

Nuclear Medicine Education Via Instagram: A Viable Method for Informal Lifelong Learning

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Formal and informal lifelong learning allows nuclear medicine professionals to grow and change over time within this dynamic field. Over the past 2 decades, Internet-based websites have provided instantaneous access to informal learning opportunities, including nuclear medicine reference articles, videos and webinars, and case-based learning. More recently, medical educators have explored social media platforms such as Instagram, Facebook, and Twitter to provide nuclear medicine education. This article discusses the use of Instagram as a platform for lifelong learning in nuclear medicine. Several nuclear medicine Instagram sites are introduced and user characteristics and participation for a representative site are presented in an effort to learn more about this educational forum, which is increasingly being recognized among academic educators.

Key words: nuclear medicine education; social media; lifelong learning; student-centered learning; global health equity

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Web-based and digital technology provides opportunities for formal and informal nuclear medicine education (Table 1). Medical education on social media platforms such as Instagram, YouTube, Facebook, and Twitter allows for informal learning that helps break down geographic-, professional-, or educational-level learning barriers. If a learner is simply interested, then educational material can be accessed through smartphones, tablets, or computers connected to the Internet (1,2). Academic medical educators across various specialties have embraced social media as an effective platform for educational activities. In addition, these educational efforts on social media are now being included as metrics for academic promotion and tenure (3).

Used by over 25 million people, Instagram is especially useful for students of nuclear medicine because it allows for multiple image- or video-based posts along with a caption area for explanations or didactics. Two-way interaction between followers, other learners, and educators is available

through likes, shares, and comments. Ideally, the Instagram platform is an easily accessible educational format that is available worldwide at any time of day. Costs for participation are minimal for users, who simply need Internet access and a free Instagram account to participate. Additionally, this is a convenient method for educators to deliver content to diverse learners at different educational levels.

There are multiple imaging-based educational sites on Instagram that post educational cases focused on nuclear medicine (Table 2). These educational sites have follower numbers in the hundreds to thousands. Despite the large numbers of followers of these sites, the literature has not elucidated the characteristics of followers of these sites, including geographic location, sex, and age, or the level of follower participation in this educational forum (1,2,4,5). Therefore, we gathered preliminary data on followers and participation levels on our nuclear medicine education site, @nuclear_radiology, on Instagram in an effort to learn more and to promote educational scholarship regarding these sites.

Based in the United States, where nuclear medicine and radiology are commonly practiced in the same department, the @nuclear_radiology Instagram site offers nuclear medicine educational posts to over 7,000 followers around the world. Started in 2016, the site currently provides interactive posts on nuclear medicine technical issues, clinical diagnoses, imaging findings and interpretation, and artifacts and pitfalls. Figure 1 shows a representative post.

After Institutional Review Board approval (exempt), we collected anonymous information on the characteristics of followers of the @nuclear_radiology Instagram site using the InsTrack for Instagram app (Innovatty, LLC). The user

TABLE 1
Characteristics of Formal and Informal Learning Environments

| Formal learning environments | Informal learning environments |
|----------------------------------|---|
| Systematic and structured | Less structured |
| Restricted to certain time slots | Available almost any time |
| Led by instructor | Self- or student-directed |
| School, college, or university | Outside of school, college, or university |

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TABLE 2
Examples of Nuclear Medicine Educational Sites
on Instagram

| Instagram site | Geographic origin | Number of followers |
|----------------------|-------------------|---------------------|
| @dr_nuclear | Israel | ~2,760 |
| @nuclear_medicine_jo | Jordan | ~1,070 |
| @nuclear_radiology | United States | ~7,100 |
| @nucmed_physicist | Indonesia | ~1,250 |

characteristics analyzed included country of origin, sex, and age. Overall follower participation rates were determined for a variety of educational posts. The technologist participation rate on a specific post that allowed users to self-identify as nuclear medicine technologists was also analyzed.

COUNTRY OF ORIGIN

Analysis showed that the proportion of @nuclear_radiology followers was 30.41% from North America, 15.65% from Asia, 13.72% from the Middle East, 12.61% from South America, 10.45% from Europe, 7.41% from the European Union, 5.12% from Africa, 2.69% from Central America, and 1.95% from Oceania (Supplemental Table 1; supplemental materials are available at <http://jnm.tsnmjournal.org>).

The Instagram @nuclear_radiology is produced in English, and the data show that approximately half of its followers are from countries with a high proportion of English speakers. Thirty-eight percent of followers are from countries where English is spoken as the primary language: the United States, Canada, the United Kingdom, South Africa, Nigeria, Singapore, and Australia. The percentage of English-speaking followers increased to 47% when India—a country that has the second-largest English-speaking population of approximately 125 million—was added.

About 45% of followers are from the Americas (Central, North, and South America). English proficiency in many Latin American countries is high, including Argentina, Brazil, and Mexico (6). Near-equal proportions of followers are from the Middle East, Asia, and Europe or the European Union (13%–17%). No followers are from China or Hong Kong, as Instagram was banned there in 2014 after pro-democracy protests.

The international nature of the Instagram platform and followers nearly worldwide suggests that this type of informal learning may be useful in regions of the world that have limited educational resources and access. In a 2016 article in the American Medical Association's *Journal of Ethics* entitled, "Medical Education and Global Health Equity," the authors explain that there are efforts under way to "expand medical training in resource-constrained settings" to improve global health-care disparities and that innovative medical education is required for this effort. In short, "medical educators need to rethink both what they teach and how they teach," the authors assert (7). Educational innovations, including social media-based efforts, could serve to improve global health equity by improving access to educational materials and strengthening ties between educators and students worldwide.

