American College of Radiology
ACR Appropriateness Criteria®
Staging and Follow-up of Gastric Cancer

Variant: 1   Adult. Suspected gastric adenocarcinoma. Initial imaging.

Procedure	Appropriateness Category	Relative Radiation Level
CT abdomen and pelvis with IV contrast	Usually Appropriate	☢☢☢
FDG-PET/CT skull base to mid-thigh	Usually Appropriate	☢☢☢☢
US abdomen endoscopic	May Be Appropriate (Disagreement)	O
MRI abdomen without and with IV contrast	May Be Appropriate	O
CT abdomen and pelvis without and with IV contrast	May Be Appropriate	☢☢☢☢
US abdomen	Usually Not Appropriate	O
US abdomen and pelvis	Usually Not Appropriate	O
Radiography abdomen	Usually Not Appropriate	☢☢
Fluoroscopy upper GI series	Usually Not Appropriate	☢☢☢
MRI abdomen and pelvis without and with IV contrast	Usually Not Appropriate	O
MRI abdomen and pelvis without IV contrast	Usually Not Appropriate	O
MRI abdomen without IV contrast	Usually Not Appropriate	O
CT abdomen and pelvis without IV contrast	Usually Not Appropriate	☢☢☢
CT chest with IV contrast	Usually Not Appropriate	☢☢☢
CT chest without and with IV contrast	Usually Not Appropriate	☢☢☢
CT chest without IV contrast	Usually Not Appropriate	☢☢☢

Variant: 2   Adult. Gastric adenocarcinoma. Staging for locoregional or distant metastases.

Procedure	Appropriateness Category	Relative Radiation Level
CT abdomen and pelvis with IV contrast	Usually Appropriate	☢☢☢
FDG-PET/CT skull base to mid-thigh	Usually Appropriate	☢☢☢☢
MRI abdomen and pelvis without and with IV contrast	May Be Appropriate	O
MRI abdomen and pelvis without IV contrast	May Be Appropriate	O
CT chest with IV contrast	May Be Appropriate	☢☢☢
CT abdomen and pelvis without and with IV contrast	May Be Appropriate	☢☢☢☢
US abdomen	Usually Not Appropriate	O
US abdomen and pelvis	Usually Not Appropriate	O
US abdomen endoscopic	Usually Not Appropriate	O
Radiography abdomen	Usually Not Appropriate	☢☢
Fluoroscopy upper GI series	Usually Not Appropriate	☢☢☢
CT abdomen and pelvis without IV contrast	Usually Not Appropriate	☢☢☢
CT chest without and with IV contrast	Usually Not Appropriate	☢☢☢
CT chest without IV contrast	Usually Not Appropriate	☢☢☢

Variant: 3   Adult. Gastric adenocarcinoma. Posttreatment evaluation.

Procedure	Appropriateness Category	Relative Radiation Level
CT abdomen and pelvis with IV contrast	Usually Appropriate	☢☢☢

Procedure	Appropriateness Category	Relative Radiation Level
FDG-PET/CT skull base to mid-thigh	Usually Appropriate	☢☢☢☢
MRI abdomen and pelvis without and with IV contrast	May Be Appropriate	O
MRI abdomen without and with IV contrast	May Be Appropriate	O
US abdomen	Usually Not Appropriate	O
US abdomen and pelvis	Usually Not Appropriate	O
US abdomen endoscopic	Usually Not Appropriate	O
Radiography abdomen	Usually Not Appropriate	☢☢
Fluoroscopy upper GI series	Usually Not Appropriate	☢☢☢
MRI abdomen and pelvis without IV contrast	Usually Not Appropriate	O
MRI abdomen without IV contrast	Usually Not Appropriate	O
CT abdomen and pelvis without IV contrast	Usually Not Appropriate	☢☢☢
CT chest with IV contrast	Usually Not Appropriate	☢☢☢
CT chest without and with IV contrast	Usually Not Appropriate	☢☢☢
CT chest without IV contrast	Usually Not Appropriate	☢☢☢
CT abdomen and pelvis without and with IV contrast	Usually Not Appropriate	☢☢☢☢

Variant: 4   Adult. Surveillance of gastric adenocarcinoma.

Procedure	Appropriateness Category	Relative Radiation Level
CT abdomen and pelvis with IV contrast	Usually Appropriate	☢☢☢
FDG-PET/CT skull base to mid-thigh	May Be Appropriate	☢☢☢☢
US abdomen	Usually Not Appropriate	O
US abdomen and pelvis	Usually Not Appropriate	O
US abdomen endoscopic	Usually Not Appropriate	O
Radiography abdomen	Usually Not Appropriate	☢☢
Fluoroscopy upper GI series	Usually Not Appropriate	☢☢☢
MRI abdomen and pelvis without and with IV contrast	Usually Not Appropriate	O
MRI abdomen and pelvis without IV contrast	Usually Not Appropriate	O
MRI abdomen without and with IV contrast	Usually Not Appropriate	O
MRI abdomen without IV contrast	Usually Not Appropriate	O
CT abdomen and pelvis without IV contrast	Usually Not Appropriate	☢☢☢
CT chest with IV contrast	Usually Not Appropriate	☢☢☢
CT chest without and with IV contrast	Usually Not Appropriate	☢☢☢
CT chest without IV contrast	Usually Not Appropriate	☢☢☢
CT abdomen and pelvis without and with IV contrast	Usually Not Appropriate	☢☢☢☢

Panel Members

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Summary of Literature Review

Introduction/Background

Gastric cancer is the fifth most commonly diagnosed malignancy and is the third most common cause of death worldwide. Approximately 26,500 patients will be diagnosed in 2024, and approximately 11,130 patients will succumb to the disease [1]. Surgical resection is the only potentially curative approach for gastric cancer. Chemotherapy and radiation therapy can prolong survival.

Pathologically, there are 2 types, intestinal and diffuse. The tumor caused by Helicobacter pylori infection is known as intestinal gland-forming carcinoma and includes tubular, papillary, and mucinous subtypes. In contrast, diffuse gastric cancer has a familial predisposition of 10% to 15%, and 5% are inherited and have a poorer prognosis [2].
Early gastric cancers are typically surgically resectable and confined to the mucosa or submucosa. Lesions measuring less than 2 cm without ulceration are classified as early-stage, regardless of lymph node status. Based on size, early gastric cancers are described as small when ≤2 cm and minute when <5 mm. As tumor size increases, the lesions often exhibit greater histologic heterogeneity and a higher likelihood of poor differentiation.

The likelihood of prolonged disease-free survival decreases once the tumor cells infiltrate the submucosa, with 5-year survival rates between 20% and 30% [3]. Patients with node-positive disease are candidates for adjuvant therapy [3,4]. Surgery is the main treatment for stage I gastric cancer. For stages II and III gastric cancer, treatment is gastrectomy with or without neoadjuvant or postoperative chemotherapy and/or radiation therapy. Stage IV disease is not resectable. The most common sites of metastases are the liver, lungs, bones, adrenal glands, and the peritoneum.

The standard chemotherapy drugs can be given alone or in combination, including capecitabine, cisplatin, docetaxel, fluorouracil, leucovorin, and oxaliplatin. For stage IV gastric cancer that is HER2 negative, the treatment includes chemotherapy with or without immunotherapy. For HER2-positive tumors, trastuzumab may be included. Several trials have shown the potential benefit of neoadjuvant chemotherapy, with or without radiation therapy, resulting in downsizing the tumor, potentially increasing the likelihood of curative resection, and eliminating micrometastasis [3,4]. Imaging plays a key role in assessing response to treatment [4,5].

Special Imaging Considerations

Advanced imaging and machine learning enhance gastric cancer diagnostics, improving staging and treatment decisions; however, they are still in the exploratory phase. CT texture analysis predicts clinical T and N stages in gastric cancer with a 90.4% and 81.6% accuracy, respectively [6]. Perfusion CT, especially blood flow, can distinguish metastatic from inflammatory perigastric lymph nodes with an 85.3% sensitivity and 66.0% specificity [7]. Iodine concentration in dual-energy CT (DECT) may differentiate between cancerous and benign gastric tissues and various adenocarcinoma grades, aiding noninvasive diagnosis [8].

New techniques have been used to improve the diagnostic accuracy of CT. For example, dual-energy spectral CT imaging differentiates early from advanced gastric cancer by using the iodine concentration [9]. For example, in the venous phase, the mean iodine concentration for early gastric cancer was 19.36 ± 2.82 mg/mL versus 21.25 ± 4.91 mg/mL for advanced gastric cancer. Computer-aided diagnosis systems increased classification accuracy from 83.33% to 90.00% using

spectral features like low single-energy CT values, tumor size, iodine density, and effective-Z values [10]. Multiple instance learning for computer-aided diagnosis with DECT imaging has achieved 76.92% accuracy with an improved Citation-KNN (k-nearest neighbors) algorithm [11].

Initial Imaging Definition

Initial imaging is defined as imaging at the beginning of the care episode for the medical condition defined by the variant. More than one procedure can be considered usually appropriate in the initial imaging evaluation when:

- There are procedures that are equivalent alternatives (ie, only one procedure will be ordered to provide the clinical information to effectively manage the patient's care)

OR

- There are complementary procedures (ie, more than one procedure is ordered as a set or simultaneously wherein each procedure provides unique clinical information to effectively manage the patient's care).

Discussion of Procedures by Variant

Variant 1: Adult. Suspected gastric adenocarcinoma. Initial imaging.

In this clinical scenario, the patient has suspicion for gastric cancer, and the goal of imaging is to identify the location and size of the tumor. Imaging will help T stage the tumor and assess for locoregional disease for surgical treatment planning.

Variant 1: Adult. Suspected gastric adenocarcinoma. Initial imaging.
A. CT abdomen and pelvis with IV contrast

Recent studies have evaluated advanced imaging techniques for their effectiveness in diagnosing gastric tumors, offering promising noninvasive alternatives with significant benefits. CT using water as an oral contrast agent (Hydro-CT) demonstrated a 92.5% accuracy in tumor identification, comparable to endoscopy [12]. Three-dimensional CT gastrography using 6 g of effervescent crystals mixed in 5 to 10 mL of water as contrast before CT scanning in the left posterior oblique or right lateral decubitus position is more effective in detecting and localizing stomach tumors, particularly early gastric cancers [13]. Low-dose DECT with iodine mapping has a 90% sensitivity in detecting gastric cancer without compromising image quality [14].

The above studies highlight the potential of using water as an oral contrast material and low-dose DECT with iodine mapping as accurate, safer diagnostic tools for gastric tumors. They also highlight their importance in clinical settings in which endoscopy or biopsy may not be feasible.

