SNMMI AUC Factsheet for Gastrointestinal Transit Scintigraphy

EXECUTIVE SUMMARY

The appropriate use of scintigraphy for studying gastrointestinal (GI) motility requires not only an understanding of the normal physiology and pathophysiology of the various disorders that can affect the GI tract, but also an understanding of the numerous methods and associated technical details of the current clinically available modalities for studying GI motility. Developing recommendations on the appropriate use of GI transit scintigraphy requires input from experts in the fields of nuclear medicine, radiology, and gastroenterology. This document has therefore been prepared with input from representatives with this expertise from various professional societies (Appendix A). These experts reviewed the current literature with the methodology described below and established appropriateness ratings for a wide range of clinical scenarios experienced by patients who have symptoms associated with suspected abnormal GI function. The appropriate use criteria (AUC) delineated in this report are intended to assist referring medical practitioners in the diagnosis and management of patients with symptoms thought to arise from altered GI motility in the esophagus, stomach, small bowel, and colon.

AUC INTRODUCTION

Direct measurement of GI motility is classically performed by a gastroenterologist by placing a tube or catheter-based probe within the GI tract to directly measure pressure changes within a lumen, electrical signals, or pH. Recently, less invasive wireless motility capsules have been introduced *(1,2)*. The advantages of scintigraphy for studying GI motility still remain valid despite the long time that has elapsed since the first application of a radiolabeled meal to measure gastric emptying (GE). Scintigraphy is noninvasive, does not disturb normal physiology, and can provide accurate quantification of the bulk transit of an orally administered radiolabeled solid or liquid meal. Compared with radiographic methods, scintigraphy involves low radiation exposure of the patient, is quantifiable, and uses commonly ingested foods rather than barium or nonphysiological radiopaque markers.

Gastroenterologists and primary care physicians are often faced with a wide range of symptoms in a patient. It is often difficult to assess whether a patient's symptoms are due to an underlying structural pathology or are functional. The authors of this AUC document recognize that management of these patients is complex and the decision to perform any diagnostic study must take into consideration the entire patient presentation. The recommendations in this document do not preclude the use of other testing. Referring health care providers should always consider the patient history, physical findings and results of previously acquired tests before using GI scintigraphy studies. This AUC document is presented to assist health care practitioners in the appropriate use of GI scintigraphy in evaluating patients with GI tract symptoms. It is not intended to replace good clinical judgment.

As scintigraphy does not provide detailed anatomic images of the GI tract, it is particularly important to make sure an anatomic cause for the patient's symptoms has been excluded before assuming that the patient has a nonstructural primary motility disorder. This is typically performed by using radiographic imaging or endoscopic methods.

As with many imaging studies, few multicenter studies have examined clinical outcomes. Our appropriateness ratings are influenced by the clinical experience of the expert panel, which included both imaging specialists and gastroenterologists who perform, order, and use these studies in the diagnosis and management of patients with a wide range of GI symptoms.

These AUC recommendations are intended to apply primarily to adults. It is our intention that the AUC be used to help ensure the appropriate ordering of GI motility scintigraphic testing in patients with GI symptoms who lack appropriate diagnosis and treatment.

METHODOLOGY

The experts of the AUC workgroup[1] were convened by the Society of Nuclear Medicine and Molecular Imaging (SNMMI) to represent a multidisciplinary panel of health care providers to determine the appropriate use of scintigraphy for studying GI motility.

The process for AUC development was modeled after the RAND/University of California, Los Angeles (UCLA) Appropriateness Method *(6,7)* and included the development of a list of common indications for the use of scintigraphy for studying GI motility, a systematic review of evidence related to these indications, and the development of an appropriateness score for each indication by using a modified Delphi process. This process strove to adhere to the standards of the Institute of Medicine of the National Academics for developing trustworthy clinical guidelines.

For all indications, the relevant patients were the populations of interest for esophageal transit Scintigraphy (GES), gastric emptying scintigraphy (GES), small-bowel transit scintigraphy, and colon transit scintigraphy of all genders, ages, races, and geographic locations.

The workgroup identified 42 clinical indications for the use of scintigraphy for studying GI motility. The indications are intended to be as representative of the relevant patient population as possible for development of AUC. The resulting AUC are based on evidence and expert opinion regarding diagnostic accuracy and effects on clinical outcomes and clinical decision making as applied to each indication.

The workgroup selected a list of the key questions specific to each type of transit scintigraphy to guide the review.

ESOPHAGEAL TRANSIT SCINTIGRAPHY (ETS)

The decision about which diagnostic study to use for esophageal dysmotility depends on the patient's symptoms. If dysphagia is present, a barium swallow or endoscopy is usually performed first to exclude an anatomic lesion. Manometry is considered the gold standard for diagnosis of primary esophageal motility disorders, including achalasia, scleroderma, diffuse esophageal spasm (DES), impaired lower esophageal sphincter (LES) relaxation, hypertensive LES, and non- specific esophageal motility disorders. Manometry, however, has limitations: It provides only an indirect measure of peristalsis, as the pressure waves recorded do not always correlate with the aboral forces applied to a solid or liquid bolus in the esophagus; the presence of a manometric tube itself may affect normal physiology; and quantification of the volume of retained solids or liquids in the esophagus is not possible.

