

Supplemental Table I | Key components of cohort derivation for reporting in studies using the National Cancer Database

Data Element	
Participant Use File (PUF) Used	NCDB Stomach PUF
Years Included	2004-2015
ICD-O-3 Histology Codes	8000–8005, 8140–8141, 8143–8147, 8210–8214, 8220–8221, 8255, 8260–8263, 8310, 8480–8481, 8490, 8510, 8560–8562, 8570–8576
Primary Site Codes	Stomach (C16.0, C16.1, C16.2, C16.3, C16.4, C16.5, C16.6, C16.8, C16.9)
Exclusion Criteria	<p><i>Stage IV (M1) disease or unresectable with palliative care:</i></p> <ul style="list-style-type: none"> <li>- ANALYTIC_STAGE_GROUP=4 or TNM_CLIN_M="c1"</li> <li>- REASON_FOR_NO_SURGERY="Surgery of the primary site was not recommended/performed because it was contraindicated due to patient risk factors" and PALLIATIVE_CARE=1-7 (received any form of palliative care)</li> <li>- CS_EXTENSION=600 or 650 (tumor extension into the aorta or celiac axis) and received palliative care</li> <li>- CS_EXTENSION=600 or 650 (tumor extension into the aorta or celiac axis) and RX_SUMM_CHEMO="Chemotherapy was not recommended/administered because it was contraindicated due to patient risk factors"</li> </ul> <p><i>Staging information unavailable:</i></p> <ul style="list-style-type: none"> <li>- TNM_CLIN_M= "88", "cX", or missing</li> <li>- ANALYTIC_STAGE_GROUP= "AJCC Staging not applicable" or "AJCC Stage Group unknown"</li> <li>- If patient was diagnosed after 2006, TNM_CLIN_N= "88", "cX", or missing</li> <li>- If patient was diagnosed after 2006, TNM_CLIN_T= "88", "cX", or missing</li> </ul> <p><i>Received care at more than one facility:</i></p> <p>PUF_MULT_SOURCE= "Records pertaining to this case submitted to NCDB by more than one CoC facility"</p> <p><i>Patient died before planned treatment:</i></p> <p>REASON_FOR_NO_SURGERY= "Surgery of the primary site was not performed because the patient died prior to planned or recommended surgery" or RX_SUMM_CHEMO= "Chemotherapy was not administered because the patient died prior to planned or recommended therapy."</p> <p><i>Hospital volume &lt;25 patients:</i></p> <p>Generated volume variable based on PUF_FACILITY_ID</p>

**Supplemental Table II** | Primary treatment recommendation based on National Comprehensive Cancer Network (NCCN) Practice Guidelines in Oncology for gastric cancer and NDCB correlate. Patients were considered to have received guideline adherent care if received primary treatment listed was received. If this treatment was not received as primary treatment, patients were considered to have received non-adherent care.

**A** | Patients diagnosed in 2004, 2004, and 2006 based on v.1.2004, v.1.2005, and v.1.2006, respectively.

	<b>NCCN Guidelines</b>	<b>NCDB</b>
Medically fit*, potentially resectable <sup>†</sup>	Surgery <sup>‡</sup>	Surgery received and minimum of 15 lymph nodes examined <sup>**</sup>
Medically fit, unresectable	RT, 45-50.4 Gy + concurrent F-FU-based radiosensitization  OR Chemotherapy	Radiation <sup>§</sup> and chemotherapy <sup>¶</sup> received  Chemotherapy <sup>¶</sup> received
Medically unfit	RT, 45-50.4 Gy + concurrent F-FU-based radiosensitization  OR Salvage chemotherapy or best supportive care (poor performance status)	Radiation <sup>§</sup> and chemotherapy <sup>¶</sup> received  Chemotherapy <sup>¶</sup> received

\* NCCN criterion of medical fitness is ability to tolerate major abdominal surgery. Patients for whom “surgery of the primary site was not recommended/performed because it was contraindicated due to patient risk factors (comorbid conditions, advanced age, etc.)” in REASON\_FOR\_NO\_SURGERY field of NCDB were considered medically unfit.

