Gastric Emptying Solid-Meal Content and Misinformation on Social Media Platforms

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Several nuclear medicine technologist–specific groups exist on social media sites such as Facebook and LinkedIn. Although these sites provide a valuable resource and forum for technologists to interact and pose questions, any recommendations, especially those regarding patient care, should be carefully scrutinized and evaluated on the basis of scientific merit and not opinion. Recently, an assortment of unvalidated ingredients for solid-meal gastric emptying scintigraphy has been suggested on these social media sites. Often, these ingredients do not comply with the peer-reviewed guidelines and can potentially produce unreliable results and misdiagnosis. Thus, before implementing advice from an unvetted source, technologists must distinguish between low- and high-quality information. Currency, reliability, authority, and purpose—a test of the trustworthiness of an information source—can help technologists evaluate recommendations and avoid the use of unsupported solid-meal gastric emptying scintigraphy ingredients.

Key Words: gastric emptying scintigraphy; guidelines; compliance; social media

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What is the big deal, you ask? GES meal composition and preparation method are two of the most critical variables affecting GES accuracy and reproducibility (3). First, meal composition, specifically volume, caloric content, and fat content, significantly affects the rate at which material empties from the stomach. For example, liquids, proteins, and carbohydrates empty more quickly than solids, fiber, and fats (4–7).

The established reference values for solid GES are based on the standardized meal described in Figure 2 (2). Note that the reference emptying values are based on the precise volume, caloric content, and fat content of this meal. Thus, the results of a solid-meal gastric emptying study deviating from this standardized meal may not be valid. Depending on their specific meal, laboratories using differing meal contents must establish their own reference values in healthy patients.
Second, the egg preparation method also affects the results of GES. The standardized meal dictates the use of liquid egg whites (e.g., Egg Beaters; Bob Evans Farms, LLC) for a good reason. Liquid egg whites cooked with \(^{99m}\text{Tc-sulfur colloid}\) form a bond with the protein component (i.e., egg white albumin) from denaturing caused by heat (8). The binding of \(^{99m}\text{Tc-sulfur colloid}\) to the egg white produces a stable solid that can be tracked through the gastrointestinal system.

If the tracer is not firmly bound to the protein and separates, the emptying rate will vary because the meal is no longer a solid meal but partly liquid. Thus, attempts to radiolabel—such as squirting \(^{99m}\text{Tc-sulfur colloid}\) on previously cooked scrambled eggs or a peanut butter sandwich—that do not firmly attach the tracer to a protein by heat will produce inaccurate results because the tracer does not remain associated with the solid material. Consequently, if the \(^{99m}\text{Tc-sulfur colloid}\) is not bound to the egg whites, the study is basically a liquid gastric emptying study, in which liquid empties from the stomach more quickly. The normal gastric emptying time for a liquid is 30 min, compared with less than 10% of the solid meal left in the stomach at 4 h.

**WHAT ARE OTHER LABORATORIES DOING?**

Unfortunately, lack of compliance with the standardized SNMMI gastric emptying meal components is fairly common. A 2023 study by Tafti et al. examining the GES protocols from 118 laboratories found that only 62% of laboratories followed the exact standardized meal content and preparation (9). The good news is that the percentage is up from 31% in 2017.

Of those not using the standardized meal, 23% used whole eggs, which is problematic because \(^{99m}\text{Tc-sulfur colloid}\) does not bind to egg yolk. In addition, because egg yolk contains more fat than egg whites, gastric emptying can be artificially delayed. Tafti et al. also found that 6% of laboratories added other ingredients such as butter or peaches, further varying the caloric content, and 3% used inappropriate meals such as tuna sandwiches, peanut butter and jelly sandwiches, beef stew, or “the patient’s favorite meal.”

**WHY DO LABORATORIES NOT USE THE GUIDELINE MEAL?**

The next logical question is, “Why do laboratories not use the guideline meal?” The reason is not simply because people are lazy; the answer to that question is multifactorial. First, there are nonspecific reasons. For example, a laboratory may not be aware of the SNMMI procedure guideline (2). A study by Cabana et al. found a low rate of guideline awareness, in general, across medicine (10). Thus, it is unsurprising that some technologists and physicians may not know about the GES guideline, even though it was published in 2009. Additionally, even if a laboratory is aware of a guideline, it may not be familiar with the specific details or be able to apply them correctly.

Another barrier to guideline adoption is a lack of agreement. A laboratory protocol decision-maker may not agree with a specific guideline or parts of the guideline. Finally, inertia may be a factor in guideline adoption. We all know that change is difficult. In the Cabana et al. study, more than 20% of respondents reported inertia as a barrier to guideline adherence.

In addition to these general reasons, there are several specific reasons laboratories do not comply with the GES guideline. First, patients may require an alternate GES meal because of an egg allergy or gluten intolerance. Obviously, in these cases, the recommended standardized GES meal cannot be used. Similarly, patient preferences and lifestyle choices can affect willingness to consume the recommended meal. For example, the standardized meal will not work well with patients following vegan, keto, or Mediterranean diets and the run-of-the-mill picky eaters who hate eggs.