Clinical scenarios for the use of nuclear medicine and final AUC scores in esophageal transit are presented in Table 1.

TABLE 1

Clinical Scenarios for Esophageal Transit (Often Performed with GER Studies)

Scenario no.	Description	Appropriateness	Score
1	Dysphagia (e.g., symptoms of achalasia, scleroderma, DES, hypertensive LES, nonspecific motility disorder, esophageal outflow obstruction)	Appropriate	7
2	Quantification of response to therapy (treatment for achalasia)	Appropriate	7
3	Aspiration	May be appropriate	4
4	Rumination	May be appropriate	4
5	Gastroesophageal reflux (e.g., symptoms of liquid or solid regurgitation, heartburn)	May be appropriate	5
6	Pre- and post-fundoplication	May be appropriate	5

GASTRIC EMPTYING OF SOLIDS (SOLID NUTRIENT OR EQUIVALENT)

GE studies are usually ordered to confirm or exclude whether gastroparesis (delayed GE) is a cause of the patient's symptoms. The goal of diagnosing delayed GE is to identify patients who will benefit from a prokinetic drug or other treatment to alleviate symptoms.

GES is currently the gold standard method for measuring GE and is the standard to which other diagnostic tests have been compared. It should be performed by using the currently accepted, standardized low-fat solid meal.

To fully integrate the results of a GES test into patient management, it is important to document GI symptoms, prior surgical procedures, and all drugs in use.

Clinical scenarios for the use of nuclear medicine and final AUC scores in gastric emptying of solids are presented in Table 2.

TABLE 2

Clinical Scenarios for Gastric Emptying of Solids (Including Postinfectious Symptoms)

Scenario no.	Description	Appropriateness	Score
1	Symptoms of gastroparesis (e.g., symptoms of diabetic or idiopathic)	Appropriate	9
2	FD (e.g., symptoms of upper abdominal pain/discomfort, early satiety, nausea, vomiting, bloating, postprandial fullness)	Appropriate	9
3	Postsurgical-induced symptoms of dyspepsia, questionable rapid GE (e.g., symptoms of postsurgical gastroparesis, postvagotomy gastroparesis)	Appropriate	9
4	Poorly controlled diabetes without dyspeptic symptoms	May be appropriate	5
5	Poorly controlled GER without dyspeptic symptoms	May be appropriate	6
6	Suspected generalized GI motility disorder (intestinal pseudo-obstruction)	May be appropriate	6
7	CVS	May be appropriate	6
8	Anorexia nervosa	May be appropriate	5
9	Suspected impaired gastric accommodation (e.g., symptoms of early satiety, postprandial fullness, and/or abdominal pain)	Appropriate	7
10	Pre- and/or postbariatric surgery	May be appropriate	5
11	Postsurgical evaluation (for neurostimulator, pyloroplasty, pyloromyotomy, partial gastric resection)	May be appropriate	6
12	Postsurgical treatment	May be appropriate	6
13	Postsurgical neurostimulator placement	May be appropriate	6
14	Postsurgical pyloroplasty	May be appropriate	6
15	Following surgical or endoscopic pyloromyotomy	May be appropriate	6
16	Postsurgical partial gastric resection	May be appropriate	6

GE OF LIQUIDS (NUTRIENT AND NON-NUTRIENT/WATER MEALS)

GES of solids remains the gold standard for measuring gastric emptying. There is limited data on the clinical value of liquid alone. Liquid GE is, however, typically combined with solids when additional small-bowel or colonic transit studies are needed. A substitute liquid meal can be of clinical value for patients who cannot tolerate the standard radiolabeled egg meal. Because water by definition has no caloric value, it is clinically of greater pertinence for to address the GE of a nutrient liquid meal. The GE characteristics of a validated liquid nutrient meal is similar to those of the standard solid meal but with a slightly faster emptying rate.

TABLE 3

Clinical Scenarios for Gastric Emptying of Liquids (Non-Nutrient/Water Meal)

Scenario no.	Description	Appropriateness	Score
1	Symptoms of gastroparesis (e.g., symptoms of diabetic vs. idiopathic) if solid emptying is normal	Appropriate	7
2	FD (e.g., symptoms of upper abdominal pain/discomfort, early satiety, nausea, vomiting, bloating, postprandial fullness)	Appropriate	7
3	Poorly controlled diabetes without dyspeptic symptoms	May be appropriate	4
4	Poorly controlled GER without dyspeptic symptoms	Rarely appropriate	3
5	Suspected generalized GI motility disorder (intestinal pseudo-obstruction)	Rarely appropriate	3
6	CVS	Rarely appropriate	3
7	Anorexia nervosa	May be appropriate	4
8	Gastrostomy evaluation	May be appropriate	5
9	Unable to tolerate solid meal	Appropriate	8
10	After a normal solid meal when symptoms suggest gastric motility disorder	Appropriate	8
11	Small-bowel transit study (when combined with liquid GE)	Appropriate	7

SMALL-BOWELTRANSIT

The investigations cited in this systematic review support the endorsement of the panel for use of small-bowel scintigraphy as an appropriate diagnostic test in patients with symptoms of small-bowel dysmotility and SIBO. The available data suggest that a subset of patients with symptoms of presumed upper and/or lower gut origin will exhibit delayed small-bowel transit. patients with functional GI disorders.