<sup>†</sup> NCCN criteria for unresectability for cure: peritoneal seeding or distant metastases; inability to perform a complete resection; invasion or encasement of major vascular structure. Patients who did not have extension into the aorta or celiac axis based on the CS\_EXTENSION field (600 or 650) of the NCDB were considered to have potentially resectable disease.

<sup>‡</sup> A minimum of 15 lymph nodes should be evaluated.

<sup>\*\*</sup> “Surgery received” based on NCDB variable RX\_SUMM\_SURG\_PRIM\_SITE with a value between 30 and 80; “minimum of 15 lymph nodes examined” based on NCDB variable REGIONAL\_NODES\_EXAMINED with a value between 15 and 90.

<sup>§</sup> “Radiation received” based on NCDB variable RX\_SUMM\_RADIATION with a value between 1 and 5, corresponding to beam radiation; radioactive implants; radioisotopes; combination of beam radiation with radioactive implants or radioisotopes; radiation therapy, NOS.

<sup>¶</sup> “Chemotherapy received” based on NCDB variable RX\_SUMM\_CHEMO with a value between 1 and 3, corresponding to chemotherapy administered as first course therapy, but the type and agents is not documented in the patient record; single-agent chemotherapy administered as first course therapy; or multiagent chemotherapy administered as first course therapy.

**B** | Patients diagnosed in 2007 and 2008 based on v.1.2007 and v.1.2008, respectively.

	Clinical Stage	NCCN Guidelines	NCDB
Medically fit*, potentially resectable†	T1 or less	Surgery‡	Surgery received and minimum of 15 lymph nodes examined**
	T2 or higher or N+	Surgery‡	Surgery received and minimum of 15 lymph nodes examined**
		OR	
		Preoperative chemotherapy followed by surgery	Received chemotherapy¶ followed by surgery with minimum of 15 lymph nodes examined**
Medically fit, unresectable		RT, 45-50.4 Gy + concurrent F-FU-based radiosensitization	Radiation§ and chemotherapy¶ received
		OR	
		Chemotherapy	Chemotherapy¶ received
Medically unfit		RT, 45-50.4 Gy + concurrent F-FU-based radiosensitization	Radiation§ and chemotherapy received
		OR	
		Salvage chemotherapy	Chemotherapy¶ received

\* NCCN criterion of medical fitness is ability to tolerate major abdominal surgery. Patients for whom “surgery of the primary site was not recommended/performed because it was contraindicated due to patient risk factors (comorbid conditions, advanced age, etc.)” in REASON\_FOR\_NO\_SURGERY field of NCDB were considered medically unfit.

† NCCN criteria for unresectability for cure: peritoneal seeding or distant metastases; inability to perform a complete resection; invasion or encasement of major vascular structure. Patients who did not have extension into the aorta or celiac axis based on the CS\_EXTENSION field (600 or 650) of the NCDB were considered to have potentially resectable disease.

‡ A minimum of 15 lymph nodes should be evaluated.

\*\* “Surgery received” based on NCDB variable RX\_SUMM\_SURG\_PRIM\_SITE with a value between 30 and 80; “minimum of 15 lymph nodes examined” based on NCDB variable REGIONAL\_NODES\_EXAMINED with a value between 15 and 90.

¶ “Chemotherapy received” based on NCDB variable RX\_SUMM\_CHEMO with a value between 1 and 3, corresponding to chemotherapy administered as first course therapy, but the type and agents is not documented in the patient record; single-agent chemotherapy administered as first course therapy; or multiagent chemotherapy administered as first course therapy.

§ “Radiation received” based on NCDB variable RX\_SUMM\_RADIATION with a value between 1 and 5, corresponding to beam radiation; radioactive implants; radioisotopes; combination of beam radiation with radioactive implants or radioisotopes; radiation therapy, NOS.

C | Patients diagnosed in 2009, 2010, 2011, 2012, 2013, 2014, and 2015 based on v.1.2009, v.1.2010, v.2.2011, v.1.2012, v.1.2013, v.1.2014, and v.1.2015, respectively.

