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Musculoskeletal Radiology teaching at a UK medical school- do we need to improve?

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5 Research Report
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10 **Musculoskeletal Radiology teaching at a UK medical**
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12 **school: Do we need to improve?**
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45 Running title: MSK Radiology teaching at a UK medical school
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ABSTRACT

The United Kingdom (UK) is currently facing crisis due to a shortage of radiology consultants despite ever increasing demand for medical imaging. The specifics of how best to teach radiology has generated increasing interest. This study aims to determine whether musculoskeletal (MSK) radiology teaching at the University of Nottingham (UoN) Medical School is perceived to be satisfactory by medical students, Foundation-Year doctors and senior medical professionals in preparing students for the demands working as Foundation-Year doctors. Questionnaires were distributed to all medical students and Foundation-Year doctors that graduated from UoN (n = 307). Semi-structured interviews were conducted with Consultants and teaching staff (n = 13). Forty-nine percent of pre-clinical medical students, 43% of clinical students and 27% of Foundation-Year doctors thought MSK radiology teaching was not sufficient in preparing them for the radiology challenges Foundation-Year doctors face. This difference was statistically significant ($P < 0.001$). The consensus from senior medical professionals was that MSK Radiology teaching is currently adequate and producing competent students. Interestingly only 5% of students were considering a career in radiology compared to 34% of Foundation-Year doctors. Overall, there seems to be concern among students regarding MSK radiology teaching and students have a lack of confidence with MSK radiology. Foundation-Year doctors and senior medical professionals do not share this

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3 view. This may be due to medical students' lack of clarity on what is required
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5 of them. Formal documentation of set learning objectives for MSK radiology
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7 throughout the curriculum may address this.
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12 **Key words:** Gross anatomy education, medical education, undergraduate
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14 education, postgraduate education, musculoskeletal anatomy, radiology
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16 education, medical school curriculum,
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INTRODUCTION

With the increased use of imaging within the healthcare setting, a greater demand has been placed on radiology services. In 2016 the Royal College of Radiologists (RCR) found that 97% of United Kingdom (UK) radiology departments were unable to meet their reporting demand (RCR, 2017a).

Therefore, it is becoming increasingly important that doctors have the skills to interpret imaging accurately because a formal report may not be available for several hours or days (RCR, 2015). Inadequate training may lead to inappropriate imaging, over-exposure of radiation, and place unnecessary strain upon already overloaded radiology departments (Ferris et al., 2016; Moloney et al., 2017).

Following graduation from medical school in the UK, doctors complete two years of Foundation training, (during which they are referred to as either Foundation-Year 1 (FY1) or Foundation-Year 2 (FY2) doctors). The fundamental purpose of medical school is to provide the basis for a career in medicine and to prepare doctors with the necessary competencies for being a Foundation-Year doctor (Goldacre et al., 2010). This raises the question as to whether medical schools have evolved alongside changing medical practice, to produce Foundation-Year doctors who feel adequately prepared to deal with this radiology-heavy culture.

Many studies have found that medical undergraduates perceive radiology to be an important aspect of education (Boissonnault et al., 2014; Linaker,