AGE AND SEX

Analysis of the age of @nuclear_radiology followers showed that 69.8% (5,387) are 18–34 y old. Worldwide, 64% of Instagram users are 18–34 y old (8). This suggests that Instagram-based nuclear medicine education may be useful in the age groups that is commonly undergoing technologist training, medical education, and residency and is in an early phase of their career. Some studies suggest that younger learners especially appreciate social media sites for medical education because of the "ease of use, ... structure, and the breadth of information that these sites provide." (9,10)

On the date of analysis, 13.2% (782) of users were 18–24 y old, 56.6% (3,360) were 25–34 y old, and 21% (1,245) were 35–44 y old. The remainder were 45 y or older (9.2%) (Table 3). On sex analysis, 51.5% of users were women and 48.5% were men.

PARTICIPATION ANALYSIS

Engagement levels on social media posts and sites seek to quantify the participation of users on single or multiple posts (11). Participation levels are determined by counting the number of actions performed by users in relation to a post, such as the number of likes, shares, comments, saves to user files, visits to the main profile,

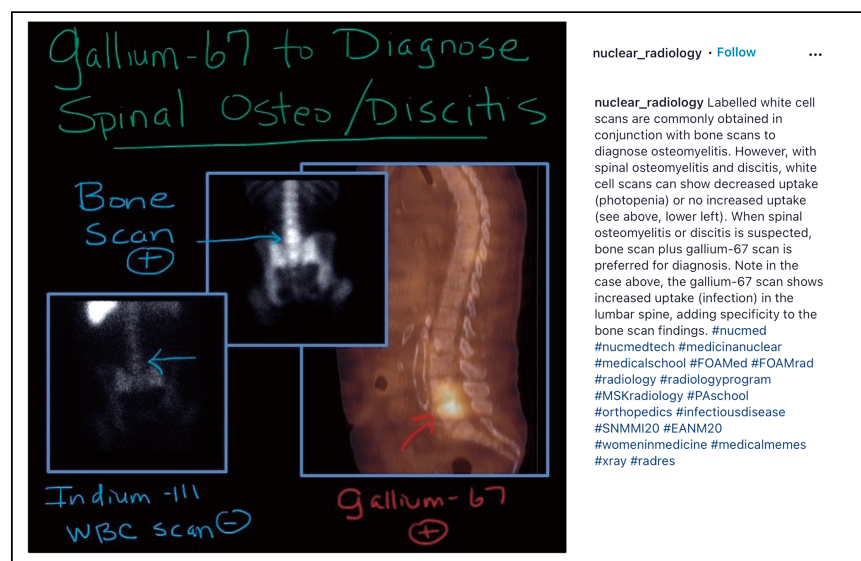


FIGURE 1. Representative Instagram post focused on nuclear medicine education.

TABLE 3

Age of Followers on Instagram Site Dedicated to Nuclear Medicine Education

| Age (y) | Percentage of followers |
|---------|-------------------------|
| 18–24 | 13.2% |
| 25–34 | 56.6% |
| 35–44 | 21% |
| 45+ | 9.2% |

and followers gained. Although engagement rates for medical education sites are unknown, in 2019 there was an overall Instagram engagement rate of 3.96% for higher-education industries (alma mater organizations, fans, current students), 2.4% for nonprofit organizations, 1.22% for media sites, and 1.97% for influencers (people on social media who attempt to influence followers to buy products). The median engagement rate per post on Instagram in 2019 across all industries was 1.6% (12).

Participation (or engagement) analysis of a post that asked followers whether they self-identify as a nuclear medicine technologist led to 607 actions of participation (like, comment, share), a participation rate of 13.3%. This rate suggests the possibility for high levels of participation by nuclear medicine technologists and technology students on this forum.

Engagement analysis of followers on 10 educational posts on the @nuclear_radiology Instagram site showed an average participation level of 5.1%. The lowest participation rate was 2.7%, on a post about pleural mesothelioma on ^{18}F -FDG PET. The highest participation rate was 6.5%, on a post about Takotsubo cardiomyopathy (broken-heart syndrome) on a $^{99\text{m}}\text{Tc}$ -tetrofosmin cardiac stress test. Engagement was calculated as number of post-induced actions of participation divided by impressions (number of times the content was shown to users or could have been seen by users). For example, on the post in Figure 1, approximately 292 followers either liked, shared, commented, saved, visited the main profile, or followed the site after reading the post. This number was divided by 6,154 impressions tallied by InsTrack, for an engagement rate of 4.7% (Table 4).

TABLE 4

Engagement Analysis for Representative Post in Figure 1

| Type of engagement | Number of actions |
|--------------------|-------------------|
| Likes | 184 |
| Comments | 10 |
| Shares | 11 |
| Saves | 36 |
| Profile visits | 42 |
| Follows | 9 |
| Total | 292 |

Engagement rate is 4.7% (292 total actions ÷ 6,154 impressions).

The average participation rate of 5% for educational posts shows participation by up to 350 learners on each post. Although this level of active follower participation would seem positive relative to levels of engagement for overall Instagram use, engagement levels for Instagram sites dedicated to medical education have not been fully quantified as yet.

CONCLUSION

This informal analysis shows that Instagram can be an acceptable method of informal nuclear medicine education, particularly in the age groups associated with in-training and early-career learners worldwide. Compared with the daily learner engagement opportunities of traditional nuclear medicine educators, social media platforms such as Instagram present a feasible method to reach additional learners, potentially reducing health-equity disparities. It also may be an effective method to encourage engagement in lifelong learning in the field of nuclear medicine.

DISCLOSURE

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

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