenocarcinoma between January 2016 and June 2022	Evidence of clinical trial participation during the 1-year period prior to diagnosis of gastric or GEJ adenocarcinoma
≥1 inpatient or ≥2 outpatient records related to gastric or GEJ adenocarcinoma	
Locally advanced or metastatic disease	

Abbreviation: GEJ, gastroesophageal junction.

- Data collection occurred at the index date (first diagnosis of la/m gastric or GEJ adenocarcinoma), during a 1-year baseline period (prior to and inclusive of the index date), and during the follow-up period (from the index date until the last hospital visit, occurrence of other primary cancer, clinical trial participation, or study termination; Figure 1)

Figure 1. Data Collection Time Points of Interest and Data Collected

Abbreviations: GEJ, gastroesophageal junction; HCRU, healthcare resource utilization; la/m, locally advanced or metastatic.

Endpoints

- A primary endpoint in all patients with gastric or GEJ adenocarcinoma was overall and annual percentage by disease stage at diagnosis
- Primary endpoints in patients with la/m gastric or GEJ adenocarcinoma included demographic characteristics, clinical characteristics at baseline, and HCRU and costs at follow-up
  - Demographic characteristics include age at the index date, sex, ethnicity, geographic location of residence, geographic location of hospital, level of hospital, insurance status, type of insurance, and index year

RESULTS

Percentage of patients with late-stage disease

- Among all patients diagnosed with gastric adenocarcinoma in 2016–2022 (N=189,725), the percentage with late-stage disease (tumor, node, metastasis [TNM] stage III or IV) at first diagnosis was 33.6% in 2016 and 34.3% in 2022; overall percentage in 2016–2022 was 34.2% (Figure 2)
- Among all patients diagnosed with GEJ adenocarcinoma in 2016–2022 (N=60,878), the percentage with late-stage disease at first diagnosis was 28.2% in 2016 and 32.4% in 2022; overall percentage in 2016–2022 was 30.2%