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2
3 2015). However, the amount of time given to teaching radiology to medical
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5 students in the UK varies widely (Kalami et al., 2016). On average 5% of
6
7 total teaching time is dedicated to radiology (Heptonstall et al., 2016) and
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9 only 15% of medical schools have a formal radiology curriculum in place
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11 (Bhogal et al., 2012). The same variability is found across Europe
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13 (Ischerwood and Thomsen, 1993; Lass and Scheffler 2003; Kourdiouskova
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15 et al., 2010) and the United States (US) (Gunderman et al., 2003;
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17 Barzansky and Etzel, 2004; Linaker, 2015). In the UK it has been reported
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19 that junior doctors feel radiology teaching at medical school is unstructured
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21 and insufficient, ultimately resulting in them being unprepared for work
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23 (Nyhsen et al., 2011, 2013), with similar findings in Canada (Dmytriw et al.,
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25 2015) and New Zealand (Subramaniam et al., 2005).
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33 Using imaging to enhance anatomy teaching is now well established in
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35 medical education (Mitchell and Williams, 2002; Heptonstall et al., 2016;
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37 Davy et al., 2017) and students have given positive feedback about
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39 integrating the two disciplines (Murphy et al., 2015; Morgan et al., 2017,
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41 Phillips et al., 2018). Currently, radiology is most commonly taught within
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43 other specialty placements and with limited documented objectives (Kalami,
44
45 2016). The need for improvement in radiology teaching with a formal
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47 radiology curriculum has been advocated by numerous authors (Afaq and
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49 McCall 2002; Gunderman et al., 2003; Prezzia et al., 2013). However, a
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51 comprehensive national and international standard for teaching radiology
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3 remains undefined and there are no established transparent vertical
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5 pathways to demonstrate radiology topics logically through pre-clinical and
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7 clinical years of training (RCR, 2017b).
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11 Institutions which have developed and integrated formal radiology programs
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13 into pre-clinical and clinical years have demonstrated significant
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15 improvements in student knowledge. These include the University of British
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17 Columbia (Canada) (Lee et al., 2007), Baha University (Saudi Arabia) (Al
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19 Qahtani and Abdelaziz, 2014) and Sydney University (Australia) (Pascual et
20
21 al., 2011). To try and standardize teaching across the UK, the RCR
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23 developed an Undergraduate Radiology Curriculum which outlines learning
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25 objectives which students should achieve by the end of medical school (RCR,
26
27 2017b). While this is not compulsory, 78% of medical schools have either
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29 based their curriculum on it, or mirror its content in their curriculum (Garrett
30
31 and Booth, 2016).
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39 The University of Nottingham runs both an undergraduate-entry and
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41 postgraduate-entry Medicine MBChB program (background information of
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43 these courses can be found in the Appendix 1). During the pre-clinical years,
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45 students undertake radiology teaching (including musculoskeletal (MSK)
46
47 radiology) during lectures (see table 1) and as part of their anatomy
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49 dissection classes, by visualizing anatomical structures through imaging.
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51 Pre-clinical students are also given radiology teaching that is integrated into
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53 teaching from other disciplines; however, the time spent on radiology during
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3 this teaching is difficult to quantify. Clinical students receive ad-hoc informal
4 radiology teaching on ward rounds and in clinics, similarly the exact amount
5 of this teaching is difficult to determine and will vary widely. The next time
6 students are given formal MSK radiology teaching at UoN is for 3 hours in
7 the final clinical year during their Musculoskeletal Disorders and Disability
8 module. In total, 10 hours of formal radiology teaching are given during
9 clinical years, although this does vary slightly depending on where students
10 are on placement. In addition, every year 25 students can study an optional
11 radiology module during which they receive 15 hours of radiology teaching,
12 3 hours of which are MSK related.
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30 This study aims to determine whether MSK radiology teaching at a UK
31 medical school is perceived as satisfactory in preparing students for the MSK
32 radiology requirements Foundation-year doctors face. The opinions of
33 current students, recent graduates and senior medical professionals of the
34 same institution were gathered. This study also explores the affect which the
35 perception of radiology teaching might have on career choice.
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46 MATERIALS AND METHODS

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48 Given the large population of medical students and Foundation-Year doctors,
49 quantitative methods (via questionnaires) were utilized to maximize the
50 number of responses. A qualitative approach (via interviews) was used to
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3 collect data from senior medical professionals (consultants and other clinical
4 staff) as interviews have been shown to achieve higher compliance in this
5 group (Mathers et al., 2009). Ethical approval was granted by the UoN
6 Faculty of Medicine and Health Sciences Research Ethics Committee.
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15 **Participants and Recruitment**

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17 Purposive sampling was used for the questionnaire aimed at all
18 undergraduate-entry and postgraduate-entry medical students at UoN
19 Medical School, and Foundation-Year doctors working in local hospitals that
20 had graduated from the same institution. Medical students were identified
21 through University e-mail distribution lists. Foundation-Year doctors were
22 identified as those registered on the Foundation Program in the Deanery. E-
23 mails, social media, recruitment posters and distributing handouts during
24 lectures were used to recruit participants.
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A difference in proportions sample size formula was used with a proportional split of 70% and 30% of participants who agree/disagree that teaching is satisfactory based on findings from a similar study (Nyhsen et al., 2013). This gave a required sample size of 58 participants per group for the questionnaire study.

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3 For the semi-structured interviews, the NHS website was used to identify
4 consultants (doctors who have completed all training in their chosen
5 specialty) in MSK radiology, orthopedics, rheumatology, emergency medicine
6 and sports and exercise medicine. Potential participants were either emailed
7 or asked in person to participate.
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18 **Questionnaire**