Variant 1: Adult. Suspected gastric adenocarcinoma. Initial imaging.
B. CT abdomen and pelvis without and with IV contrast

There are no studies that directly compare CT of the abdomen and pelvis without and with intravenous (IV) contrast with CT abdomen and pelvis with IV contrast; thus, the usefulness or added value of including the without IV contrast scan for suspected gastric cancer is not known. This procedure may be useful in some clinical scenarios based on expert opinion.

Variant 1: Adult. Suspected gastric adenocarcinoma. Initial imaging.

C. CT abdomen and pelvis without IV contrast

There are no studies that directly compare CT of the abdomen and pelvis without IV contrast with CT of the abdomen and pelvis with IV contrast in suspected gastric cancer.

Variant 1: Adult. Suspected gastric adenocarcinoma. Initial imaging.
D. CT chest with IV contrast

There is no relevant literature to support the use of CT chest with IV contrast in suspected gastric cancer.

Variant 1: Adult. Suspected gastric adenocarcinoma. Initial imaging.
E. CT chest without and with IV contrast

There is no relevant literature to support the use of CT chest without and with IV contrast in suspected gastric cancer.

Variant 1: Adult. Suspected gastric adenocarcinoma. Initial imaging.
F. CT chest without IV contrast

There is no relevant literature to support the use of CT chest without IV contrast in suspected gastric cancer.

Variant 1: Adult. Suspected gastric adenocarcinoma. Initial imaging.
G. FDG-PET/CT skull base to mid-thigh

The effectiveness of fluorine-18-2-fluoro-2-deoxy-D-glucose (FDG)-PET/CT in diagnosing primary gastric cancer under fasting conditions and after stomach distension using milk and diatrizoate meglumine mixture has been explored [15]. In the fasting state, the sensitivity, specificity, positive predictive value, and negative predictive value were 92.9%, 75.0%, 94.5%, and 69.0%, respectively. After gastric distension, these values were 91.1%, 91.7%, 98.1%, and 68.8%, respectively. The lesion visibility improved significantly, with the maximum standardized uptake value (SUV_{max}) ratio increasing from 3.30 to 13.50, although this did not significantly enhance overall diagnostic accuracy.

Diffusion-weighted imaging (DWI)/T2 and PET/CT have similar sensitivity for detecting upper gastrointestinal (GI) cancers, with tumor size and invasion depth influencing the detectability [16]. Larger tumors showed higher positivity in imaging results. Dual time point imaging with PET/CT effectively differentiates malignant from benign gastric lesions, showing a high sensitivity (87%) and specificity (89.3%) and an area under the curve (AUC) of 0.923 [17]. When used alone, it has a relative sensitivity of only 37.9% and a positive predictive value of 33.6% for detecting gastric cancer, significantly lower than other combined diagnostic methods like endoscopy [18].

A systematic review by Wang et al [19] revealed that the novel agent Ga-68-FAPI-04 PET MRI/CT outperforms PET MRI/CT in detecting primary gastric tumors (100% versus 84.4%), lymph node metastases (81.9% versus 67.2%), and peritoneal metastases (100% versus 44.7%), suggesting its superior diagnostic and staging capabilities for gastric cancer.

Variant 1: Adult. Suspected gastric adenocarcinoma. Initial imaging.
H. Fluoroscopy upper GI series

There is no relevant literature to support the use of fluoroscopy upper GI series in suspected gastric cancer.

Variant 1: Adult. Suspected gastric adenocarcinoma. Initial imaging.

I. MRI abdomen and pelvis without and with IV contrast

There are no studies that directly compare MRI of the abdomen and pelvis without and with IV contrast with MRI abdomen; thus, the usefulness or added value of including the pelvis for suspected gastric cancer is not known.

Variant 1: Adult. Suspected gastric adenocarcinoma. Initial imaging.
J. MRI abdomen and pelvis without IV contrast

There is no relevant literature to support the use of an MRI of the abdomen and pelvis without IV contrast in suspected gastric cancer.

Variant 1: Adult. Suspected gastric adenocarcinoma. Initial imaging.
K. MRI abdomen without and with IV contrast

Limited evidence suggests that MRI abdomen, particularly with DWI, is more effective in detecting gastric cancer than 2-D multidetector CT (MDCT) or conventional MRI alone. In a study by Jang et al [20], researchers found that MRI, combining conventional and DWI techniques, had a higher diagnostic accuracy (77.8%-78.3%) and sensitivity (75.3%-75.9%) for gastric cancer than CT (67.7%-71.4% accuracy, 64.1%-68.2% sensitivity) or conventional MRI (72%-73% accuracy, 68.8%-70% sensitivity). This combined MRI approach was particularly more sensitive for pT2 and pT3 gastric cancers (91.6%-92.6%) than CT (76.8%-81.1%). A recent study showed that multiparametric MRI was better than DECT for the T staging of gastric cancer, with the overall accuracy ranging from 60.9% to 77.2%, which was higher than DECT. Additionally, gastric cancer lesions showed significantly different mean apparent diffusion coefficients (ADC) compared with normal gastric walls, supporting MRI with DWI's enhanced sensitivity for gastric cancer detection [21].

Variant 1: Adult. Suspected gastric adenocarcinoma. Initial imaging.
L. MRI abdomen without IV contrast

Limited evidence exists for using an MRI abdomen without IV contrast in suspected gastric cancer cases. Combining MRI-DWI signal intensity with serum levels of pepsinogen I, pepsinogen II, and carbohydrate antigen 199 can significantly improve early gastric cancer detection [22]. The study showed that DWI signal intensity correlates with gastric cancer differentiation, and changes in serum marker levels (pepsinogen I, pepsinogen II, carbohydrate antigen 199) were significant between patients and healthy controls. This combined diagnostic method achieved an AUC of 0.932, with a 91.67% sensitivity and 90.00% specificity, outperforming individual markers.

Variant 1: Adult. Suspected gastric adenocarcinoma. Initial imaging.
M. Radiography abdomen

There is no relevant literature to support the use of radiography of the abdomen in suspected gastric cancer

Variant 1: Adult. Suspected gastric adenocarcinoma. Initial imaging.
N. US abdomen

There is no relevant literature to support the use of the US abdomen in suspected gastric cancer.

Variant 1: Adult. Suspected gastric adenocarcinoma. Initial imaging.
O. US abdomen and pelvis

There is no relevant literature to support the use of the US abdomen and pelvis in suspected gastric cancer.

Variant 1: Adult. Suspected gastric adenocarcinoma. Initial imaging.
P. US abdomen endoscopic

Limited evidence exists for using an endoscopic US (EUS) in suspected gastric cancer cases. A study comparing EUS and CT for diagnosing gastric lesions in 160 patients found CT to have a higher detection rate of 90.63% compared with EUS's 78.13% [23]. Combining both methods further improved diagnostic accuracy.

Another study on oral contrast ultrasonography (OCUS) in 12,716 patients, including 5,021 elderly, showed that OCUS had a 94.73% diagnostic coincidence rate with gastroscopy for detecting gastric cancer, with sensitivity and specificity rates of 94.74% and 100%, respectively, and a positive and negative predictive value of 100% and 95% [24]. Endoscopy is the reference standard for the detection of cancer.

Variant 2: Adult. Gastric adenocarcinoma. Staging for distant metastases.

In this clinical scenario, the patient has known locally advanced gastric cancer, and imaging aims to assess distant nodal disease, solid organ metastases, and peritoneal disease.

Variant 2: Adult. Gastric adenocarcinoma. Staging for distant metastases.
A. CT abdomen and pelvis with IV contrast

Gastric adenocarcinoma staging studies have highlighted the accuracy and limitations of various imaging techniques, particularly Hydro-MDCT.

He et al [25] noted that CT is superior to double contrast-enhanced ultrasound (CEUS) (US using both an oral US contrast agent and an IV US contrast agent) for T3 and T4 stages, although both have limitations in early-stage cancer. CT has an accuracy of 86.3% for lymph node staging. Accuracy for staging N0, N1, N2, and N3 disease was 83.5%, 89.0%, 83.5%, and 89.0%, respectively [26]; however, slice thickness, tumor size [27], tumor volume [28], and serosal invasion impact accuracy [29]. Wu et al [30] found no significant difference in overall accuracy between OCUS and contrast-enhanced CT (CECT) for staging. However, the former was more accurate for early-stage tumors.

Girolamo et al [31] found that Hydro-CT has an accuracy of 75% for T staging, 69% for N staging, and 99% for detecting metastatic disease, making it reliable for T3 and T4 stages but less so for T1 and T2. Similarly, Fujikawa et al [32] noted the limited usefulness of CT for staging clinical T1 gastric cancer. They reported high detection rates and accuracy for primary tumors, depth of invasion, serosal involvement, and lymph node staging when using Hydro-CT. Li et al [33] reported that pelvic CT yielded negligible additional gastric cancer staging information.

CT has an 86.3% accuracy for N staging [26]. One study's lymph node short axis diameter lymph node-sum correlates with the pathological N stage and provides better diagnostic performance than the conventional MDCT [34]. Kawaguchi et al [35] found that the total diameter of enlarged lymph nodes ≥45 mm was associated with a worse prognosis. However, Wada et al [36] reported a high false-positive rate for nodal metastasis after endoscopic submucosal dissection, indicating the unreliability of CT for nodal diagnosis after this procedure.

CECT is commonly used to detect distant metastatic disease. A meta-analysis reported that CT has a sensitivity and specificity for hepatic metastases and peritoneal carcinomatosis of 74% and 99%, and 33% and 99%, respectively [37].

Identification of peritoneal carcinomatosis preoperatively can preclude unnecessary surgery [37].

Studies have suggested that gastric cancer sizes of 3 to 4 cm have a higher chance of developing peritoneal carcinomatosis [37]. CT has a sensitivity and specificity of 40% and 97% for the detection of ascites [38]. The presence of ascites, peritoneal nodules, smudge-like ground-glass opacities, fat stranding, and peritoneal enhancement suggests peritoneal carcinomatosis [39,40]. For the detection of <5 mm peritoneal nodules, CECT has a low sensitivity of 43% versus 89% for >5 mm. Therefore, the presence of free fluid in the abdomen or pelvis should alert for the possible presence of peritoneal carcinomatosis [38]. However, staging laparoscopy is more effective than CT in detecting peritoneal metastases in esophagogastric cancer, with staging laparoscopy showing a sensitivity of 94.1% and specificity of 100%, compared with MDCT's sensitivity of 58.8% and specificity of 89.6% [41].