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<tr>
<th>Standardized Solid Gastric Emptying Meal</th>
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<tr>
<td>18.5 - 37 MBq (0.5-1 mCi) (^{99m}\text{Tc-sulfur colloid})</td>
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<tr>
<td>118 mL (4 oz) liquid egg whites (e.g., Eggbeaters (ConAgra Foods, Inc))</td>
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<tr>
<td>2 slices of toasted white bread</td>
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<tr>
<td>30 g of jam or jelly</td>
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<td>120 mL of water</td>
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To prepare: add the \(^{99m}\text{Tc-sulfur colloid}\) to the liquid egg whites and beat well. Cook in a microwave or nonstick skillet, stirring once or twice during cooking, until firm texture.

**FIGURE 1.** Marie Curie, the first woman to receive a Nobel prize (for her research on radioactivity), was a brilliant scientist and would have investigated the veracity of recommendations posted on social media.

"Don’t believe everything you read on social media.”
- Marie Curie

**FIGURE 2.** Accuracy and reproducibility of gastric emptying study require strict adherence to SNMMI standardized protocol and meal. If different ingredients or preparation methods are used, reference values cited in GES guideline (2) cannot be used.
Another reason laboratories may not be able to comply with GES guidelines is a lack of equipment, such as microwaves, toasters, or refrigerators, necessary for radiolabeled egg preparation. Anecdotally, there have been reports of accreditation and state inspectors questioning how a technologist determines whether the radiolabeled eggs are thoroughly cooked (e.g., >170°) to prevent Salmonella or food poisoning (11). Several technologists have been told they must have food handler training (check state regulations, but food handler courses are relatively easy to obtain online). Finally, some technologists mistakenly believe radiolabeled egg preparation falls under the U.S. Pharmacopeia general chapter <825> regulations, which their laboratory may be unable to meet (12).

WHAT IS A NUCLEAR MEDICINE TECHNOLOGIST TO BELIEVE?

Distinguishing between low- and high-quality information on social media platforms can be challenging. And as we have preached, misinformation—defined as information that conflicts with the best scientific evidence available at the time—is plentiful (13). Therefore, we recommend using currency, reliability, authority, and purpose (CRAP) as a test to evaluate source trustworthiness (14).

Currency refers to the timeliness of the information. When was the information posted? Reliability relates to the accuracy of the information. Does the post include citations or references? Is the information linked to credible, peer-reviewed sources? Is the science sound? Authority is the source of the information. Who is the author of the information, and what are the author’s credentials? Is the author qualified to direct patient care? Finally, purpose is the reason the information exists. Does the author seem to be pushing an agenda? Is the purpose of the post to sell, persuade, entertain, or inform? Is there any evidence of bias?

Let us apply the CRAP test to a real-life social media post. Earlier this year, a technologist queried an online nuclear medicine technologist group about acceptable solid-meal alternatives for a patient allergic to eggs. One person responded that macaroni and cheese could be substituted for the egg whites and referenced a 2020 article in the Journal of Nuclear Medicine Technology.

On face value, the recommendation might seem sound. The article was timely, having been published in 2020 (currency). The post referenced the Journal of Nuclear Medicine Technology, which is credible and peer-reviewed (reliability). Two nuclear medicine students wrote the cited reference (authority), and there was no bias from the social media poster (purpose). However, on further inspection of the reference, it was not a scientific research article but an abstract from the SNMMI annual meeting and, therefore, not peer-reviewed. Furthermore, the students’ study included only 7 patients and compared the macaroni and cheese meal to 2 whole eggs and buttered toast. The students concluded that the emptying percentages did not vary between the 2 meals and fell within the reference limits specified by the SNMMI. These study results are problematic for 3 reasons: the small size of the sample, the comparison of macaroni and cheese to whole eggs and not the egg white standardized meal, and application of reference values from the standardized meal to a divergent meal.

The purpose of presenting this example is not to shame the students (we thought they were creative and look forward to reading their follow-up study). The aim is to show how recommendations found on social media must be scrutinized. In this case, the social media post appeared to satisfy the CRAP test parameters. However, on further inspection, the recommendation lacked reliability and authority.

CONCLUSION

Social media is a valuable tool that allows nuclear medicine technologists to network and learn from their peers. Social media content travels quickly, freely, and far. Technologists must recognize that most of the information found on social media is unvetted; thus, they must view it cautiously. Before implementing any suggestions from social media, especially if it involves changes to imaging protocols or something that could affect patient care, technologists must scrutinize and investigate the information thoroughly. The burden of evaluating the credibility and validity of content falls on the user.

One final plea to readers: unless your laboratory has validated the reference values and ensured firm binding of the 99mTc-SC to atypical ingredients, please follow the standardized solid gastric emptying meal and preparation method specified in the GES guideline (2). Stop squirting 99mTc-SC on whatever. Special-order meals using unvalidated reference values will not deliver accurate results and will serve up a buffet of confusion and irreproducible results.

DISCLOSURE

No potential conflict of interest relevant to this article was reported.

KEY POINTS

**QUESTION:** Can solid-meal GES suggestions found on social media sites be trusted?

**PERTINENT FINDINGS:** Although social media sites provide a valuable resource and forum for technologists to interact, any recommendations, especially those regarding patient care, should be carefully scrutinized and evaluated on the basis of scientific merit. The CRAP test, a method to evaluate the information source’s trustworthiness, can be used to weigh social media recommendations and avoid the use of unsupported solid-meal GES ingredients.

**IMPLICATIONS FOR PATIENT CARE:** GES solid-meal ingredients suggested on social media are unvetted and must be scrutinized before implementation.
REFERENCES