	Clinical Stage	NCCN Guidelines	NCDB
Medically fit*, potentially resectable†	Tis or T1a	Surgery‡	Surgery received and minimum of 15 lymph nodes examined**
		OR	
		Endoscopic Mucosal Resection	Local tumor excision or destruction††
	T1b	Surgery‡	Surgery received and minimum of 15 lymph nodes examined**
	T2 or higher or N+	Surgery‡	Surgery received and minimum of 15 lymph nodes examined**
OR			
Preoperative chemotherapy followed by surgery		Received chemotherapy¶ followed by surgery with minimum of 15 lymph nodes examined**	
	OR		
	Preoperative chemoradiation followed by surgery	Received chemotherapy¶ and radiation§ followed by surgery with minimum of 15 lymph nodes examined**	
Medically fit, unresectable		RT, 45-50.4 Gy + concurrent 5-FU-based radiosensitization or taxane-based chemoradiation‡‡	Radiation§ and chemotherapy¶ received
		OR	
		Chemotherapy	Chemotherapy¶ received
Medically unfit	Tis or T1a	Endoscopic mucosal resection	Local tumor excision or destruction
	T1b or higher or N+	RT, 45-50.4 Gy + concurrent 5-FU-based radiosensitization or taxane-based chemoradiation‡‡	Radiation§ and chemotherapy¶ received

\* NCCN criterion of medical fitness is ability to tolerate major abdominal surgery. Patients for whom “surgery of the primary site was not recommended/performed because it was contraindicated due to patient risk factors (comorbid conditions, advanced age, etc.)” in REASON\_FOR\_NO\_SURGERY field of NCDB were considered medically unfit.

† NCCN criteria for unresectability for cure: peritoneal seeding or distant metastases; inability to perform a complete resection; invasion or encasement of major vascular structure. Patients who did not have extension into the aorta or celiac axis based on the CS\_EXTENSION field (600 or 650) of the NCDB were considered to have potentially resectable disease.

‡ A minimum of 15 lymph nodes should be evaluated.

‡‡ Guidelines from 2009 and 2010 did not include taxane-based chemoradiation. This was added as an alternative to 5-FU-based radiosensitization in 2011.

\*\* “Surgery received” based on NCDB variable RX\_SUMM\_SURG\_PRIM\_SITE with a value between 30 and 80; “minimum of 15 lymph nodes examined” based on NCDB variable REGIONAL\_NODES\_EXAMINED with a value between 15 and 90.

†† “Local tumor excision or destruction” based on NCDB variable RX\_SUMM\_SURG\_PRIM\_SITE with a value between 10 and 29.