Figure 2. Percentages of Patients With Early-Stage or Late-Stage Disease at First Diagnosis of Gastric or GEJ Adenocarcinoma (2016–2022)
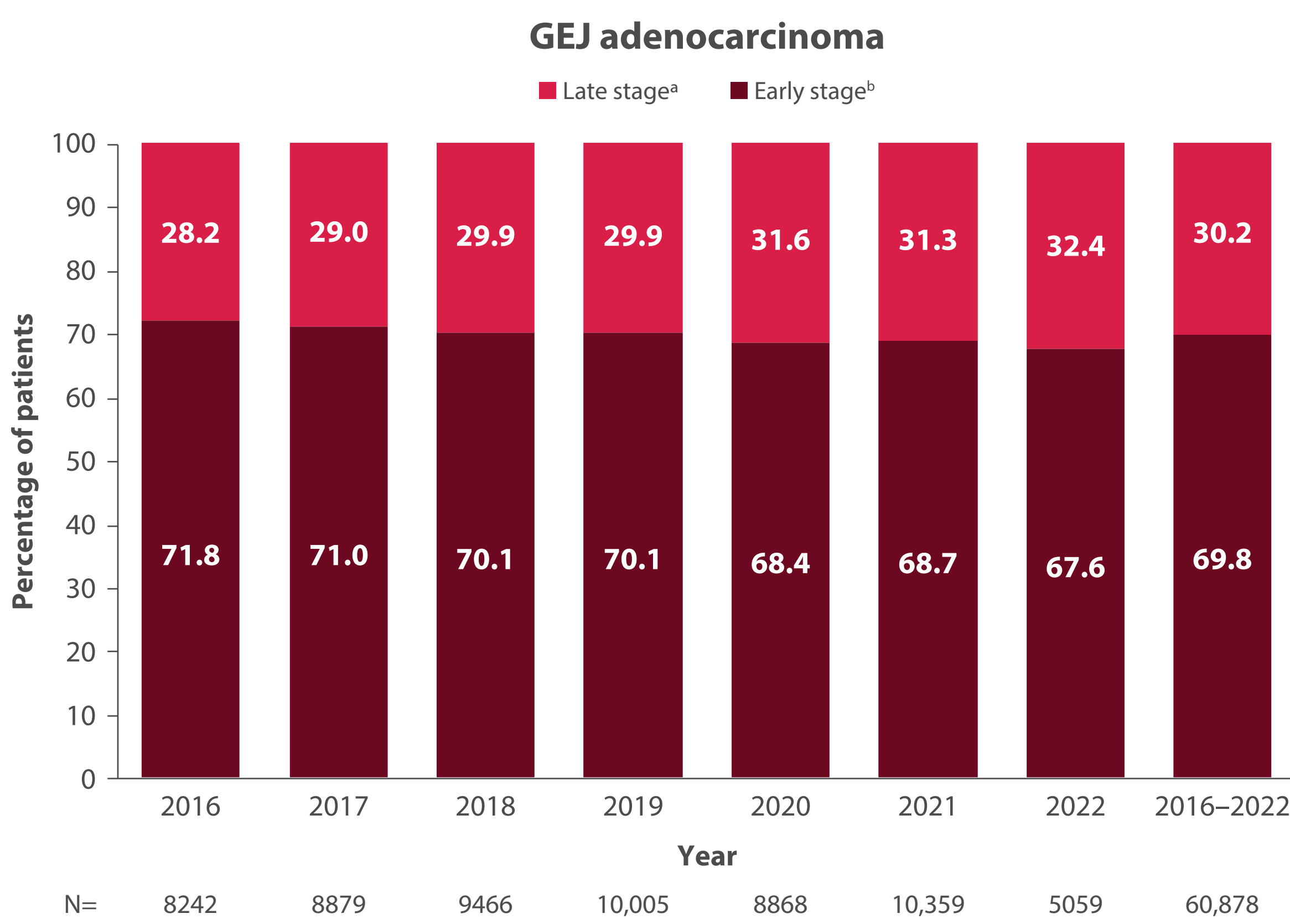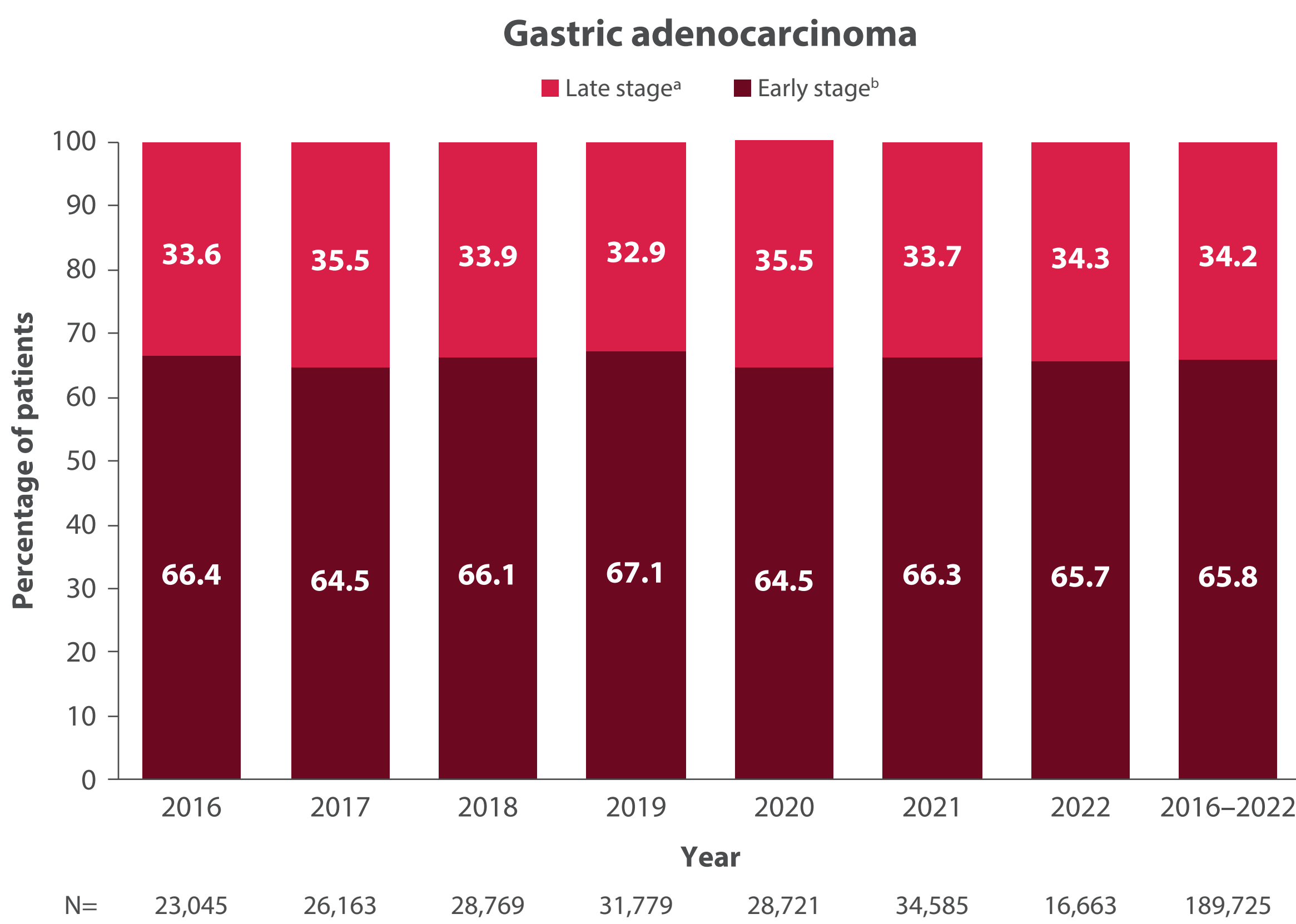
Abbreviations: GEJ, gastroesophageal junction; TNM, tumor, node, metastasis.
[a]TNM stage III or IV.
[b]TNM stage I or II.