Variant 2: Adult. Gastric adenocarcinoma. Staging for distant metastases.
B. CT abdomen and pelvis without and with IV contrast

A retrospective study on 50 patients with gastric cancer to assess the efficacy of 64-slice MDCT prior to as well as following IV contrast administration in detecting peritoneal metastasis [39] had an accuracy of 80% for detecting ascites, 80% for detecting increased peritoneal fat density, 68% for detecting peritoneal thickening/enhancement, and 84% for detecting peritoneal nodules, concluding that CT is a valuable noninvasive tool for diagnosing and staging gastric cancer with peritoneal carcinomatosis [39]. It remains unknown if there is any added utility in including a noncontrast scan phase, although it is unlikely of added benefit.

Variant 2: Adult. Gastric adenocarcinoma. Staging for distant metastases.
C. CT abdomen and pelvis without IV contrast

There are no studies comparing noncontrast CT with CECT for gastric cancer. Tian et al [42] evaluated the efficacy of virtual noncontrast imaging from spectral CT compared with conventional noncontrast CT. The study found that virtual noncontrast imaging may serve as a viable alternative, particularly in the arterial phase, with higher contrast-to-noise ratio values for carcinoma-water (2.72 for virtual noncontrast arterial, 2.60 for virtual noncontrast venous, and 2.61 for virtual noncontrast equilibrium phases) compared with normal CT images [42].

Variant 2: Adult. Gastric adenocarcinoma. Staging for distant metastases.
D. CT chest with IV contrast

Chong et al [43] evaluated the need for thoracic CT in staging gastric cancer in a study of 808 cases. The study found that only 0.42% of patients had isolated lung metastasis, suggesting the limited value of routine thoracic CT in gastric cancer staging due to the rarity of isolated lung metastases and concurrent intraabdominal metastases in most cases. Nevertheless, based on expert opinion, CT of the chest can be performed in the setting of advanced gastric cancer when lung metastasis is suspected.

Variant 2: Adult. Gastric adenocarcinoma. Staging for distant metastases.
E. CT chest without and with IV contrast

Isolated metastases to the lungs are rare. Only 0.42% to 1.6% of patients have pulmonary metastases at presentation, none isolated to the lung [44]. Liver metastases and abdominal lymphadenopathy are associated with an increased risk of pulmonary metastases [45]. Thus, routine chest CT is not useful for gastric cancer staging due to the low incidence of isolated pulmonary metastases.

Variant 2: Adult. Gastric adenocarcinoma. Staging for distant metastases.
F. CT chest without IV contrast

There is no relevant literature to support the use of the noncontrast CT of the chest to evaluate lung metastases in gastric cancer. See above.

Variant 2: Adult. Gastric adenocarcinoma. Staging for distant metastases.
G. FDG-PET/CT skull base to mid-thigh

Gastric adenocarcinoma is FDG-avid. However, the depth of tumor invasion cannot be determined due to PET's low spatial resolution [46,47]. PET/CT is useful for initial overall staging and has a sensitivity of 76.4% and a specificity of 86.7% [48]. The sensitivity of PET/CT is 96.5% for tumors >3 cm versus 33.3% for those <3 cm [49]. Park et al [50] found that PET/CT was more sensitive than CECT for primary tumor detection, with a sensitivity of 67% compared with 55% for CECT, but less so for lymph node metastasis, suggesting limited use in early gastric cancer.

Lymph node metastases are an important prognostic indicator in gastric carcinoma. Accurate staging is imperative and has implications for surgical planning. However, PET/CT is not sensitive to preoperative lymph node staging, specifically in early gastric cancer [26,50]. Some studies have reported that PET/CT is less sensitive but more specific in assessing the lymph nodes than CECT. The low sensitivity may be related to the lymph nodes' size and the cancer's histopathology [49]. The reasons for the low sensitivity of PET/CT are the histological type of the primary tumor and the size of metastatic lymph nodes <3 mm. Despite the low sensitivity, PET/CT usually shows a higher specificity than most other imaging modalities, including CECT, because PET/CT diagnoses lymph node metastases using glucose metabolism rather than size. Another limitation may be that the FDG activity for the primary tumor may obscure the adjacent lymph nodes [51,52]. PET/CT can be used as a prognostic indicator for recurrent disease, and studies have shown that patients with PET-positive lymph nodes have a higher chance of recurrence [53,54].

Song et al [55] demonstrated that high nodal SUV_{max} on PET/CT predicts poorer survival, advocating for its inclusion in prognostic assessment. The sensitivity and specificity of PET/CT for lymph node involvement are reported to be 86% and 97% in one meta-analysis [49]. Heterogenous uptake in advanced gastric cancer and SUV_{max} are predictive of lymph node metastases [56,57].

PET/CT has a sensitivity of 95.2% and a specificity of 100% in detecting solid organ metastases [49]. In one study, the specificity of CECT versus PET/CT was 88.57% versus 62.86% for distant metastatic disease [49]. Bosch et al [58] highlighted its usefulness in patients with advanced disease and demonstrated the ability to upstage disease in 19% of patients. Thus, PET/CT helps detect unsuspected metastases and helps in risk stratification [54], greatly impacting management [57-59].

PET/CT has a lower sensitivity for diagnosing peritoneal metastases than CECT, which may be due to a lack of oral and IV contrast on the CT scan of the PET and the size of the peritoneal nodules. However, PET/CT can be used for indeterminate peritoneal nodules seen on CECT, which may preclude unnecessary laparotomy. The reported specificity of PET/CT for detecting peritoneal disease compared with CECT is 80% versus 60% [49]. Although imaging may be useful in detecting peritoneal disease lesions <5 mm, it may not be FDG-avid; staging laparoscopy is better in assessing peritoneal nodules, specifically in patients with locally advanced gastric cancer [59].

PET/CT is superior to whole body bone scans in detecting bone metastasis and has a sensitivity of 93.5% and a specificity of 25.0% [60]. Depending on the type of bone metastases, sclerotic versus

lytic, the metastasis may or may not be FDG-avid. Activity can predict disease-specific survival more accurately than TNM staging [55]. High SUV_{max} in bone metastases is associated with poorer survival in certain histologies [61,62].

Variant 2: Adult. Gastric adenocarcinoma. Staging for distant metastases.
H. Fluoroscopy upper GI series

There is no relevant literature to support the use of fluoroscopy upper GI series in staging gastric cancer.

Variant 2: Adult. Gastric adenocarcinoma. Staging for distant metastases.
I. MRI abdomen and pelvis without and with IV contrast

An MRI examination is time-consuming, which might affect the image quality and diagnostic accuracy, and has lower spatial resolution than CT or US [26]. Some studies have suggested that MRI can visualize the 3 layers of the gastric wall, and the tumor's thickness can be useful for early T staging. In one study, the accuracy of T staging on MRI was only 50%; others have reported a higher sensitivity ranging from 68% to 78% and a specificity of 89% to 95% [63]. Studies have suggested that rapid enhancement of gastric cancer compared with normal mucosa after administration of gadolinium chelates aids in diagnosis [64].

Dynamic contrast-enhanced MRI can be beneficial in assessing cancer in uncooperative patients [65]. Recent studies have explored various MRI techniques for diagnosing and staging gastric cancer, highlighting the potential of DWI and texture analysis in improving diagnostic accuracy [66]. DWI-MRI has been used to T stage gastric cancer and has shown a diagnostic accuracy of 80% to 93% [67]. The ADC values are significantly higher in the intestinal-type tumors versus the diffuse-type [68]. DWI in T staging can be a prognostic indicator because lower ADC values ($\leq 1.5 \times 10{-3}$ mm2/sec) are associated with poorer survival outcomes [69,70]. A recent study showed that multiparametric MRI was better than DECT for the T staging of gastric cancer, with the overall accuracy ranging from 60.9% to 77.2%, which was higher than DECT [21].

Kim et al [71] reported a 47% accuracy in detecting lymph node metastases using size and signal intensity on T1- and T2-weighted images. Lymph nodes ≥ 8 mm in the short axis were considered positive for metastases [71]. Adding DWI increases the sensitivity (86.7% and 58.8%, respectively) but lowers the specificity compared with MRI without DWI (50.0% and 94.1%) [72]. Metastatic nodes have been shown to have a lower ADC value (1.70 ± 0.40 mm2/s) compared with nonmetastatic lymph nodes (2.10 ± 0.22) [67]. ADC values of primary gastric cancer have been used to predict lymph node metastasis [67,73,74]. MRI with DWI had a diagnostic accuracy of 76.6% for N staging, superior to MDCT (63.8%) [72].

MRI is widely used for detecting and characterizing liver lesions in the setting of gastric cancer and diagnosing liver metastases [47]. Contrast-enhanced MRI and DWI-MRI can differentiate liver metastases from benign liver lesions. MRI is superior to PET/CT for detecting liver metastases ≤ 10 mm [75].

There is limited evidence on the performance of MRI in assessing peritoneal disease. Laparoscopic assessment is more useful in identifying microscopic peritoneal disease because small <5 mm nodules may not be visible on MRI. Peritoneal carcinomatosis can appear as enhancing nodules on the postcontrast images. DWI is now widely accepted for abdominal MRI, and adding DWI with high b-values to delayed gadolinium-enhanced imaging can improve the detection rate of

peritoneal carcinomatosis [76].

Variant 2: Adult. Gastric adenocarcinoma. Staging for distant metastases.
J. MRI abdomen and pelvis without IV contrast

DWI-MRI is superior to T2-weighted MRI for preoperative staging of gastric cancer in 45 patients, particularly in detecting early and advanced stages, with a higher accuracy in staging advanced cancers at 87.9% compared with 69.7% with T2-weighted imaging [77]. The ADC values are significantly lower than those of normal gastric wall, which helps with diagnosis. Lower ADC values from DWI correlate with poorer differentiation and advanced histological types of gastric cancer, suggesting that ADC can be used as a noninvasive biomarker to assess the aggressiveness of cancer [78].

Novel methods such as intravoxel incoherent motion DWI can effectively predict lymphovascular invasion in gastric cancer by analyzing intravoxel incoherent motion parameters (ADC, D, D*, and f). Lower ADC and D values and higher f values indicate the lymphovascular invasion presence [79].

Variant 2: Adult. Gastric adenocarcinoma. Staging for distant metastases.
K. Radiography abdomen

There is no relevant literature to support the use of radiography in the staging of gastric cancer.

