INTRODUCTION:

Although gastric cancer is relatively common in the world, it is relatively rare in the United States. In 2012, the estimated new gastric cancer cases diagnosed is 21,320, with over 60% of the cases diagnosed in males. It is estimated that 10,540 cases will succumb to their disease in 2012. Unlike many other cancers, gastric cancer is often diagnosed at an advanced stage. The cause of gastric cancer includes certain environmental risk factors such as H. pylori infection, diet, tobacco use, and heavy alcohol consumption. Diagnostic imaging, including endoscopic ultrasound, PET CT, CT, and MRI, has greatly assisted with a pre-operative staging. Surgical resection has been considered the mainstay of treatment with the goal to accomplish a complete resection with negative margins. For patients with evidence of locally advanced disease (making a patient unresectable) or patients with peritoneal involvement or distal metastasis, surgery may not be indicated.

For patients with resectable gastric cancer, radiation therapy has been used both in the pre-operative and post-operative settings. External beam radiation therapy alone is of limited use for patients with locally unresectable gastric cancer with no evidence of improved survival. Combined chemoradiation, however, does result in improved survival, and thus combined modality treatment is typically supported. Typically recommended radiation dose is 45-50.4 Gy, delivered at 1.8 Gy per fraction. Conformal beam irradiation is typically delivered. This technique allows for more accurate dose distribution, reducing excess dose to normal surrounding tissue. The role of intensity modulated radiation therapy (according to current National Comprehensive Cancer Network Guidelines) “may be appropriate in selected cases to reduce dose to normal structures, such as heart, lungs, kidneys and liver.” However, “uncertainties from variations in stomach filling and respiratory motion need to be taken into account.” CT-based 3D planning is strongly recommended. Modifiers, such as wedges, blocks, multileaf collimators, compensators, etc. should be used with the aim to minimize dose to non-target and critical structures as well as minimizing dose in homogeneity (“hotspots”). Use of daily immobilizations is also strongly recommended. IMRT is strictly defined as a technique of dose modulation using inverse planning with defined target and normal tissue dose constraints. Forward plan dose modulation techniques are considered 3D-CRT. Standard patient positioning techniques and weekly portal imaging verification is appropriate for delivery of radiation therapy. Image-guided radiation therapy (IGRT) for external beam techniques does not ensure the accuracy of targeting a dose.
GOAL OF THE GUIDELINE:

The goal of these guidelines is to delineate appropriate indications of the employment of radiation therapy in the treatment of gastric cancer and to define suitable methods of delivery of radiation therapy for these indications.

GENERAL CONSIDERATIONS:

Pre-treatment radiographic images, including CT, ultrasound (and tube placement if post-operative), should be used to assist delineating clinical target volume. Patient should be simulated with CT simulator and with 3D treatment planning. Customized blocking should be used to reduce dose to normal surrounding tissue, including, but not limited to, the spinal cord, heart, kidneys and lung. Dose volume histograms should be performed, especially for patients receiving concurrent chemotherapy. Pre-operative and post-operative field will differ for patients whose tumors arise within the proximal, middle, and right distal third. Nodal risk of metastasis is based on the site of the primary as well as the size and depth of invasion.

MEDICALLY NECESSARY INDICATIONS FOR RADIATION THERAPY AND TREATMENT OPTIONS:

Pre Operative (Potentially Resectable) ≥T2, Any N, M0
- Pre-operative chemotherapy ± radiation (45-50.4 Gy)

Primary Therapy (Unresectable/Medically Unfit) Any N, Any T, M0
- Chemoradiation (45-50.4 Gy)

Postoperative · Surgical Resection (without use of pre-operative chemoradiation) T2, N0 or ≥T2, Any N or Any T, N+ or Positive margins, or M1
- Chemoradiation (45-50.4 Gy)

Postoperative · Surgical Resection (patient received preoperative chemoradiation) Positive margins or M1
- Chemoradiation (45-50.4 Gy)

Unless otherwise indicated standard radiation fractionation consists of 1.8 Gy to 2.0 Gy per day

TREATMENT OPTIONS REQUIRING ADDITIONAL CLINICAL REVIEW:

Intensity Modulated Radiation Therapy (IMRT)
IMRT is not indicated as a standard treatment option and should not be used routinely for the delivery of radiation therapy for gastric cancer. IMRT is strictly defined by the utilization of inverse planning modulation techniques. IMRT may be appropriate for limited circumstances in which radiation therapy is indicated and 3D conformal radiation therapy (3D-CRT) techniques cannot adequately deliver the radiation prescription without exceeding normal tissue radiation tolerance, the delivery is anticipated to contribute to potential late toxicity or tumor volume dose heterogeneity is such that unacceptable hot or
cold spots are created. The role of intensity modulated radiation therapy, according to current National Comprehensive Cancer Network Guidelines may be appropriate in selected cases to reduce dose to normal structures, such as heart, lungs, kidneys and liver. However, uncertainties from variations in stomach filling and respiratory motion need to be taken into account.

Clinical rationale and documentation for performing IMRT rather than 2D or 3D-CRT treatment planning and delivery will need to:

- Demonstrate how 3D-CRT isodose planning cannot produce a satisfactory treatment plan (as stated above) via the use of a patient specific dose volume histograms and isodose plans.

- Provide tissue constraints for both the target and affected critical structures.

**Proton Beam Radiation Therapy**
Proton beam is not an approved treatment option for gastric cancer. There are limited clinical studies comparing proton beam therapy to 3-D conformal radiation. Overall, studies have not shown clinical outcomes to be superior to conventional radiation therapy.

**Stereotactic Body Radiation Therapy**
Stereotactic Body Radiation Therapy (SBRT) is not an approved treatment option for the treatment of gastric cancer.
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