Characteristics of patients with la/m gastric or GEJ adenocarcinoma

- A total of 22,156 patients with la/m gastric adenocarcinoma and 6183 patients with la/m GEJ adenocarcinoma met study eligibility criteria
- Mean (standard deviation [SD]) age at diagnosis was 59.0 (12.3) years for la/m gastric adenocarcinoma and 64.5 (10.1) years for la/m GEJ adenocarcinoma; 14,837 (67.0%) and 5125 (82.9%) patients, respectively, were male (Table 2)
- The provinces in which most patients resided (top 3) were Anhui (8.9%), Henan (8.5%), and Zhejiang (7.4%) for patients with la/m gastric adenocarcinoma, and Henan (15.1%), Anhui (10.3%), and Sichuan (9.2%) for patients with la/m GEJ adenocarcinoma
- Of all provincial-level administrative regions, hospitals in Beijing accounted for the highest proportion of patients diagnosed with la/m gastric adenocarcinoma (12.3%) and la/m GEJ adenocarcinoma (14.9%)

Table 2. Patient Demographics and Clinical Characteristics

	la/m Gastric Adenocarcinoma (2016–2022) N=22,156	la/m GEJ Adenocarcinoma (2016–2022) N=6183
Age at diagnosis, years		
Mean (SD)	59.0 (12.3)	64.5 (10.1)
Median (range)	61.0 (18, 94)	65.0 (20, 99)
Sex, n (%)		
Male	14,837 (67.0)	5125 (82.9)
Female	7319 (33.0)	1058 (17.1)
Ethnicity, n (%)		
Han Chinese	11,696 (52.8)	3243 (52.5)
Non-Han Chinese	9688 (43.7)	2717 (43.9)
Unknown	772 (3.5)	223 (3.6)
Level of hospital, n (%)		
Class 2	35 (0.2)	24 (0.4)
Class 3	22,121 (99.8)	6159 (99.6)
Insurance type, n (%)		
Urban and Rural Resident Basic Medical Insurance	5539 (25.0)	2165 (35.0)
Urban Employee Basic Medical Insurance	6192 (27.9)	1845 (29.8)
Commercial	151 (0.7)	30 (0.5)
Other	4264 (19.2)	943 (15.3)
Unknown	6010 (27.1)	1200 (19.4)
Year of index date, n (%)		
2016	2221 (10.0)	584 (9.4)
2017	2789 (12.6)	773 (12.5)
2018	2857 (12.9)	852 (13.8)
2019	3378 (15.2)	950 (15.4)
2020	3896 (17.6)	1044 (16.9)
2021	4777 (21.6)	1337 (21.6)
2022	2238 (10.1)	643 (10.4)
Disease stage at diagnosis, n (%)		
Stage III	2964 (13.4)	800 (12.9)
Stage IV	19,042 (85.9)	5338 (86.3)
Unknown	150 (0.7)	45 (0.7)
Charlson Comorbidity Index score,[7,8] n (%)		
0	0 (0)	0 (0)
1	0 (0)	0 (0)
2	1418 (6.4)	370 (6.0)
3	1357 (6.1)	398 (6.4)
4	595 (2.7)	183 (3.0)
5	195 (0.9)	77 (1.2)
≥6	18,591 (83.9)	5155 (83.4)
Metastasis location		
n (missing)	6466 (15,690)	2283 (3900)
Liver, n (%)	3890 (60.2)	1440 (63.1)
Lung, n (%)	876 (13.5)	499 (21.9)
Bone, n (%)	1159 (17.9)	282 (12.4)
Brain, n (%)	105 (1.6)	83 (3.6)
Pancreas, n (%)	189 (2.9)	38 (1.7)
Supraclavicular lymph nodes, n (%)	89 (1.4)	29 (1.3)
Ovary, n (%)	474 (7.3)	26 (1.1)
Duration of baseline period, days		
Mean (SD)	200.6 (387.46)	235.2 (407.98)
Median (range)	28.0 (12, 671)	43.0 (12, 646)
Duration of follow-up period, days		
Mean (SD)	228.9 (330.40)	234.9 (308.61)
Median (range)	110.0 (12, 487)	135.0 (12, 507)