Variant 2: Adult. Gastric adenocarcinoma. Staging for distant metastases.
L. US abdomen

In a highly selected series of studies from Asia evaluating diagnostic tools for gastric cancer, transabdominal US proved effective, particularly for advanced stages, with a pooled accuracy of 79.7% and a sensitivity of 98.6% for advanced gastric cancer, compared with a 38.7% accuracy and a 61.2% sensitivity for early stages [80]. Transabdominal US also matched CECT with an accuracy of 86% versus 83% and slightly surpassed EUS with a 77.2% accuracy compared with 74.7%. Transabdominal OCUS is comparable to CT for preoperative tumor staging in advanced cases, with accuracies of 88%, 86%, and 98% for stages T2 to T4, respectively, versus 93%, 83%, and 90% for CT [81]. A study by Urakawa et al [82] showed that combining transabdominal US with endoscopy and CT improved the overall accuracy from 47.8% to 60.7% in preoperative tumor depth diagnosis, with accuracy varying by tumor region from 31.8% in the middle region to 53.7% in the lower region. A combined diagnostic approach using CT, MRI, and CEUS may significantly enhance the diagnostic metrics, with sensitivity rates ranging from 88.00% to 97.22%, specificity rates ranging from 95.89% to 100%, and diagnostic coincidence rates ranging from 96.33% to 98.17% across different T stages [63]. However, most of these studies were performed in Asia and have not been replicated in the United States. Because this procedure remains very patient dependent, the expert panel questioned its appropriateness for cancer staging. It could be used in some situations as an alternative to CT.

Variant 2: Adult. Gastric adenocarcinoma. Staging for distant metastases.
M. US abdomen and pelvis

There is no relevant literature to support the use of US abdomen and pelvis in the staging of gastric cancer.

Variant 2: Adult. Gastric adenocarcinoma. Staging for distant metastases.
N. US abdomen endoscopic

The studies by Yu et al [83], Mehmedović et al [84], and Han et al [85] used various imaging techniques to explore aspects of preoperative T staging in gastric cancer. Yu et al [83] found that

combining enhanced CT and US increased the accuracy to 85%, better than using either technique alone. Mehmedović et al [84] demonstrated that EUS was more effective for locoregional staging. The reported accuracy of EUS in identifying lymph node metastasis was 85.3%, with a sensitivity of 29.2% and positive predictive value of 38.7% [86]. EUS achieves a 74.7% accuracy in T staging; however, CT remains better at detecting distant metastases. Key factors associated with EUS staging inaccuracy include tumor location, the type of echoendoscope used, and histological type [85].

Variant 3: Adult. Gastric adenocarcinoma. Posttreatment evaluation.

In this clinical scenario, the patient has locally advanced disease with metastasis. The patient has been treated with radiation or chemotherapy. Imaging in this context aims to assess response to treatment.

Even though neoadjuvant therapy is advocated, about 22% to 51% of patients may have adverse effects, and about 16% may have progression. Imaging may help identify disease progression and avoid unnecessary surgery [87].

Variant 3: Adult. Gastric adenocarcinoma. Posttreatment evaluation.
A. CT abdomen and pelvis with IV contrast

CT is one of the main modalities to assess response to postchemotherapy treatment. CT uses tumor size to assess response to therapy, and postcontrast images are usually recommended to assess the primary tumor and metastatic disease [38]. Recent studies have explored the efficacy of various imaging techniques in assessing treatment outcomes and staging of gastric adenocarcinoma. Lee et al [88] demonstrated that perfusion CT parameters, particularly the permeability surface value, can predict chemotherapy response and survival in patients with unresectable advanced gastric cancer. However, the usefulness of CECT following neoadjuvant chemotherapy is limited. In one study, CT overstaged 38% and understaged 38% of the tumors after neoadjuvant chemotherapy. The researchers found similar patterns of discordance for the T and N stages. For the M-stage, restaging CT found carcinomatosis in only 12 patients, and an additional 14 patients with peritoneal disease were found during surgery [4]. Restaging CT after neoadjuvant therapy may be equivocal in identifying distant metastases, which usually precludes surgery. In one study, 3% of distant interval metastases were not identified, and patients underwent unnecessary surgery [87]. Although CT may not be able to identify distant metastases, CT may identify disease progression and help change chemotherapy or surgery [87].

Blank et al [5] evaluated the prognostic value of clinical response in esophagogastric adenocarcinomas using endoscopy and CT scans. Their findings indicated that preoperative clinical response is a significant prognostic indicator, with substantial differences in median survival times between responders (108 months) and nonresponders (27 months). Using CT for staging post–neoadjuvant chemotherapy in locally advanced gastric cancer revealed a low accuracy for both T staging (42.7%) and N staging (44%), suggesting that CT restaging should not be solely relied upon for clinical decision making due to its poor correlation with pathologically staged cancer [89]. The effectiveness of restaging CT scans following neoadjuvant chemotherapy for resectable gastric cancer was explored, and the concordance between radiologic and pathologic staging was limited because there were significant discrepancies in tumor assessment, highlighting the challenges of using CT for accurate restaging postchemotherapy. Specifically, the study reported a 43% response rate to neoadjuvant chemotherapy with CT scans but only 24% concordance between radiology and pathology, suggesting that restaging CT may not be able to

stratify patients into long-term survivors based on imaging response and cannot be used as a biomarker [4].

Variant 3: Adult. Gastric adenocarcinoma. Posttreatment evaluation.
B. CT abdomen and pelvis without and with IV contrast

There is no relevant literature to support the use of CT abdomen and pelvis without and with IV contrast in the posttreatment follow-up imaging of gastric cancer.

Variant 3: Adult. Gastric adenocarcinoma. Posttreatment evaluation.
C. CT abdomen and pelvis without IV contrast

There is no relevant literature to support the use of CT abdomen and pelvis without IV contrast in the posttreatment follow-up imaging of gastric cancer.

Variant 3: Adult. Gastric adenocarcinoma. Posttreatment evaluation.
D. CT chest with IV contrast

There is no relevant literature to support the use of CT chest with IV contrast in the posttreatment follow-up imaging of gastric cancer.

Variant 3: Adult. Gastric adenocarcinoma. Posttreatment evaluation.
E. CT chest without and with IV contrast

There is no relevant literature to support the use of CT chest without and with IV contrast in the posttreatment follow-up imaging of gastric cancer.

Variant 3: Adult. Gastric adenocarcinoma. Posttreatment evaluation.
F. CT chest without IV contrast

There is no relevant literature to support the use of CT chest without IV contrast in the posttreatment follow-up imaging of gastric cancer.

Variant 3: Adult. Gastric adenocarcinoma. Posttreatment evaluation.
G. FDG-PET/CT skull base to mid-thigh

Response to treatment on PET/CT is based on the SUV_{max} increase or decrease posttreatment. The tumors may not respond as early as 2 weeks [29-31] posttreatment, but the response may be more evident after 4 to 6 weeks [90].

PET/CT has been shown to predict treatment response and influence management plans in 52.9% of cases, with a sensitivity of 95.8% and specificity of 100% [53,91]. A systematic review and meta-analysis showed that FDG-PET had a sensitivity of 78% and a specificity of 82% in detecting recurrent gastric cancer, with slight improvements when combined with CT [92]. Another systematic review and meta-analysis reported that FDG-PET/CT has a pooled sensitivity of 85% and a specificity of 78% for detecting recurrent gastric cancer [93]. A clinical study revealed that high SUV on FDG-PET was associated with longer overall survival in patients with localized gastric adenocarcinoma treated with preoperative chemoradiation. Pretreatment SUV values have been associated with a pathological response after neoadjuvant chemotherapy and better progression-free survival [53,54].

A novel feasibility study using FDG-PET/MRI for predicting chemotherapy response in patients with unresectable advanced gastric cancers found that the perfusion parameters Ktrans and the initial AUC may serve as early predictive markers for chemotherapy efficacy [94].

Variant 3: Adult. Gastric adenocarcinoma. Posttreatment evaluation.

H. Fluoroscopy upper GI series

There is no relevant literature to support the use of fluoroscopy upper GI series in the posttreatment follow-up imaging of gastric cancer.

Variant 3: Adult. Gastric adenocarcinoma. Posttreatment evaluation.
I. MRI abdomen and pelvis without and with IV contrast

Although there is no relevant literature to support the use of MRI of the abdomen and pelvis without and with IV contrast in the posttreatment follow-up of gastric cancer, the expert consensus is that it may be appropriate. DWI has been used as a biomarker for response in many cancers. MRI with DWI can detect early changes in the tumor [68]. ADC values are associated with several tumor features that correlate with the cellularity of the tumor, which causes restriction of water molecule diffusivity in tissues. Gastric cancers with a lower ADC value are more likely to respond than those with a higher ADC value [68]. Giganti et al [95] found significant inverse correlations between posttreatment changes in ADC on DWI-MRI and tumor regression grade. ADC better-differentiates nonresponders than FDG-PET/CT. Imaging of the pelvis may help identify metastatic disease in the pelvis and assess response and is specifically valuable as an alternative to CT.

Variant 3: Adult. Gastric adenocarcinoma. Posttreatment evaluation.
J. MRI abdomen and pelvis without IV contrast

There is no relevant literature to support the use of MRI of the abdomen and pelvis without IV contrast in the posttreatment follow-up imaging of gastric cancer.

Variant 3: Adult. Gastric adenocarcinoma. Posttreatment evaluation.
K. MRI abdomen without and with IV contrast

There is no relevant literature to support the use of MRI of the abdomen without and with IV contrast in the posttreatment follow-up imaging of gastric cancer; however, the expert consensus is that it may be appropriate.

Variant 3: Adult. Gastric adenocarcinoma. Posttreatment evaluation.
L. MRI abdomen without IV contrast

The increase in ADC values post–radiation treatment is a biomarker of response, and these changes occur before any changes are seen in the carcinoembryonic antigen and can be used to assess radiation therapy [96]. Similarly, lymph node metastases have increased ADC values posttreatment, suggesting a response [68]. Like SUV, ADC values have been used to predict survival outcomes in patients with various cancer responses [95]. In one study, an ADC value of 1.36×10^{-3} mm^2/s or lower was associated with poor survival [68]. However, expert consensus favors the use of MRI without and with IV contrast over MRI without IV contrast alone.

Variant 3: Adult. Gastric adenocarcinoma. Posttreatment evaluation.
M. Radiography abdomen

There is no relevant literature to support the use of radiography of the abdomen in the posttreatment follow-up imaging of gastric cancer.

Variant 3: Adult. Gastric adenocarcinoma. Posttreatment evaluation.
N. US abdomen

There is no relevant literature to support the use of US abdomen in the posttreatment follow-up imaging of gastric cancer.

Variant 3: Adult. Gastric adenocarcinoma. Posttreatment evaluation.
O. US abdomen and pelvis

There is no relevant literature to support the use of US abdomen and pelvis in the posttreatment follow-up imaging of gastric cancer.

Variant 3: Adult. Gastric adenocarcinoma. Posttreatment evaluation.
P. US abdomen endoscopic

There is no relevant literature to support the use of EUS in the posttreatment follow-up imaging of gastric cancer.

Variant 4: Adult. Surveillance of gastric adenocarcinoma.

In this clinical scenario, the patient undergone surgical resection of gastric cancer, and imaging is done for evaluation of recurrence.