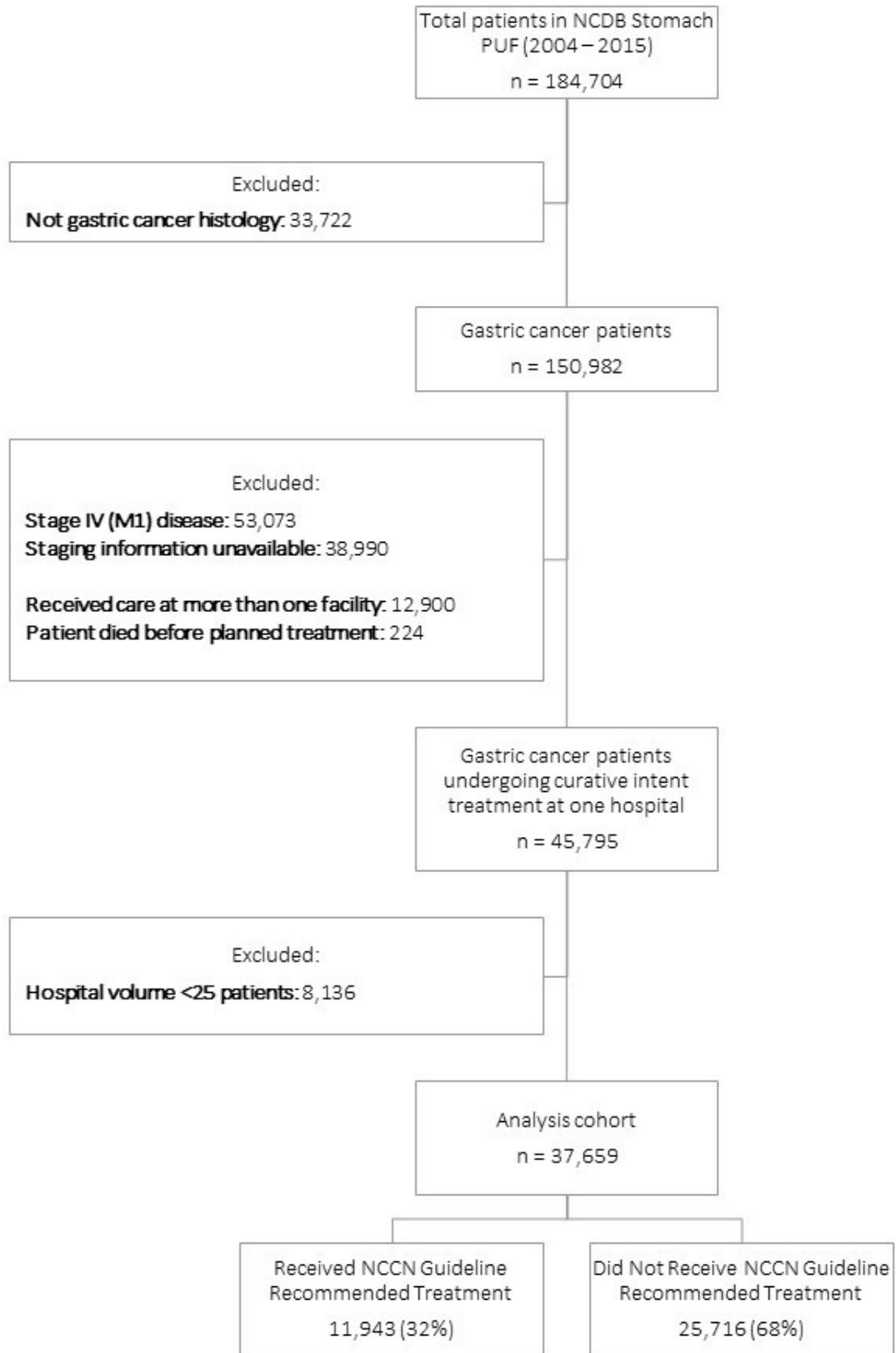
¶ “Chemotherapy received” based on NCDB variable RX\_SUMM\_CHEMO with a value between 1 and 3, corresponding to chemotherapy administered as first course therapy, but the type and agents is not documented in the patient record; single-agent chemotherapy administered as first course therapy; or multiagent chemotherapy administered as first course therapy.

§ “Radiation received” based on NCDB variable RX\_SUMM\_RADIATION with a value between 1 and 5, corresponding to beam radiation; radioactive implants; radioisotopes; combination of beam radiation with radioactive implants or radioisotopes; radiation therapy, NOS.

**Supplemental Table III | Patient and disease characteristics by hospital adherence quartile. *P* value is based on F test using ANOVA model.**