Abbreviation: GEJ, gastroesophageal junction; la/m, locally advanced or metastatic; SD, standard deviation.

Healthcare resource utilization

- Among patients with la/m gastric adenocarcinoma, 17,061 (77.0%) had a gastric adenocarcinoma-related inpatient admission and 9526 (43.0%) had a gastric adenocarcinoma-related outpatient visit (Table 3)
  - The average number of inpatient admissions was 0.31 (95% confidence interval [CI]: 0.31, 0.31) per patient-month (PPM), and the average number of outpatient visits was 0.28 (0.27, 0.28) PPM
- Among patients with la/m GEJ adenocarcinoma, 4818 (77.9%) had a GEJ adenocarcinoma-related inpatient admission and 1428 (23.1%) had a GEJ adenocarcinoma-related outpatient visit
  - The average number of inpatient admissions was 0.28 (95% CI: 0.28, 0.29) PPM, and the average number of outpatient visits was 0.13 (0.13, 0.13) PPM

Table 3. Gastric or GEJ Adenocarcinoma-Related HCRU

	la/m Gastric Adenocarcinoma (2016–2022) N=22,156	la/m GEJ Adenocarcinoma (2016–2022) N=6183
Inpatient admission		
Number (%) of patients	17,061 (77.0)	4818 (77.9)
Rate PPM (95% CI)	0.31 (0.31, 0.31)	0.28 (0.28, 0.29)
Cumulative incidence risk, %	78.3	77.9
LOS per inpatient admission in patients with ≥1 admission, days		
Mean (SD)	25.8 (32.14)	22.4 (26.03)
Median (IQR)	15.0 (7.0, 32.0)	13.0 (6.0, 29.0)
Outpatient visit		
Number (%) of patients	9526 (43.0)	1428 (23.1)
Rate PPM (95% CI)	0.28 (0.27, 0.28)	0.13 (0.13, 0.13)
Cumulative incidence risk, %	49.3	27.1

Abbreviations: CI, confidence interval; GEJ, gastroesophageal junction; HCRU, healthcare resource utilization; IQR, interquartile range; la/m, locally advanced or metastatic; LOS, length of stay; PPM, per patient-month; SD, standard deviation.

Cost of treatment

- Mean (SD) costs (US dollars [December 2022 exchange rate]) PPM of gastric adenocarcinoma-related and GEJ adenocarcinoma-related treatment were: inpatient admissions, $2100.81 ($4452.05) and $1891.51 ($4346.75); outpatient visits, $165.74 ($375.44) and $140.11 ($310.32); EOX chemotherapy, $139.35 ($397.06) and $137.38 ($426.00); FOLFOX chemotherapy, $141.88 ($402.87) and $148.31 ($518.64); and CAPOX chemotherapy, $139.62 ($398.20) and $137.06 ($426.47; Table 4)

Table 4. Cost of Gastric or GEJ Adenocarcinoma-Related Treatment (US Dollars)[a]