The tumor recurs in high-risk patients in about 11.4% of patients who have pathological lymph node metastases and lymphovascular invasion despite surgery with curative intent [97]. Distant recurrence is more common than locoregional recurrence and most commonly occurs in the liver and the peritoneum. Local recurrence can occur at the anastomosis [97].

Variant 4: Adult. Surveillance of gastric adenocarcinoma.
A. CT abdomen and pelvis with IV contrast

CECT is commonly used for postsurgical surveillance of gastric cancer. However, it has a poor sensitivity for detecting local gastric recurrence because it may not be able to detect small mucosal lesions due to poor soft tissue resolution. Several studies collectively explored the role of CT in managing and surveilling gastric cancer. Some of the specific preoperative CT findings, such as spiculated and nodular extramural tumor infiltration and a CT size of 5 to 10 cm, are predictors of recurrence and worse disease-free survival in advanced gastric cancer, suggesting its use for prognostic stratification [98,99]. Similarly, CT is not needed after endoscopic submucosal dissection for early gastric cancer; in one prospective study, only 2 of 81 recurrent lesions over a median follow-up of 19.7 months were detected on CT [100]. The 10-year extragastric recurrence-free survival in a low-risk group is 99.7% [97]. Thus, intensive surveillance after 2 years is unnecessary. For low-risk patients, the reported cumulative incidence of extragastric recurrence is 0.5% over 5 years. This advocates for using endoscopy with biopsy and reconsidering routine CT scans to reduce unnecessary radiation and costs [101].

Seo et al [97] devised a risk-scoring system to predict extragastric recurrence following surgical resection of early gastric cancer, using data from 3,162 patients, in which the overall incidence of extragastric recurrence was 1.4%. This risk-scoring system, validated internally and externally, effectively categorized patients into low- and high-risk groups. The findings suggest that postsurgical CT surveillance might be unnecessary for the low-risk group due to the rare occurrence of extragastric recurrence, potentially reducing unnecessary medical interventions and associated costs.

CT has a sensitivity of 15% for local recurrence and 91% for distant recurrence. About 56.4% of patients with high-risk factors will develop extragastric recurrence in the first 2 years after surgery [97].

The incidence of extragastric recurrence (2.2%) is low in stage I gastric cancer, suggesting a limited role for postoperative CT surveillance in low-risk patients [102]. CT has a higher sensitivity for peritoneal carcinomatosis (96% versus 50%, P = .001) detection than PET/CT due to better contrast

resolution [103].

Variant 4: Adult. Surveillance of gastric adenocarcinoma.
B. CT abdomen and pelvis without and with IV contrast

There is no relevant literature to support the use of CT abdomen and pelvis without and with IV contrast in the surveillance of gastric cancer.

Variant 4: Adult. Surveillance of gastric adenocarcinoma.
C. CT abdomen and pelvis without IV contrast

There is no relevant literature to support the use of CT abdomen and pelvis without IV contrast in the surveillance of gastric cancer.

Variant 4: Adult. Surveillance of gastric adenocarcinoma.
D. CT chest with IV contrast

There is no relevant literature to support the use of CT chest with IV contrast in the surveillance of gastric cancer.

Variant 4: Adult. Surveillance of gastric adenocarcinoma.
E. CT chest without and with IV contrast

There is no relevant literature to support the use of CT chest without and with IV contrast in the surveillance of gastric cancer.

Variant 4: Adult. Surveillance of gastric adenocarcinoma.
F. CT chest without IV contrast

There is no relevant literature to support the use of CT chest without IV contrast in the surveillance of gastric cancer.

Variant 4: Adult. Surveillance of gastric adenocarcinoma.
G. FDG-PET/CT skull base to mid-thigh

Recent studies have explored the usefulness of FDG-PET/CT in gastric cancer, focusing on its effectiveness in detecting recurrence, guiding treatment decisions, and assessing prognostic outcomes. PET/CT has an overall sensitivity of 42.9% to 100% and a specificity of 59.7% to 88.1% for detecting recurrence [104,105].

Due to physiologic activity in the stomach, the detection of recurrence after surgery in the gastric remnant is limited. PET/CT has a moderate sensitivity and specificity for detecting gastric cancer recurrence due to false-positive uptake at the anastomosis after surgery [106]. Low-grade reuptake is usually noted in the stomach, and gastritis can cause higher uptake. Distention of the stomach with negative oral contrast may help better localize the recurrence.

A meta-analysis confirmed the moderate accuracy of PET/CT in detecting gastric cancer recurrence in the remnant postsurgery, with a sensitivity of 86% and specificity of 88%. Similarly, PET/CT, compared with CT alone, has shown much greater sensitivity for mediastinal lymph node recurrences [107,108].

PET/CT has a specificity of 47.8% for locoregional disease, 87.5% for peritoneal disease, and 94.4% for liver metastases [108]. Although PET/CT and abdominal CECT are comparable in detecting recurrence, CT has a higher rate of detecting peritoneal carcinomatosis [109].

Metabolic tumor burden can be used as a prognostic indicator for recurrence and survival postsurgery [110]. PET/CT can be used as a prognostic marker; patients with a positive PET have a shorter survival rate than those with a negative PET at 18.5 months versus 6.9 months [107].

Bone metastases in gastric cancer are rare and seen in up to 3.8% of patients [111]. FDG uptake in bone metastases is an independent prognostic factor for survival [112].

Variant 4: Adult. Surveillance of gastric adenocarcinoma.
H. Fluoroscopy upper GI series

There is no relevant literature to support the use of fluoroscopy upper GI series in the surveillance of gastric cancer.

Variant 4: Adult. Surveillance of gastric adenocarcinoma.
I. MRI abdomen and pelvis without and with IV contrast

There is no relevant literature to support the use of MRI of the abdomen and pelvis without and with IV contrast in the surveillance of gastric cancer.

Variant 4: Adult. Surveillance of gastric adenocarcinoma.
J. MRI abdomen and pelvis without IV contrast

There is no relevant literature to support the use of MRI of the abdomen and pelvis without IV contrast in the surveillance of gastric cancer.

Variant 4: Adult. Surveillance of gastric adenocarcinoma.
K. MRI abdomen without and with IV contrast

There is no relevant literature to support the use of MRI abdomen without and with IV contrast in the surveillance of gastric cancer.

Variant 4: Adult. Surveillance of gastric adenocarcinoma.
L. MRI abdomen without IV contrast

There is no relevant literature to support the use of MRI abdomen without IV contrast in gastric cancer surveillance.

Variant 4: Adult. Surveillance of gastric adenocarcinoma.
M. Radiography abdomen

There is no relevant literature to support the use of radiography of the abdomen in the surveillance of gastric cancer.

Variant 4: Adult. Surveillance of gastric adenocarcinoma.
N. US abdomen

There is no relevant literature to support the use of US abdomen in the surveillance of gastric cancer.

Variant 4: Adult. Surveillance of gastric adenocarcinoma.
O. US abdomen and pelvis

There is no relevant literature to support the use of US abdomen and pelvis in the surveillance of gastric cancer.

Variant 4: Adult. Surveillance of gastric adenocarcinoma.
P. US abdomen endoscopic

There is no relevant literature to support the use of EUS in the surveillance of gastric cancer.

Summary of Highlights

This is a summary of the key recommendations from the variant tables. Refer to the complete narrative document for more information.

- **Variant 1:** For suspected gastric adenocarcinoma, CT abdomen and pelvis with IV contrast and FDG-PET/CT skull base to mid-thigh are complementary and usually appropriate for initial staging, providing high-resolution anatomic detail and whole-body metabolic assessment, respectively. CT demonstrates tumor location, wall invasion, regional lymphadenopathy, and intraabdominal metastases, whereas PET/CT detects occult nodal and distant lesions. EUS may be appropriate for precise T staging of early lesions, and MRI with IV contrast and DWI can be considered as an alternative to CT, offering superior soft tissue characterization and peritoneal implant detection. Plain radiography, fluoroscopy, noncontrast CT, and transabdominal US are usually not recommended due to limited diagnostic value.

- **Variant 2:** For staging known gastric adenocarcinoma, CT of the abdomen and pelvis with IV contrast remains the pivotal imaging modality because it detects tumor spread within the stomach, identifies regional lymph node enlargement, evaluates hepatic metastasis, and detects peritoneal involvement. FDG-PET/CT from skull base to mid-thigh provides complementary whole body metabolic information, detecting nodal and bone metastases that may not be detected on anatomic imaging and can offer prognostic insights based on tumor uptake. MRI of the abdomen and pelvis can be a useful alternative to CT or when more detailed soft tissue characterization is desired; diffusion-weighted sequences enhance the detection of subtle peritoneal disease and better evaluate small hepatic lesions. Chest CT with IV contrast may be considered if thoracic involvement is suspected. Other modalities lack sufficient sensitivity or specificity for comprehensive staging and are therefore not recommended.

- **Variant 3:** For posttreatment evaluation following chemotherapy or radiation, CT abdomen and pelvis with IV contrast and FDG-PET/CT are both usually appropriate as complementary procedures for assessing treatment response and detecting disease spread. DWI-MRI may be appropriate when additional treatment response biomarkers are needed, as ADC changes correlate with tumor response. For postsurgical surveillance, CT abdomen and pelvis with IV contrast is usually appropriate, particularly for high-risk patients, as recurrence can occur predominantly at distant sites. FDG-PET/CT may be appropriate when suspicious findings warrant further evaluation or for detecting distant recurrences. For low-risk early-stage patients, routine imaging surveillance may be unnecessary given extremely low recurrence rates, with endoscopy and clinical follow-up being sufficient.

- **Variant 4:** For surveillance following curative surgical resection of gastric adenocarcinoma, CT abdomen and pelvis with IV contrast is usually appropriate as the primary imaging modality. CT effectively detects distant recurrences, particularly in the liver and peritoneum, where gastric cancer most commonly metastasizes. FDG-PET/CT may be appropriate in select scenarios, particularly when CT findings are equivocal or when there is clinical suspicion of recurrence not well-visualized on anatomic imaging. Surveillance intensity should be risk-stratified based on tumor characteristics and patient factors. High-risk patients with lymph

node metastases or lymphovascular invasion benefit most from regular CT surveillance, especially within the first 2 years when recurrence risk is highest. Conversely, low-risk early-stage patients have extremely low recurrence rates, making routine CT surveillance potentially unnecessary and favoring endoscopic follow-up with selective imaging based on clinical findings.

Supporting Documents

The evidence table, literature search, and appendix for this topic are available at https://acsearch.acr.org/list. The appendix includes the strength of evidence assessment and the final rating round tabulations for each recommendation.

For additional information on the Appropriateness Criteria methodology and other supporting documents, please go to the ACR website at https://www.acr.org/Clinical-Resources/Clinical-Tools-and-Reference/Appropriateness-Criteria.

