General Reference:
https://journals.lww.com/nuclearmed/abstract/2019/06000/ensureplus_as_an_alternative_to_the_standardized.5.aspx

Common Indications:
In patients who cannot consume solid food, to evaluate rate of gastric emptying with diabetic gastroparesis, early satiety, bloating, or post-prandial abdominal pain

Pre-scan Clinical History:
Determine history related to stated clinical history. Locate any pertinent imaging results which describe related findings.

Patient Preparation:
It is the general consensus among nuclear medicine professionals that patients ***not be withdrawn*** from current medical therapy, even though these medications may be contributory to the patient's symptoms; withdrawal of these medications could confound the utility of an otherwise abnormal result. It is important to document in the clinical record, however, any and all medications that the patient might be taking, including semaglutides.

The patient should take nothing by mouth for a minimum of 4 hours prior to the examination, preferably since midnight the night before.

Diabetic patients should have their glucose levels under control. If appropriate, they should bring their insulin and glucose monitors to the appointment, and monitor glucose levels throughout the examination.

Relative Contraindications (if present, consult with nuclear medicine physician prior to scan):
1. Recent nuclear medicine studies
2. Recent barium contrast examinations
3. Pregnancy

Radiopharmaceutical and Route of Administration:
This recommended alternative test meal consists of 8 oz **EnsurePlus** (350 kcal, 11g fat, 16g protein, 47g carbohydrate) or **EnsureEnlive** (350 kcal, 11g fat, 20g protein, 44g carbohydrate) mixed with 1.0mCi Tc-99m–sulfur colloid and shaken prior to consumption. patient upright. The meal is administered orally, the patient upright.

Procedure:
Begin imaging as soon as possible after the patient has finished consuming the meal. All images will be acquired in as an Anterior/Posterior pair, the patient supine on the imaging table, LEHR collimation, 128x128 matrix, 60 seconds per frame, 15% window around 140 kEv. ***All images for a given exam must be acquired on the same camera.***

Four sets of ***accurately timed images*** will be acquired:

A. Immediately after eating (T0)
B. 1 hour after eating (T1)
C. 2 hours after eating (T2)
D. 4 hours after eating (T4)

When imaging is complete, the patient may be discharged.

Image Processing:
Most modern nuclear medicine acquisition and processing systems have standard processing for gastri emptying. The essential points of image processing are as follows:

A. Separate regions of interest are drawn around the stomach in each of four anterior views, with the same (mirrored) ROI used for the corresponding posterior projection

B. Image counts at T0, T1, T2, and T4 time points are calculated using the **geometric mean technique**. As an example, T0 mean image counts equals the square root of (T0 Anterior counts times T0 Posterior counts)

C. Geometric mean counts at each time point are corrected for radioisotope decay, with the following decay factors: T0 = 1.0, T1 = 0.89, T2 = 0.79, and T4 = 0.63.

D. Gastric retention rates are reported for T1, T2, and T4 time points. As an example, retention for time point T2 is calculated as: T2 retention = T2 x 100% / T0

Interpretation:
The 95% upper confidence limit percentages for **gastric retention** for EnsurePlus were as follows:

87.1% at 1 hour,
64.3% at 2 hours, and
13.5% at 4 hours.

“There were time-related differences in the gastric emptying of the EnsurePlus compared with the egg meal. In the first and second hours, there were no difference between EnsurePlus and the egg meal in terms of percentage retention ($P = 0.92$ at 1 hour, $P = 0.05$ at 2 hours). However, at 3 and 4 hours after meal ingestion, the mean percentage gastric retention of the EnsurePlus was significantly higher than the egg meal ($P < 0.001$).”

Review:
Retention results (***not emptying***) for T1, T2, and T4 should be annotated on a screen capture image showing all eight gastric images with their ***corresponding regions of interest***. Prepare images and documents for clinical review as per **Nuclear Imaging Acquisition and Presentation Guidelines**.

1320 S University Dr • Fort Worth, TX 76107 • 817-321-0499 • www.radntx.com