	la/m Gastric Adenocarcinoma (2016–2022) N=22,156		la/m GEJ Adenocarcinoma (2016–2022) N=6183	
	Cost PPM	Cost per Admission/ Visit/Treatment	Cost PPM	Cost per Admission/ Visit/Treatment
Total cost for inpatient admission				
n (missing)	16,976 (5180)	16,976 (5180)	4762 (1421)	4762 (1421)
Mean (SD)	$2100.81 ($4452.05)	$2584.06 ($2908.91)	$1891.51 ($4346.75)	$2327.22 ($2506.79)
Median (IQR)	$1079.49 ($403.49, $2406.81)	$1744.53 ($1103.68, $2921.21)	$809.80 ($314.24, $1999.89)	$1655.95 ($1016.53, $2630.03)
Min, max	$1.58, $87,882.66	$0.14, $52,711.18	$0.00, $134,998.35	$0.14, $33,903.88
Total cost for outpatient visit				
n (missing)	9731 (12,425)	9731 (12,425)	1348 (4835)	1348 (4835)
Mean (SD)	$165.74 ($375.44)	$190.44 ($314.75)	$140.11 ($310.32)	$193.20 ($322.18)
Median (IQR)	$44.02 ($6.67, $172.31)	$94.58 ($18.84, $244.90)	$29.51 ($3.67, $150.23)	$94.77 ($16.21, $251.34)
Min, max	$0.00, $8126.82	$0.00, $6042.56	$0.00, $6392.25	$0.00, $4479.69
Costs for chemotherapy				
EOX				
n (missing)	8190 (13,966)	8190 (13,966)	2200 (3983)	2200 (3983)
Mean (SD)	$139.35 ($397.06)	$121.10 ($246.60)	$137.38 ($426.00)	$148.05 ($264.31)
Median (IQR)	$48.73 ($18.69, $118.08)	$50.06 ($21.29, $109.88)	$39.79 ($14.82, $105.98)	$68.13 ($31.63, $133.32)
Min, max	$0.00, $14,116.82	$0.00, $5646.33	$0.00, $13,811.95	$0.00, $2668.37
FOLFOX				
n (missing)	7910 (14,246)	7910 (14,246)	2128 (4055)	2128 (4055)
Mean (SD)	$141.88 ($402.87)	$119.07 ($235.55)	$148.31 ($518.64)	$148.80 ($245.53)
Median (IQR)	$50.36 ($18.97, $124.86)	$51.29 ($21.91, $112.53)	$44.85 ($16.41, $115.83)	$75.34 ($34.07, $143.60)
Min, max	$0.00, $16,883.14	$0.00, $5772.63	$0.00, $13,811.95	$0.00, $2171.61
CAPOX				
n (missing)	8122 (14,034)	8122 (14,034)	2184 (3999)	2184 (3999)
Mean (SD)	$139.62 ($398.20)	$121.20 ($246.78)	$137.06 ($426.47)	$147.98 ($265.10)
Median (IQR)	$48.85 ($18.76, $117.51)	$49.86 ($21.27, $109.22)	$39.54 ($14.79, $105.68)	$67.82 ($31.35, $133.10)
Min, max	$0.00, $14,116.82	0.00, $5646.33	$0.00, $13,811.95	$0.00, $2668.37

Abbreviations: CAPOX, capecitabine and high-dose oxaliplatin; EOX, epirubicin, oxaliplatin, and capecitabine; FOLFOX, low-dose oxaliplatin with leucovorin and bolus/continuous infusion of 5-fluorouracil; GEJ, gastroesophageal junction; IQR, interquartile range; la/m, locally advanced or metastatic; max, maximum; min, minimum; PPM, per patient-month; SD, standard deviation.
[a]December 2022 exchange rate: 1 US dollar = 6.9833 Chinese yuan.

LIMITATIONS

- Data quality varies across hospitals in NCCOID; therefore, data from hospitals with unacceptable data quality were excluded, potentially impacting the generalizability of the results
- EMR are subject to omissions, misclassifications, and errors; additionally, healthcare encounters outside of participating hospitals were not captured in the EMR, potentially leading to underestimation of the burden of disease
- There was no longitudinal follow-up on patients with early-stage disease to determine how many developed late-stage disease

CONCLUSION

- Approximately one-third of patients at initial diagnosis had late-stage disease—gastric (34.2%) or GEJ (30.2%) adenocarcinoma; the annual percentage of late-stage diagnoses remained stable over the period spanning 2016–2022
  - Gastric cancer is often diagnosed in advanced stages due to nonspecific symptoms or asymptomatic progression[9]
- Among patients meeting study eligibility criteria, the majority were diagnosed with stage IV gastric (85.9%) or GEJ (86.3%) adenocarcinoma; most (83.9% and 83.4%, respectively) had a Charlson Comorbidity Index score ≥6, indicating numerous and/or severe comorbid diseases and increased risk of mortality[7]
- Characteristics of patients with unresectable la/m disease were similar to those in other studies, including male predominance and average age at diagnosis around the seventh decade of life[10]
- Unresectable la/m gastric and GEJ adenocarcinoma are associated with significant HCRU and associated costs in China

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