Gender Equality and Inclusivity Clause

The ACR acknowledges the limitations in applying inclusive language when citing research studies that predates the use of the current understanding of language inclusive of diversity in sex, intersex, gender, and gender-diverse people. The data variables regarding sex and gender used in the cited literature will not be changed. However, this guideline will use the terminology and definitions as proposed by the National Institutes of Health.

Appropriateness Category Names and Definitions

Appropriateness Category Name	Appropriateness Rating	Appropriateness Category Definition
Usually Appropriate	7, 8, or 9	The imaging procedure or treatment is indicated in the specified clinical scenarios at a favorable risk-benefit ratio for patients.
May Be Appropriate	4, 5, or 6	The imaging procedure or treatment may be indicated in the specified clinical scenarios as an alternative to imaging procedures or treatments with a more favorable risk-benefit ratio, or the risk-benefit ratio for patients is equivocal.
May Be Appropriate (Disagreement)	5	The individual ratings are too dispersed from the panel median. The different label provides transparency regarding the panel's recommendation. "May be appropriate" is the rating category and a rating of 5 is assigned.
Usually Not Appropriate	1, 2, or 3	The imaging procedure or treatment is unlikely to be indicated in the specified clinical scenarios, or the risk-benefit ratio for patients is likely to be unfavorable.

Relative Radiation Level Information

Potential adverse health effects associated with radiation exposure are an important factor to consider when selecting the appropriate imaging procedure. Because there is a wide range of radiation exposures associated with different diagnostic procedures, a relative radiation level (RRL) indication has been included for each imaging examination. The RRLs are based on effective dose, which is a radiation dose quantity that is used to estimate population total radiation risk associated with an imaging procedure. Patients in the pediatric age group are at inherently higher risk from exposure, because of both organ sensitivity and longer life expectancy (relevant to the long latency that appears to accompany radiation exposure). For these reasons, the RRL dose estimate ranges for pediatric examinations are lower as compared with those specified for adults (see Table below). Additional information regarding radiation dose assessment for imaging examinations can be found in the ACR Appropriateness Criteria[®] [Radiation Dose Assessment Introduction](#) document.

Relative Radiation Level Designations

Relative Radiation Level*	Adult Effective Dose Estimate Range	Pediatric Effective Dose Estimate Range
O	0 mSv	0 mSv
☢	<0.1 mSv	<0.03 mSv
☢☢	0.1-1 mSv	0.03-0.3 mSv
☢☢☢	1-10 mSv	0.3-3 mSv
☢☢☢☢	10-30 mSv	3-10 mSv
☢☢☢☢☢	30-100 mSv	10-30 mSv

*RRL assignments for some of the examinations cannot be made, because the actual patient doses in these procedures vary as a function of a number of factors (e.g., region of the body exposed to ionizing radiation, the imaging guidance that is used). The RRLs for these examinations are designated as "Varies."

References

1. Siegel RL, Giaquinto AN, Jemal A. Cancer statistics, 2024. CA Cancer J Clin 2024;74:12-49.

2. Oliveira C, Pinheiro H, Figueiredo J, Seruca R, Carneiro F. Familial gastric cancer: genetic susceptibility, pathology, and implications for management. Lancet Oncol 2015;16:e60-70.

3. Cunningham D, Allum WH, Stenning SP, et al. Perioperative chemotherapy versus surgery alone for resectable gastroesophageal cancer. N Engl J Med. 2006;355(1):11-20.

4. Sando AD, Fougner R, Gronbech JE, Bringeland EA. The value of restaging CT following neoadjuvant chemotherapy for resectable gastric cancer. A population-based study. World J Surg Oncol. 19(1):212, 2021 Jul 13.

5. Blank S, Lordick F, Bader F, et al. Post-therapeutic response evaluation by a combination of endoscopy and CT scan in esophagogastric adenocarcinoma after chemotherapy: better than its reputation. Gastric Cancer. 18(2):314-25, 2015 Apr.

6. Yardimci AH, Sel I, Bektas CT, et al. Computed tomography texture analysis in patients with gastric cancer: a quantitative imaging biomarker for preoperative evaluation before neoadjuvant chemotherapy treatment. Jpn J Radiol. 2020 Jun;38(6):553-560.

7. Sun Z, Li J, Wang T, Xie Z, Jin L, Hu S. Predicting perigastric lymph node metastasis in gastric cancer with CT perfusion imaging: A prospective analysis. Eur J Radiol. 2020 Jan;122():S0720-048X(19)30403-6.

8. Li R, Li J, Wang X, Liang P, Gao J. Detection of gastric cancer and its histological type based on iodine concentration in spectral CT. Cancer Imaging. 2018 Nov 09;18(1):42.

9. Cheng SM, Ling W, Zhu J, Xu JR, Wu LM, Gong HX. Dual Energy Spectral CT Imaging in the assessment of Gastric Cancer and cell proliferation: A Preliminary Study. Sci Rep. 2018 Dec 04;8(1):17619.

10. Li C, Shi C, Zhang H, Hui C, Lam KM, Zhang S. Computer-aided diagnosis for preoperative invasion depth of gastric cancer with dual-energy spectral CT imaging. Acad Radiol. 2015 Feb;22(2):S1076-6332(14)00313-4.

11. Li C, Shi C, Zhang H, Chen Y, Zhang S. Multiple instance learning for computer aided detection and diagnosis of gastric cancer with dual-energy CT imaging. J Biomed Inform. 2015 Oct;57():S1532-0464(15)00185-9.

12. Miedzybrodzki K, Zaleska-Dorobisz U, Slonina J, et al. Usefulness of conventional and low-dose hydro-CT in the diagnosis of gastric tumors in comparison to endoscopy. European Journal of Radiology. 93:90-94, 2017 Aug.

13. Kim JW, Shin SS, Heo SH, et al. The role of three-dimensional multidetector CT gastrography in the preoperative imaging of stomach cancer: emphasis on detection and localization of the tumor. Korean J Radiol. 2015;16(1):80-9.

14. Wang L, Jin X, Qiao Z, Xu B, Shen J. The Value of Low-dose Prospective Dual-energy Computed Tomography with Iodine Mapping in the Diagnosis of Gastric Cancer. Current Medical Imaging. 16(4):433-437, 2020.

15. Ma Q, Xin J, Zhao Z, et al. Value of 18F-FDG PET/CT in the diagnosis of primary gastric cancer via stomach distension. European Journal of Radiology. 82(6):e302-6, 2013 Jun.

16. Tomizawa M, Shinozaki F, Uchida Y, et al. Diffusion-weighted whole-body imaging with background body signal suppression/T2 image fusion and positron emission tomography/computed tomography of upper gastrointestinal cancers. Abdominal Imaging. 40(8):3012-9, 2015 Oct.

17. Cui J, Zhao P, Ren Z, Liu B. Evaluation of Dual Time Point Imaging 18F-FDG PET/CT in Differentiating Malignancy From Benign Gastric Disease. Medicine. 94(33):e1356, 2015 Aug.

18. Minamimoto R, Senda M, Jinnouchi S, Terauchi T, Yoshida T, Inoue T. Performance profile of a FDG-PET cancer screening program for detecting gastric cancer: results from a nationwide Japanese survey. Japanese Journal of Radiology. 32(5):253-9, 2014 May.

19. Wang Y, Luo W, Li Y. [68Ga]Ga-FAPI-04 PET MRI/CT in the evaluation of gastric carcinomas compared with [18F]-FDG PET MRI/CT: a meta-analysis. [Review]. European Journal of Medical Research. 28(1):34, 2023 Jan 18.

20. Jang KM, Kim SH, Lee SJ, Lee MW, Choi D, Kim KM. Upper abdominal gadoxetic acid-enhanced and diffusion-weighted MRI for the detection of gastric cancer: Comparison with two-dimensional multidetector row CT. Clinical Radiology. 69(8):827-35, 2014 Aug.

21. Li Q, Xu WY, Sun NN, et al. MRI versus Dual-Energy CT in Local-Regional Staging of Gastric Cancer. Radiology 2024;312:e232387.

22. Li M, Zheng G, Yu L, et al. Diagnostic value of MRI-DWI signal intensity value combined with serum PGI, PGII and CA199 in early gastric cancer. Cellular & Molecular Biology.

67(2):95-100, 2021 Aug 31.

23. Xiong J, Jiang J, Chen Y, Chen Y, Xie C, Xu S. Application of Endoscopic Ultrasound Combined with Multislice Spiral CT in Diagnosis and Treatment of Patients with Gastrointestinal Eminence Lesions. Disease Markers. 2022:1417104, 2022.

24. Liu L, Lu DY, Cai JR, Zhang L. The value of oral contrast ultrasonography in the diagnosis of gastric cancer in elderly patients. World Journal of Surgical Oncology. 16(1):233, 2018 Dec 07.

25. He P, Miao LY, Ge HY, et al. Preoperative Tumor Staging of Gastric Cancer: Comparison of Double Contrast-Enhanced Ultrasound and Multidetector Computed Tomography. J Ultrasound Med. 2019 Dec;38(12):3203-3209.

26. Jiang M, Wang X, Shan X, et al. Value of multi-slice spiral computed tomography in the diagnosis of metastatic lymph nodes and N-stage of gastric cancer. Journal of International Medical Research. 47(1):281-292, 2019 Jan.

27. Ri M, Yamashita H, Gonoi W, et al. Identifying multiple swollen lymph nodes on preoperative computed tomography is associated with poor prognosis along with pathological extensive nodal metastasis in locally advanced gastric cancer. European Journal of Surgical Oncology. 48(2):377-382, 2022 Feb.

28. Wang Z, Liu Q, Zhuang X, et al. pT1-2 gastric cancer with lymph node metastasis predicted by tumor morphologic features on contrast-enhanced computed tomography. Diagnostic & Interventional Radiology. 29(2):228-233, 2023 03 29.

29. Luo M, Lv Y, Guo X, Song H, Su G, Chen B. Value and impact factors of multidetector computed tomography in diagnosis of preoperative lymph node metastasis in gastric cancer: A PRISMA-compliant systematic review and meta-analysis. [Review]. Medicine. 96(33):e7769, 2017 Aug.

30. Wu LL, Xin JY, Wang JJ, Feng QQ, Xu XL, Li KY. Prospective Comparison of Oral Contrast-Enhanced Transabdominal Ultrasound Imaging With Contrast-Enhanced Computed Tomography in Pre-operative Tumor Staging of Gastric Cancer. Ultrasound in Medicine & Biology. 49(2):569-577, 2023 02.

31. Girolamo MDI, Carbonetti F, Bonome P, Grossi A, Mazzuca F, Masoni L. Hydro-MDCT for Gastric Adenocarcinoma Staging. A Comparative Study With Surgical and Histopathological Findings for Selecting Patients for Echo-endoscopy. Anticancer Res 2020;40:3401-10.