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20 An online questionnaire was created using Google Forms (Google, LLC.,
21 Mountain View, CA; see Supplementary Material: Supplement S1). The
22 questionnaire was based on similar papers published (Nyhsen et al., 2013;
23 Leveritt et al., 2016), adapted by the first author (K.M.) to explore opinions
24 on MSK radiology. Six medical students from another UK university piloted
25 the questionnaire, resulting in minor amendments to grammar and
26 formatting. Consent was assumed by completion of the questionnaire. As an
27 incentive, participating medical students were given the option to enter a
28 prize draw to win a £50 gift voucher.
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45 Upon completion of the questionnaire, students were offered to complete a
46 ten-question multiple choice MSK radiology practice test that asked students
47 to choose which pathology, if any, was shown on an MSK X-ray (see
48 Supplementary Material: Supplement S2). This was offered mainly to
49 encourage participation, but also allow for analysis of student knowledge.
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3 This test was not offered to Foundation-Year doctors as it was deemed it
4 would reduce participation rates (in hindsight this is acknowledged as a
5 limitation of the study). One of our researchers created the test based upon
6 the MSK radiology section in the RCR' recommended undergraduate
7 curriculum (RCR, 2017b). An orthopedic consultant reviewed the test to
8 ensure accuracy.
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20 **Interviews**

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22 The interview questions were based upon the interview guide used in a
23 previous study adapted by K.M. to explore opinions of MSK radiology
24 teaching (Leveritt et al, 2016). Each participant was given a unique code to
25 protect their identity. All interviews were conducted by the same member of
26 the research team and digitally recorded. The same member transcribed the
27 interviews verbatim and removed any identifiable information. Following
28 confirmation of the themes and sub-themes, NVIVO software, version 11
29 (QRS International, Ltd., Melbourne, Australia) was utilized to illustrate
30 themes.
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47 **Data Analysis**

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49 Descriptive analyses of the questionnaire data used means (standard
50 deviation) for continuous data, and proportions for categorical data. Where
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3 appropriate, data were divided into the subgroups of pre-clinical students,
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5 clinical students, and Foundation-Year doctors.
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10 When asked about sufficiency of MSK radiology teaching the results of a
11 Likert scale were classified into the two nominal categories of 'sufficient'
12 (i.e., teaching is sufficient or very sufficient in preparing students for the
13 radiology demands of being a Foundation-Year doctor) and 'not sufficient'
14 (i.e., teaching is not sufficient or not sufficient at all in preparing students
15 for the radiology demands of being a Foundation-Year doctor). When asked
16 about confidence in MSK radiology a similar Likert scale was used and
17 similarly structured to classify responses into 'confident' or 'not confident'.
18 Neutral and unsure responses were not included in the statistical analysis.
19 To compare differences in opinion between pre-clinical students, clinical
20 students and Foundation-Year doctors the data were analyzed by χ^2 test
21 using the nominal categories.
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42 For the MSK radiology practice test, scores were assessed for normality
43 using Shapiro-Wilk. Differences between pre-clinical and clinical students
44 were analyzed using Mann Whitney U as data were not normally distributed.
45 Statistical Package for the Social Sciences (SPSS), version 23.0 (IBM Corp,
46 Armonk, NY) was used to analyze the data. Statistical significance was set at
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3 $P < 0.05$. The questionnaire and practice test were tested for internal
4 consistency using Cronbach's alpha.
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10 For the interviews, an inductive thematic analysis approach was taken
11 (Holloway, 1997). The six-step process is used to extract meaning and
12 concepts from data to identify patterns and ultimately generate themes until
13 data saturation was reached (Braun and Clarke, 2006; Javadi and Zarea,
14 2016). A realist approach was adopted, and the data were analyzed at a
15 semantic level. A reflective journal was kept throughout.
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27 Two reviewers (K.M. and M.T.) were involved in the coding process. Once all
28 interviews had been coded and themes finalized, a randomly selected
29 transcript was given to both reviewers to code to check whether extracts
30 represented the themes appropriately. There was a 73% similarity. A result
31 of over 70% has previously been deemed acceptable (Fahy, 2001).
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41 RESULTS

42 **Demographic Information**

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44 Two-hundred and thirty-nine medical students (72 pre-clinical; 167 clinical)
45 (15% response rate) and 68 Foundation-Year doctors (34% response rate)
46 completed the questionnaire, giving a total of 307 participants and achieving
47 the required sample size. The total response rate was 17%. Sixty percent of
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3 Foundation-Year doctors and 65% of medical students were female,
4 reflecting that there are more female than male medical students and
5 Foundation-Year doctors (Foundation Programme, 2017; HESA, 2018). Of
6 note, when asked about career intentions, 34% of Foundation-Year doctors
7 and 5% of medical students were considering radiology as a career ($\chi =$
8 41.2 (1), $P < 0.001$).
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20 Out of the 61 senior professionals invited to participate, 13 agreed (20%
21 response rate). Table 2 presents a summary of their characteristics.
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28 **Questionnaire Results from Medical Students and Foundation-Year** 29 **Doctors**

