Radiation Dose Justification and Optimization Should Not Be Applied to Medical Imaging in Emergency Medicine

To the Editor:
I read with interest the recent article on justification and optimization of radiation dose for medical imaging in emergency medicine in *Annals*. The article raised concerns about the projected increased cancer risks caused by low-dose radiation exposure to patients from the computed tomography (CT) scans performed in emergency departments, by referring to a sentinel event alert by The Joint Commission (TJC). The alert quoted an estimate of 29,000 future cancers attributed to CT scans performed in 2007 in the United States as an example of the stated concerns. This estimate used risk projection models recommended by the Biological Effects of Ionizing Radiation (BEIR) VII report according to the linear no threshold model for radiation-induced cancers. The model was justified in the BEIR VII report by referring to atomic bomb survivor data (p 10) thus: “The arguments for thresholds or beneficial health effects are not supported by these data.” The report (p 336) also claimed consistency of cancer risk factors from the 15-country study of radiation workers as additional supporting evidence.

As described in a recent article, analyses of the updated data for the atomic bomb survivors have shown that the data no longer support the conclusion of zero threshold dose, and corrections to the 15-country study of radiation workers have negated their earlier conclusion of the carcinogenicity of low-dose radiation. In addition, a considerable amount of additional evidence has been published in the past few years (analysis of atomic bomb survivor data, analysis of cancer incidence in Taiwan apartment residents exposed to low-dose radiation from contaminated building materials, and analysis of second cancers per kilogram of tissue as a function of dose in radiation therapy patients), contradicting the linear no threshold model and supporting the concept that low-dose radiation reduces cancers.

One quoted reason for the carcinogenic concerns about CT scans is the increased DNA damage from the low-dose radiation, as, for example, discussed in the BEIR VII report. However, DNA damage is known to be ubiquitous from common activities such as physical and thinking exercises that have been shown to result in reduced cancers and reduced cognitive decline in the elderly, respectively, rendering such concerns not justifiable. Another consequence of low-dose radiation is the stimulation of the immune system. Because the immune system is known to play an extremely important role in preventing cancers, low-dose radiation would be expected to reduce rather than increase cancers, again obviating the low-dose radiation carcinogenic concerns.

The reasons for the linear no threshold model–based low-dose radiation carcinogenic concerns expressed in the TJC sentinel event alert are thus no longer valid. Without these concerns, the concept of dose optimization does not have any justification because it...
would not reduce the patients’ cancer risk, whereas such efforts may reduce image quality, resulting in less accurate diagnoses, and may also cause delays in the diagnosis and care of emergency patients, potentially placing their health at risk.

In conclusion, radiation dose justification and optimization should not be applied to medical imaging in emergency medicine.

Mohan Doss, PhD
Diagnostic Imaging
Fox Chase Cancer Center
Philadelphia, PA

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2. Doss M. Radiation doses from radiological imaging do not increase the risk of cancer. Letter to the editor regarding the article by Brenner: what we know and what we don’t know about cancer risks associated with radiation doses from radiological imaging. Br J Radiol. 2014;87:20130629.

IMAGES IN EMERGENCY MEDICINE
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DIAGNOSIS:

Ingestion of 35% hydrogen peroxide. Unlike dilute (3% to 9%) hydrogen peroxide sold for home use as a disinfectant and topical antiseptic, 35% hydrogen peroxide is used primarily for industrial purposes and for cleaning fruits and vegetables. It has also been promoted as an alternative health remedy, known as “hyperoxygennation therapy.” Although dilute hydrogen peroxide is a mild irritant, concentrated hydrogen peroxide is a caustic, causing necrosis and ulceration of mucosal tissue.1,2

Assuming 1 mouthful equals 30 mL, such ingestion of 35% hydrogen peroxide could yield approximately 3,000 mL of oxygen gas. After systemic absorption of hydrogen peroxide, metabolism by catalase in RBCs liberates oxygen. If intact hydrogen peroxide bypasses the liver before metabolism, cerebral gas embolism may occur in patients with patent foramen ovale.3

The patient was treated at the local hyperbaric treatment facility,3,4 with resolution of her abdominal pain. Her course was complicated by 2 bouts of coffee-ground emesis. Endoscopy revealed a Zargar 2A mucosal injury associated with diffuse erosion of the esophagus and stomach (Figure 2). The patient responded well to treatment with esomeprazole, ondansetron, and simethicone and was discharged on hospital day 3.

Author affiliations: From the Department of Emergency Medicine, Jacobi Medical Center, Albert Einstein College of Medicine, Bronx, NY (Manning, Touger); the Department of Emergency Medicine, New York University School of Medicine, New York, NY (Laskowski, Nelson); and the New York City Poison Control Center, New York, NY (Laskowski, Nelson).

REFERENCES