



Incorporation of musculoskeletal ultrasound training into the radiology core curriculum

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The use of ultrasound for the assessment of musculoskeletal pathological conditions has increased significantly in recent years in the USA [1, 2]. Targeted examination, absence of radiation, widespread availability, lower cost than MRI, and ability to perform interventions at the time of diagnostic evaluation make ultrasound an ideal modality for the evaluation of a wide variety of musculoskeletal conditions [3].

As interest in musculoskeletal ultrasound in the USA continues to grow, it is important for radiology residents to receive adequate training in this modality. A recent survey of program directors from various specialties showed that radiology residents received less musculoskeletal ultrasound training than trainees from physical medicine and rehabilitation, sports medicine and rheumatology programs [4]. Furthermore, radiology residency programs that lacked musculoskeletal ultrasound training were less likely to implement such training in the near future than programs from other specialties [4].

Among the challenges facing radiology programs in the USA in the implementation of musculoskeletal ultrasound training is a lack of available faculty members to provide such training [4]. In some programs, this is because of the lack of faculty members trained in musculoskeletal ultrasound,

whereas in others, this could be due to busy clinical services with a lack of time available to devote to such training. Widespread incorporation of musculoskeletal ultrasound training into the radiology core curriculum requires approaches that address these challenges.

The use of electronic, web-based modules is one approach that has successfully been utilized for musculoskeletal ultrasound training. Maloney et al. designed an electronic learning module for radiology resident musculoskeletal ultrasound training [5]. The module addressed topics including image optimization, musculoskeletal ultrasound anatomy, artifacts, and pathology. A variety of interactive features, including videos, animations, and multiple-choice questions, were used in the module. They found that this module had similar educational efficacy to a traditional, didactic lecture.

Benefits of electronic modules include the ability to easily distribute the content widely on the internet, and these modules can therefore be used by residents in programs that lack radiologists familiar with musculoskeletal ultrasound. Additionally, the interactive, self-directed learning structure of electronic modules may be the preferred learning approach for residents, as reflected by slightly higher satisfaction ratings with the electronic module than the didactic lecture in the study by Maloney et al. [5].

Although electronic, web-based modules can be used to teach ultrasound image interpretation, the ability of a resident to appropriately scan a patient and obtain diagnostic images requires hand-on training. Hands-on training relies more on the physical presence of a radiologist with musculoskeletal ultrasound experience than does didactic teaching. A technique that can be used to minimize the number of radiologists required for such training is the use of peer teachers.

Peer teaching is defined as students teaching other students [6]. Peer teachers have been utilized successfully in a variety of medical student and postgraduate training settings [7–11]. Knobe et al. compared the efficacy of shoulder ultrasound training for third- and fourth-year medical students taught by

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faculty members and other third- and fourth-year students (“student teachers”). They found no significant difference in skill acquisition between the groups taught by faculty members and those taught by student teachers [10]. Similarly, Luz et al. designed a musculoskeletal ultrasound curriculum for psychiatry residents, in which residents served as instructors during hands-on training sessions. Resident participants in this training rated peer teaching as very beneficial [11].

We designed peer-teacher-based hands-on musculoskeletal ultrasound scanning workshops for radiology residents. Several senior residents volunteered to serve as peer teachers and received 3 h of hands-on ultrasound scanning training before the workshops. Radiology residents of all years of training then participated in the workshops. Scanning during the workshops was divided into sections by anatomy. Each section included a demonstration of the scanning technique performed by a musculoskeletal radiologist with musculoskeletal ultrasound training. The residents were then divided into groups of four and practiced scanning while supervised and assisted by the peer teachers. Residents participating in this training demonstrated significant skill acquisition, as measured by subjective and objective metrics. Using this teaching model, we were able to successfully implement hands-on ultrasound training for 36 radiology residents with one radiologist.

We found that 3 h of training was sufficient to adequately prepare the peer teachers. The amount of training required differs based on the level of resident experience, and likely would be somewhat longer if more junior residents were being trained as peer teachers. However, the benefit of training multiple residents with only one staff member probably outweighs the cost of the additional time spent training the peer teachers.

Peer teaching has been shown to have educational benefits, both for the peer teachers and for their trainees [6]. The teaching experience increases the peer teacher’s understanding of the material and increases his or her confidence in teaching. Trainees who serve as peer teachers are also more likely to engage in teaching throughout their career [12]. There are a number of benefits for the trainees as well. These include a more relaxed learning environment when learning from their peers [7, 9, 13]. Additionally, as the peer teachers themselves recently learned the material, they can easily recall difficulties that they had with the material and therefore more effectively address potential problems that the trainees may have [14].

An additional benefit of using peer teachers is that it allows implementation of teaching using fewer faculty members. As such, using peer teachers could allow for effective implementation of musculoskeletal ultrasound training for radiology residents while addressing some of the current challenges facing radiology programs.

In summary, as interest in musculoskeletal ultrasound continues to increase in the USA, it would be prudent to incorporate musculoskeletal ultrasound education into the radiology

core curriculum. Educational methods that can be helpful in successfully implementing widespread musculoskeletal ultrasound training are electronic, web-based modules for the didactic teaching of image interpretation and pathology, and peer-teacher based workshops for hands-on scanning skills.

Compliance with ethical standards

Conflicts of interest The authors declare that they have no conflicts of interest.

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