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31 Cronbach's alpha for the questionnaire was found to be 0.83. Medical
32 students and Foundation-Year doctors were asked if they thought MSK
33 radiology teaching at UoN medical school is sufficient in preparing students
34 for the radiology challenges Foundation-Year doctors face. Four percent of
35 pre-clinical students and 31% of clinical students think MSK radiology
36 teaching is sufficient, compared to 44% of Foundation-Year doctors (Figure
37 1). The difference in opinions between medical students and Foundation-
38 Year doctors is statistically significant ($\chi = 11.8 (1)$, $P = 0.001$). Similarly,
39 Figure 1 shows that 49%, 44% and 27% of pre-clinical students, clinical
40 students, and Foundation-Year doctors respectively thought the MSK
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3 radiology teaching was not sufficient. The difference in opinion between all
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5 three groups is also statistically significant ($\chi = 26.5$ (2), $P < 0.001$).
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10 Students and Foundation-Year doctors were also asked how confident they
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12 feel with MSK radiology (Figure 2). Sixty percent of all students do not feel
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14 confident with MSK radiology, with similar responses from pre-clinical and
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16 clinical students (59%, 60%). Thirty seven percent of Foundation-Year
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18 doctors do not feel confident with MSK radiology. The difference between
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20 students and Foundation-Year doctors was not statistically significant ($\chi =$
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0.461 (1), $P = 0.497$).

Assessing Musculoskeletal radiology knowledge

32 Students were offered to participate in an optional ten-question MSK
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34 radiology practice test. Cronbach's alpha for the test was found to be 0.71.
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Approximately a third (32%) of all students completed the test and the
average score was 69.0%. The normality tests indicated the data were
normally distributed ($P = 0.01$). There was a statistically significant
difference in scores between pre-clinical and clinical students, with clinical
students scoring significantly better (Mann Whitney U = 866.5, $P = 0.023$,
effect size = 0.26).

Interview Results from Senior Medical Professionals

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3 Semi-structured interviews were conducted with 13 senior medical
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5 professionals. A total of 136 codes were noted and data saturation was
6
7 reached. Seven themes and 18 sub-themes were deciphered and are
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9 outlined as a thematic map (see Supplementary Material: Supplement S3)
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11 and a codebook was made detailing themes, subthemes and supporting
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13 quotes (see Supplementary Material: Supplement S4). Only theme 3 is given
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15 in full, as it is particularly relevant to the primary objective.
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23 **Theme 3: Is Musculoskeletal radiology teaching sufficient?**

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25 *Positive opinions.* Most interview participants had positive opinions regarding
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27 how adequately MSK radiology is taught and the competency levels of
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29 current medical students and Foundation-Year doctors. One participant said,
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31 *'I would say that I think the current teaching is appropriate'* (P06) and
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33 another said, *'If anything, they're giving too much. I don't think they are*
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35 *giving too little'* (P08). The same participant also commented that the
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37 students must not be overloaded, adding that *'if you expect the students to*
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39 *do too much and they're worried that they are missing something that makes*
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41 *a negative contextual experience'* (P08).
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50 *Negative Opinions.* A few participants gave negative comments towards how
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52 adequate MSK radiology is taught, with one participant commenting on the
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54 low competency level of students stating, *'they often struggle to identify even*
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3 *which joint they are looking at'* (P09). Another participant commented, *'what*
4 *happens is that radiology ends up being at the lower end of the objectives',*
5 *and that this 'automatically de-prioritizes it'* (P05).
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10 11 12 DISCUSSION