32. Fujikawa H, Yoshikawa T, Hasegawa S, et al. Diagnostic value of computed tomography for staging of clinical T1 gastric cancer. Annals of Surgical Oncology. 21(9):3002-7, 2014 Sep.

33. Li J, Tan Y, Zhang D, et al. Value and necessity of pelvic CT in gastric cancer staging: an observational study. Scandinavian Journal of Gastroenterology. 53(9):1097-1099, 2018 Sep.

34. You JM, Kim TU, Kim S, et al. Preoperative N stage evaluation in advanced gastric cancer patients using multidetector CT: can the sum of the diameters of metastatic LNs be used for N stage evaluation?. Clinical Radiology. 74(10):782-789, 2019 Oct.

35. Kawaguchi T, Komatsu S, Ichikawa D, et al. Clinical significance and prognostic impact of the total diameter of enlarged lymph nodes on preoperative multidetector computed tomography in patients with gastric cancer. Journal of Gastroenterology & Hepatology.

30(11):1603-9, 2015 Nov.

36. Wada T, Yoshikawa T, Kamiya A, et al. A nodal diagnosis by computed tomography is unreliable for patients who need additional gastrectomy after endoscopic submucosal dissection. Surgery Today. 50(9):1032-1038, 2020 Sep.

37. Kwee RM, Kwee TC. Imaging in local staging of gastric cancer: a systematic review. J Clin Oncol 2007;25:2107-16.

38. Hallinan JT, Venkatesh SK. Gastric carcinoma: imaging diagnosis, staging and assessment of treatment response. [Review]. Cancer Imaging. 13:212-27, 2013 May 30.

39. Pongpornsup S, Neungton P, Chairoongruang S, Apisamrnthanarak P. Diagnostic performance of multidetector computed tomography (MDCT) in evaluation for peritoneal metastasis in gastric cancer. Journal of the Medical Association of Thailand. 97(8):863-9, 2014 Aug.

40. Li ZY, Tang L, Li ZM, et al. Four-Point Computed Tomography Scores for Evaluation of Occult Peritoneal Metastasis in Patients with Gastric Cancer: A Region-to-Region Comparison with Staging Laparoscopy. Annals of Surgical Oncology. 27(4):1103-1109, 2020 Apr.

41. Leeman MF, Patel D, Anderson J, O'Neill JR, Paterson-Brown S. Multidetector Computed Tomography Versus Staging Laparoscopy for the Detection of Peritoneal Metastases in Esophagogastric Junctional and Gastric Cancer. Surgical Laparoscopy, Endoscopy & Percutaneous Techniques. 27(5):369-374, 2017 Oct.

42. Tian SF, Liu AL, Wang HQ, Liu JH, Sun MY, Liu YJ. Virtual non-contrast computer tomography (CT) with spectral CT as an alternative to conventional unenhanced CT in the assessment of gastric cancer. Asian Pacific Journal of Cancer Prevention: Apjcp. 16(6):2521-6, 2015.

43. Chong CS, Ng CW, Shabbir A, Kono K, So JB. Computed tomography of the thorax for gastric cancer staging: Is it necessary?. Scandinavian Journal of Surgery: SJS. 104(4):244-7, 2015 Dec.

44. Chen AH, Chan WH, Lee YH, et al. Routine chest CT for staging of gastric cancer. British Journal of Surgery. 106(9):1197-1203, 2019 08.

45. Nostedt J, Gibson-Brokop L, Ghosh S, Seidler M, McCall M, Schiller D. Evaluating the utility of computed tomography of the chest for gastric cancer staging. Canadian Journal of Surgery. 63(1):E57-E61, 2020 02 07.

46. Bozkurt M, Doganay S, Kantarci M, et al. Comparison of peritoneal tumor imaging using conventional MR imaging and diffusion-weighted MR imaging with different b values. Eur J Radiol 2011;80:224-8.

47. Borggreve AS, Goense L, Brenkman HJF, et al. Imaging strategies in the management of gastric cancer: current role and future potential of MRI. [Review]. British Journal of Radiology. 92(1097):20181044, 2019 May.

48. Debiec K, Wydmanski J, d'Amico A, et al. The application of 18F-FDG-PET/CT in gastric cancerstaging and factors affecting its sensitivity. Hellenic Journal of Nuclear Medicine. 24(1):66-74, 2021 Jan-Apr.

49. Altini C, Niccoli Asabella A, Di Palo A, et al. 18F-FDG PET/CT role in staging of gastric

carcinomas: comparison with conventional contrast enhancement computed tomography. Medicine. 94(20):e864, 2015 May.

50. Park K, Jang G, Baek S, Song H. Usefulness of combined PET/CT to assess regional lymph node involvement in gastric cancer. Tumori. 100(2):201-6, 2014 Mar-Apr.

51. Lehmann K, Eshmuminov D, Bauerfeind P, et al. 18FDG-PET-CT improves specificity of preoperative lymph-node staging in patients with intestinal but not diffuse-type esophagogastric adenocarcinoma. European Journal of Surgical Oncology. 43(1):196-202, 2017 Jan.Eur J Surg Oncol. 43(1):196-202, 2017 Jan.

52. Park JS, Lee N, Beom SH, et al. The prognostic value of volume-based parameters using 18F-FDG PET/CT in gastric cancer according to HER2 status. Gastric Cancer. 21(2):213-224, 2018 Mar.

53. Mirshahvalad SA, Seyedinia SS, Huemer F, et al. Prognostic value of [18F]FDG PET/CT on treatment response and progression-free survival of gastroesophageal cancer patients undergoing perioperative FLOT chemotherapy. European Journal of Radiology. 163:110843, 2023 Jun.

54. Findlay JM, Antonowicz S, Segaran A, et al. Routinely staging gastric cancer with 18F-FDG PET-CT detects additional metastases and predicts early recurrence and death after surgery. European Radiology. 29(5):2490-2498, 2019 May.

55. Song BI, Kim HW, Won KS, Ryu SW, Sohn SS, Kang YN. Preoperative Standardized Uptake Value of Metastatic Lymph Nodes Measured by 18F-FDG PET/CT Improves the Prediction of Prognosis in Gastric Cancer. Medicine. 94(26):e1037, 2015 Jul.

56. Yamada K, Urakawa N, Kanaji S, et al. Preoperative prediction of the pathological stage of advanced gastric cancer by 18F-fluoro-2-deoxyglucose positron emission tomography. Scientific Reports. 12(1):11370, 2022 07 05.

57. Wang J, Yu X, Shi A, et al. Predictive value of 18F-FDG PET/CT multi-metabolic parameters and tumor metabolic heterogeneity in the prognosis of gastric cancer. Journal of Cancer Research & Clinical Oncology. 149(16):14535-14547, 2023 Nov.

58. Bosch KD, Chicklore S, Cook GJ, et al. Staging FDG PET-CT changes management in patients with gastric adenocarcinoma who are eligible for radical treatment. European Journal of Nuclear Medicine & Molecular Imaging. 47(4):759-767, 2020 04.

59. Gertsen EC, Brenkman HJF, van Hillegersberg R, et al. 18F-Fludeoxyglucose-Positron Emission Tomography/Computed Tomography and Laparoscopy for Staging of Locally Advanced Gastric Cancer: A Multicenter Prospective Dutch Cohort Study (PLASTIC). JAMA Surgery. 156(12):e215340, 2021 12 01.

60. Ma DW, Kim JH, Jeon TJ, et al. 18F-fluorodeoxyglucose positron emission tomography-computed tomography for the evaluation of bone metastasis in patients with gastric cancer. Digestive & Liver Disease. 45(9):769-75, 2013 Sep.

61. Chon HJ, Kim C, Cho A, et al. The clinical implications of FDG-PET/CT differ according to histology in advanced gastric cancer. Gastric Cancer. 22(1):113-122, 2019 01.

62. Chung HW, Kim JH, Sung IK, et al. FDG PET/CT to predict the curability of endoscopic resection for early gastric cancer. Journal of Cancer Research & Clinical Oncology. 145(3):759-764, 2019 Mar.

63. Gai Q-, Li X-, Li N, Li L, Meng Z, Chen A-. Clinical significance of multi-slice spiral CT, MRI combined with gastric contrast-enhanced ultrasonography in the diagnosis of T staging of gastric cancer. Clinical & Translational Oncology: Official Publication of the Federation of Spanish Oncology Societes & of the National Cancer Institute of Mexico. 23(10):2036-2045, 2021 Oct.

64. Choi JI, Joo I, Lee JM. State-of-the-art preoperative staging of gastric cancer by MDCT and magnetic resonance imaging. [Review]. World Journal of Gastroenterology. 20(16):4546-57, 2014 Apr 28.

65. Li HH, Zhu H, Yue L, et al. Feasibility of free-breathing dynamic contrast-enhanced MRI of gastric cancer using a golden-angle radial stack-of-stars VIBE sequence: comparison with the conventional contrast-enhanced breath-hold 3D VIBE sequence. European Radiology. 28(5):1891-1899, 2018 May.

66. Qiao X, Li Z, Li L, et al. Preoperative T2-weighted MR imaging texture analysis of gastric cancer: prediction of TNM stages. Abdominal Radiology. 46(4):1487-1497, 2021 04.

67. Caivano R, Rabasco P, Lotumolo A, et al. Gastric cancer: The role of diffusion weighted imaging in the preoperative staging. Cancer Investigation. 32(5):184-90, 2014 Jun.

68. Zhang Y, Yu J. The role of MRI in the diagnosis and treatment of gastric cancer. [Review]. Diagnostic & Interventional Radiology. 26(3):176-182, 2020 May.

69. Giganti F, Orsenigo E, Esposito A, et al. Prognostic Role of Diffusion-weighted MR Imaging for Resectable Gastric Cancer. Radiology. 276(2):444-52, 2015 Aug.

70. Liu S, Wang H, Guan W, et al. Preoperative apparent diffusion coefficient value of gastric cancer by diffusion-weighted imaging: Correlations with postoperative TNM staging. Journal of Magnetic Resonance Imaging. 42(3):837-43, 2015 Sep.

71. Kim IY, Kim SW, Shin HC, et al. MRI of gastric carcinoma: results of T and N-staging in an in vitro study. World J Gastroenterol 2009;15:3992-8.

72. Joo I, Lee JM, Kim JH, Shin CI, Han JK, Choi BI. Prospective comparison of 3T MRI with diffusion-weighted imaging and MDCT for the preoperative TNM staging of gastric cancer. Journal of Magnetic Resonance Imaging. 41(3):814-21, 2015 Mar.