	Hospital Adherence Rate Category				<i>P</i> value
	Quartile 1 (0% - 15.9%) n = 6,349	Quartile 2 (15.9% - 25%) n = 6,959	Quartile 3 (25% - 34.6%) n = 9,333	Quartile 4 (34.6% - 75.7%) n = 15,018	
Age (years), Median (IQR)	72	70	69	68	<0.001
Sex					0.0012
Male	4,167 ( 65.6)	4,590 ( 66.0)	6,206 ( 66.5)	10,208 ( 68.0)	
Female	2,182 ( 34.4)	2,369 ( 34.0)	3,127 ( 33.5)	4,810 ( 32.0)	
Race					<0.001
White	5,158 ( 81.2)	5,388 ( 77.4)	7,156 ( 76.7)	11,423 ( 76.1)	
Black	758 ( 11.9)	1,099 ( 15.8)	1,373 ( 14.7)	1,732 ( 11.5)	
Asian or Pacific Islander	276 ( 4.3)	365 ( 5.2)	566 ( 6.1)	1,465 ( 9.8)	
Other, Unknown	157 ( 2.5)	107 ( 1.5)	238 ( 2.6)	398 ( 2.7)	
Spanish/Hispanic Origin					<0.001
Non-Spanish, Non-Hispanic	5,351 ( 84.3)	5,884 ( 84.6)	7,883 ( 84.5)	13,133 ( 87.4)	
Spanish, Hispanic	551 ( 8.7)	538 ( 7.7)	1,026 ( 11.0)	1,254 ( 8.3)	
Unknown	447 ( 7.0)	537 ( 7.7)	424 ( 4.5)	631 ( 4.2)	
Primary Payor					<0.001
Not Insured	189 ( 3.0)	174 ( 2.5)	371 ( 4.0)	340 ( 2.3)	
Private Insurance/Managed Care	1,592 ( 25.1)	2,023 ( 29.1)	2,908 ( 31.2)	5,383 ( 35.8)	
Medicaid	293 ( 4.6)	397 ( 5.7)	627 ( 6.7)	926 ( 6.2)	
Medicare	3,735 ( 58.8)	4,180 ( 60.1)	5,167 ( 55.4)	7,863 ( 52.4)	
Other Government	82 ( 1.3)	101 ( 1.5)	129 ( 1.4)	194 ( 1.3)	
Insurance Status Unknown	458 ( 7.2)	84 ( 1.2)	131 ( 1.4)	312 ( 2.1)	
Charlson-Deyo Score					<0.001
0	4,190 ( 66.0)	4,424 ( 63.6)	6,151 ( 65.9)	10,324 ( 68.7)	
1	1,442 ( 22.7)	1,718 ( 24.7)	2,233 ( 23.9)	3,327 ( 22.2)	
2	496 ( 7.8)	556 ( 8.0)	677 ( 7.3)	937 ( 6.2)	
≥ 3	221 ( 3.5)	261 ( 3.8)	272 ( 2.9)	430 ( 2.9)	
Urban/Rural					<0.001
Metro Area	5,222 ( 82.2)	5,749 ( 82.6)	7,907 ( 84.7)	12,784 ( 85.1)	
Adjacent to Metro Area	638 ( 10.0)	736 ( 10.6)	885 ( 9.5)	1,222 ( 8.1)	
Not Adjacent to Metro Area	320 ( 5.0)	301 ( 4.3)	347 ( 3.7)	539 ( 3.6)	
Median Income Quartiles 2008-2012					<0.001
< \$38,000	1,423 ( 22.4)	1,530 ( 22.0)	1,818 ( 19.5)	2,285 ( 15.2)	
\$38,000-\$47,999	1,636 ( 25.8)	1,761 ( 25.3)	2,240 ( 24.0)	2,866 ( 19.1)	
\$48,000-\$62,999	1,629 ( 25.7)	1,762 ( 25.3)	2,442 ( 26.2)	3,975 ( 26.5)	
≥ \$63,000	1,618 ( 25.5)	1,872 ( 26.9)	2,780 ( 29.8)	5,795 ( 38.6)	
NCDB Analytic Stage Group					0.5706
Stage 0	194 ( 3.1)	231 ( 3.3)	317 ( 3.4)	434 ( 2.9)	
Stage I	2,487 ( 39.2)	2,609 ( 37.5)	3,638 ( 39.0)	5,937 ( 39.5)	
Stage II	1,677 ( 26.4)	1,885 ( 27.1)	2,397 ( 25.7)	3,835 ( 25.5)	
Stage III	1,991 ( 31.4)	2,234 ( 32.1)	2,981 ( 31.9)	4,812 ( 32.0)	
Grade					<0.001
Well differentiated	343 ( 5.4)	388 ( 5.6)	579 ( 6.2)	910 ( 6.1)	
Moderately differentiated	1,889 ( 29.8)	1,928 ( 27.7)	2,558 ( 27.4)	4,269 ( 28.4)	
Poorly differentiated	3,078 ( 48.5)	3,472 ( 49.9)	4,536 ( 48.6)	7,600 ( 50.6)	
Undifferentiated, anaplastic	85 ( 1.3)	85 ( 1.2)	108 ( 1.2)	237 ( 1.6)	
Cell type not determined	954 ( 15.0)	1,086 ( 15.6)	1,552 ( 16.6)	2,002 ( 13.3)	

Supplemental Figure I | Patient cohort derivation.



**Supplemental Figure II** | Reason patients who were recommended to undergo surgery as primary treatment per NCCN Guidelines did not receive guideline-adherent care.