However, there is not yet convincing literature that specifically documents that small-bowel transit delays will influence additional management decisions or affect outcomes of any treatments for patients with functional GI disorders.

TABLE 4

Clinical Scenarios for Small-Bowel Transit

Scenario no.	Description	Appropriateness	Score
1	Symptoms of small bowel dysmotility (e.g., symptoms of nausea, vomiting, bloating, constipation, diarrhea, abdominal distention)	Appropriate	7
2	Suspected SIBO	May be appropriate	5
3	Suspected generalized GI motility disorder (e.g., drug-induced, idiopathic, or genetic)	Appropriate	8
4	Suspected intestinal pseudo-obstruction (e.g., unexplained small-bowel dilation)	Appropriate	8

COLON TRANSIT

A key question in patients with chronic constipation is to identify whether there is colonic inertia, generalized slow colon transit, pelvic floor dysfunction, functional outlet obstruction, or IBS *(95)*. Colonic motility and transit time are tested to determine whether a patient with symptoms of constipation has abnormal colonic transit and whether a specific area of the colon is involved. Colon transit can be imaged by using serial radiographs after ingestion of radiopaque markers with a meal.

Colonic transit scintigraphy can be used to distinguish motility disorders that affect colonic transit from those that affect the whole gut. Disorders of colonic transit that cause constipation can be further differentiated into slow-intestinal-transit and normal-transit constipation. In addition, this test may identify patients who have intestinal pseudo-obstruction and distal colonic disorders such as delayed rectosigmoid transit or dysfunction and disorders of the pelvic floor.

TABLE 5

Clinical Scenarios for Colon Transit

Scenario no.	Description	Appropriateness	Score
1	Symptoms of large-bowel (colon) dysmotility (e.g., symptoms of constipation, bloating, abdominal pain, non-diarrhea-dominant IBS)	Appropriate	8
2	Suspected generalized GI motility disorder	Appropriate	8
3	Suspected intestinal pseudo-obstruction (e.g., unexplained megacolon)	Appropriate	8

WHOLE-GUT TRANSIT

WGTS refers to a combined study that includes measurement of GE, small-bowel, and colonic transit after administration of a dual-isotope, solid-liquid meal *(73,74,99)*. These studies are helpful for evaluating patients whose symptoms cannot be classified as either upper or lower GI in origin, or where a functional and not an organic cause is suspected *(100)*. The wireless motility capsule has been shown to correlate well with scintigraphy for measuring whole-gut transit *(1)*. Substantial evidence exists that WGTS helps in localizing a site of abnormal GI mobility, thus helping yield a diagnosis and directing therapy in patients with a wide range of both upper and lower GL tract symptoms

TABLE 6

Clinical Scenarios for Whole-Gut Transit

Scenario no.	Description	Appropriateness	Score
1	Suspected pan GI motility disorder (e.g., unable to differentiate upper from lower GI motility disorder)	Appropriate	8
2	Presurgical evaluation of colonic inertia	Appropriate	8

BENEFITS AND HARMS OF IMPLEMENTING THE AUC GUIDANCE

The goal of this document is to aid and benefit referring physicians in using clinical decision support (CDS) toll so that they may achieve efficient and cost-effective use of scintigraphic GI motility studies for the wide range of clinical scenarios described in this report. The recommendations presented are not meant to replace clinical judgement, but rather are presented so that they can be incorporated into CDS tools to both educate referring physicians about the appropriate use of these studies and permit efficient ordering of scintigraphic GI motility studies.

It is not possible to cover all patient symptoms scenarios where GI scintigraphy studies may aid the referring physician in diagnosis and treatment. There are instances where no literature is available to support the use of such studies in a particular clinical scenario. Thus, there is concern that the reliance on CDS tools may diminish the appropriate use of an imaging study for a clinical indication not described in this document. At this time, the future impact on patient outcomes of CDS tools based on use of AUC is unknown.

QUALIFYING STATEMENTS

A limitation of the literature on GI transit studies is the lack of a gold standard to establish sensitivity and specificity values. Much of the literature, especially on measurement of GE and small and large- bowel transit, was established without comparison to another standard because no other methodology was available to investigate solid and liquid transit of a physiological meal within the GI tract.

[1]*This AUC was developed with participation from experts affiliated with the following organizations: Society of Nuclear Medicine and Molecular Imaging, American Gastroenterological Association American College of Physicians, American College of Nuclear Medicine.*

For the complete manuscript and listing of references, visit:
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