73. Soydan L, Demir AA, Torun M, Cikrikcioglu MA. Use of Diffusion-Weighted Magnetic Resonance Imaging and Apparent Diffusion Coefficient in Gastric Cancer Staging. Current Medical Imaging. 16(10):1278-1289, 2020.

74. Liu S, Zhang Y, Xia J, et al. Predicting the nodal status in gastric cancers: The role of apparent diffusion coefficient histogram characteristic analysis. Magnetic Resonance Imaging. 42:144-151, 2017 10.

75. Maegerlein C, Fingerle AA, Souvatzoglou M, Rummeny EJ, Holzapfel K. Detection of liver metastases in patients with adenocarcinomas of the gastrointestinal tract: comparison of (18)F-FDG PET/CT and MR imaging. Abdom Imaging 2015;40:1213-22.

76. Low RN, Sebrechts CP, Barone RM, Muller W. Diffusion-weighted MRI of peritoneal tumors: comparison with conventional MRI and surgical and histopathologic findings--a feasibility study. AJR Am J Roentgenol 2009;193:461-70.

77. Liu S, He J, Guan W, et al. Preoperative T staging of gastric cancer: comparison of diffusion- and T2-weighted magnetic resonance imaging. Journal of Computer Assisted

Tomography. 38(4):544-50, 2014 Jul-Aug.

78. Liu S, Guan W, Wang H, et al. Apparent diffusion coefficient value of gastric cancer by diffusion-weighted imaging: correlations with the histological differentiation and Lauren classification. European Journal of Radiology. 83(12):2122-2128, 2014 Dec.

79. Li J, Yan LL, Zhang HK, et al. Application of intravoxel incoherent motion diffusion-weighted imaging for preoperative knowledge of lymphovascular invasion in gastric cancer: a prospective study. Abdominal Radiology. 48(7):2207-2218, 2023 07.

80. Zhang Y, Zhang J, Yang L, Huang S. A meta-analysis of the utility of transabdominal ultrasound for evaluation of gastric cancer. [Review]. Medicine. 100(32):e26928, 2021 Aug 13.

81. He X, Sun J, Huang X, et al. Comparison of Oral Contrast-Enhanced Transabdominal Ultrasound Imaging With Transverse Contrast-Enhanced Computed Tomography in Preoperative Tumor Staging of Advanced Gastric Carcinoma. Journal of Ultrasound in Medicine. 36(12):2485-2493, 2017 Dec.

82. Urakawa S, Michiura T, Tokuyama S, et al. Preoperative diagnosis of tumor depth in gastric cancer using transabdominal ultrasonography compared to using endoscopy and computed tomography. Surgical Endoscopy. 37(5):3807-3813, 2023 05.

83. Yu T, Wang X, Zhao Z, et al. Prediction of T stage in gastric carcinoma by enhanced CT and oral contrast-enhanced ultrasonography. World Journal of Surgical Oncology. 13:184, 2015 May 19.

84. Mehmedovic A, Mesihovic R, Saray A, Vanis N. Gastric cancer staging: EUS and CT. Medicinski Arhiv. 68(1):34-6, 2014.

85. Han C, Xu T, Zhang Q, Liu J, Ding Z, Hou X. The New American Joint Committee on Cancer T staging system for stomach: increased complexity without clear improvement in predictive accuracy for endoscopic ultrasound. BMC Gastroenterology. 21(1):255, 2021 Jun 11.

86. Liu S, Zhang M, Yang Y, et al. Establishment and validation of a risk score model based on EUS: assessment of lymph node metastasis in early gastric cancer. Gastrointest Endosc 2024;100:857-66.

87. Gertsen EC, de Jongh C, Brenkman HJF, et al. The additive value of restaging-CT during neoadjuvant chemotherapy for gastric cancer. European Journal of Surgical Oncology. 46(7):1247-1253, 2020 07.

88. Lee DH, Kim SH, Lee SM, Han JK. Prediction of Treatment Outcome of Chemotherapy Using Perfusion Computed Tomography in Patients with Unresectable Advanced Gastric Cancer. Korean Journal of Radiology. 20(4):589-598, 2019 04.

89. Yoshikawa T, Tanabe K, Nishikawa K, et al. Accuracy of CT staging of locally advanced gastric cancer after neoadjuvant chemotherapy: cohort evaluation within a randomized phase II study. Annals of Surgical Oncology. 21 Suppl 3:S385-9, 2014 Jun.

90. Ott K, Fink U, Becker K, et al. Prediction of response to preoperative chemotherapy in gastric carcinoma by metabolic imaging: results of a prospective trial. J Clin Oncol 2003;21:4604-10.

91. Bilici A, Ustaalioglu BB, Seker M, et al. The role of 18F-FDG PET/CT in the assessment of

suspected recurrent gastric cancer after initial surgical resection: can the results of FDG PET/CT influence patients' treatment decision making?. Eur J Nucl Med Mol Imaging. 38(1):64-73, 2011 Jan.

92. Wu LM, Hu JN, Hua J, Gu HY, Zhu J, Xu JR. 18 F-fluorodeoxyglucose positron emission tomography to evaluate recurrent gastric cancer: a systematic review and meta-analysis. [Review]. Journal of Gastroenterology & Hepatology. 27(3):472-80, 2012 Mar.

93. Li P, Liu Q, Wang C, et al. Fluorine-18-fluorodeoxyglucose positron emission tomography to evaluate recurrent gastric cancer after surgical resection: a systematic review and meta-analysis. [Review]. Annals of Nuclear Medicine. 30(3):179-87, 2016 Apr.

94. Lee DH, Kim SH, Im SA, Oh DY, Kim TY, Han JK. Multiparametric fully-integrated 18-FDG PET/MRI of advanced gastric cancer for prediction of chemotherapy response: a preliminary study. European Radiology. 26(8):2771-8, 2016 Aug.

95. Giganti F, De Cobelli F, Canevari C, et al. Response to chemotherapy in gastric adenocarcinoma with diffusion-weighted MRI and (18) F-FDG-PET/CT: correlation of apparent diffusion coefficient and partial volume corrected standardized uptake value with histological tumor regression grade. Journal of Magnetic Resonance Imaging. 40(5):1147-57, 2014 Nov.

96. Tanaka O, Yagi N, Tawada M, et al. Hemostatic Radiotherapy for Gastric Cancer: MRI as an Alternative to Endoscopy for Post-Treatment Evaluation. Journal of Gastrointestinal Cancer. 54(2):554-563, 2023 Jun.

97. Seo N, Han K, Hyung WJ, et al. Stratification of Postsurgical Computed Tomography Surveillance Based on the Extragastric Recurrence of Early Gastric Cancer. Annals of Surgery. 272(2):319-325, 2020 08.

98. Park CJ, Seo N, Hyung WJ, et al. Prognostic significance of preoperative CT findings in patients with advanced gastric cancer who underwent curative gastrectomy. PLoS ONE [Electronic Resource]. 13(8):e0202207, 2018.

99. Yang D, Zhou Y, Peng Z, Ou N. Effects of MSCT enhanced scan image diagnosis on clinical outcome of patients after radical gastrectomy and its influence on misdiagnosis rate. Journal of B.U.On.. 26(4):1479-1484, 2021 Jul-Aug.

100. Park CH, Kim EH, Chung H, et al. Role of computed tomography scan for the primary surveillance of mucosal gastric cancer after complete resection by endoscopic submucosal dissection. Surgical Endoscopy. 28(4):1307-13, 2014 Apr.

101. Choi KS, Kim SH, Kim SG, Han JK. Early Gastric Cancers: Is CT Surveillance Necessary after Curative Endoscopic Submucosal Resection for Cancers That Meet the Expanded Criteria?. Radiology. 281(2):444-453, 2016 Nov.

102. Jin Kim S, Kim TU, Woong Choi C, Gon Ryu D. Extragastric recurrence in patients who underwent surgical resection of stage I gastric cancer: Incidence, risk factors, and value of abdominal computed tomography as a postoperative surveillance method. Medicine. 101(37):e30335, 2022 Sep 16.

103. Kim JH, Heo SH, Kim JW, et al. Evaluation of recurrence in gastric carcinoma: Comparison of contrast-enhanced computed tomography and positron emission tomography/computed tomography. World Journal of Gastroenterology. 23(35):6448-6456, 2017 Sep 21.

104. Lee JW, Lee SM, Lee MS, Shin HC. Role of 18F-FDG PET/CT in the prediction of gastric cancer recurrence after curative surgical resection. European Journal of Nuclear Medicine & Molecular Imaging. 39(9):1425-34, 2012 Sep.

105. Lee JW, Lee SM, Son MW, Lee MS. Diagnostic performance of FDG PET/CT for surveillance in asymptomatic gastric cancer patients after curative surgical resection. European Journal of Nuclear Medicine & Molecular Imaging. 43(5):881-888, 2016 May.

106. Zou H, Zhao Y. 18FDG PET-CT for detecting gastric cancer recurrence after surgical resection: a meta-analysis. [Review]. Surgical Oncology. 22(3):162-6, 2013 Sep.

107. Malibari N, Hickeson M, Lisbona R. PET/Computed Tomography in the Diagnosis and Staging of Gastric Cancers. [Review]. Pet Clinics. 10(3):311-26, 2015 Jul.

108. Cayvarli H, Bekis R, Akman T, Altun D. The Role of 18F-FDG PET/CT in the Evaluation of Gastric Cancer Recurrence. Mol Imaging Radionucl Ther 2014;23:76-83.

109. Kim DW, Park SA, Kim CG. Detecting the recurrence of gastric cancer after curative resection: comparison of FDG PET/CT and contrast-enhanced abdominal CT. Journal of Korean Medical Science. 26(7):875-80, 2011 Jul.

110. Sun G, Cheng C, Li X, Wang T, Yang J, Li D. Metabolic tumor burden on postsurgical PET/CT predicts survival of patients with gastric cancer. Cancer Imaging. 19(1):18, 2019 Mar 22.

111. Turkoz FP, Solak M, Kilickap S, et al. Bone metastasis from gastric cancer: the incidence, clinicopathological features, and influence on survival. J Gastric Cancer 2014;14:164-72.

112. Lee JW, Lee MS, Chung IK, Son MW, Cho YS, Lee SM. Clinical implication of FDG uptake of bone marrow on PET/CT in gastric cancer patients with surgical resection. World Journal of Gastroenterology. 23(13):2385-2395, 2017 Apr 07.

113. Measuring Sex, Gender Identity, and Sexual Orientation.

114. American College of Radiology. ACR Appropriateness Criteria® Radiation Dose Assessment Introduction. Available at: https://edge.sitecorecloud.io/americancoldf5f-acrorgf92a-productioncb02-3650/media/ACR/Files/Clinical/Appropriateness-Criteria/ACR-Appropriateness-Criteria-Radiation-Dose-Assessment-Introduction.pdf.

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