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15 This study sought the views of medical students, recent graduates and
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17 senior medical professionals of the same institution, to determine whether
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19 MSK radiology teaching at UoN Medical School is satisfactory in preparing
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21 students to be Foundation-Year doctors. A pattern emerged from the data
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23 demonstrating that subgroups higher in their medical training perceived MSK
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25 radiology teaching to be more adequate than their junior peers. Given that
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27 senior medical professionals and recent graduates currently working in post
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29 are in a better position to determine whether the teaching is adequate
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31 (WHO, 2001; Eyal and Cohen, 2006; Goldacre et al., 2014), it can be
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33 inferred that the MSK radiology teaching given at UoN Medical School is
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35 adequate in preparing students for Foundation-year doctor posts.
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45 Currently it is estimated that 70% of radiology teaching at medical schools
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47 occurs during lectures, despite current evidence suggesting the optimum
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49 method to teach radiology is in small group tutorials (Jacob et al., 2016; Zou
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51 et al., 2011). The majority of teaching at Nottingham occurs during anatomy
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53 sessions in small groups, and this method has been demonstrated to have a
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3 positive effect on student learning (Kourdioukova et al., 2011; Oris et al.,
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5 2012). The importance of delivering this teaching in the early years of study
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7 have also been highlighted (McLachlan et al., 2004; Ahmed et al., 2011).
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11 Recent studies have found Foundation-Year doctors feel increasingly
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13 prepared for their postgraduate posts (Lachish et al, 2016; Miles et al.,
14
15 2017). However, when examining radiology specifically, studies in the UK
16
17 and Ireland have found that Foundation-Year doctors feel their
18
19 undergraduate radiology education had not adequately prepared them for
20
21 practice (Nyhsen et al., 2011; Mair et al., 2012). The findings of this study
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23 differ from this, in that a high proportion of UoN medical school graduates
24
25 think that MSK radiology teaching was adequate. This may reflect the fact
26
27 that UoN successfully integrates anatomy and radiology teaching in pre-
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29 clinical years in addition to providing a formal MSK radiology teaching
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31 module in the final clinical year. In response to this study, UoN Medical
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33 School have moved the first introductory lecture to radiology to the first
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35 semester of first year, resulting in students' exposure to radiology at an
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37 even earlier stage.
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48 **Formal learning objectives are essential**

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50 The opinion that medical students at UoN Medical School are sufficiently
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52 competent with MSK radiology is further supported by the average results of
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54 the MSK practice test being 69.0%, just below the score needed to receive a
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3 UK first-class honors degree. Despite this, students do not feel they are
4 taught it well enough and do not feel confident with it. This is in keeping
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6 with previous studies that have found a lack of correlation between
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8 confidence and competence (Morgan and Cleave-Hogg, 2002; Brinkman et
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10 al., 2015).
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16 Interestingly the only MSK radiology learning objectives in the clinical years
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18 at UoN medical school are during the Musculoskeletal Disorders and
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20 Disability module in final year and they are: 'learn radiographic terminology'
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22 and 'identifying the radiographic features of common adult fractures'. The
23
24 importance of ensuring there are specific, clear learning outcomes for
25
26 students has been highlighted in many studies (McKimm and Swanwick,
27
28 2009; Raszka et al., 2010). The lack of objectives at UoN medical school
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30 may explain students' poor awareness of what MSK radiology knowledge is
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32 expected of them at their level. The literature suggests a list of objectives
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34 may aid students in understanding what is expected of them, promoting
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36 greater confidence and satisfaction with the curriculum (Rapp et al., 2007).
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45 In response to this study UoN medical school has incorporated significantly
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47 more radiology-related learning objectives into the pre-clinical years (see
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49 Supplementary Material: Supplement S5). It is recommended that UoN
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51 medical school also incorporate more radiology learning objectives
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53 throughout the clinical years. Re-assessing student perception of MSK
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3 radiology and confidence a few years after the implementation of learning
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5 objectives throughout the curriculum is required to ascertain whether a
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7 change has been effected.
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10 11 12 **Negative experiences of radiology may affect career choice**

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15 Previous studies have found that 21% of Foundation-year doctors are
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17 considering a career in radiology and this study found this to be higher in
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19 recent Nottingham graduates (Lambert et al., 2018). However, this study
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21 found a statistically significant difference in the number of medical students
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23 and Foundation-Year doctors contemplating a career in radiology (much
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25 fewer students than doctors). This may be due to Foundation-Year doctors
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27 realizing they are capable of facing the radiology challenges they see as
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29 doctors, whereas students believe much more knowledge is required of
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31 them, putting them off the specialty. With an estimated one-third of current
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33 UK radiology consultants set to retire by 2025 (RCR, 2016a), the RCR
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35 recommends that by 2026 the UK needs to increase their radiologist
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37 workforce from 48 radiologists per million to at least 80 radiologists per
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39 million (RCR, 2016b). Medical school experience is important in determining
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41 career choice (Chen et al., 2001; O'Herrin et al., 2004; Takeda et al., 2013)
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43 and with the current need for more radiologists medical schools have a
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45 responsibility to promote this specialty. Improving students' perception of
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47 radiology by outlining more clearly what knowledge is required of them
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3 throughout their training may increase the number considering it as a career
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5 choice.
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10 **Limitations of the study**

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12 The limitations of this study include: low response rate (although this was
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14 expected for a questionnaire study (Rindfuss et al., 2015), non-validated
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16 questionnaires and MSK radiology practice test, possible interviewer
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18 influence, incentive to participate in study, self-selection bias particularly for
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20 the MSK radiology knowledge test, and recall bias from Foundation-Year
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22 doctors. In addition, not assessing MSK radiology knowledge of Foundation-
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24 Year doctors though the ten-question MSK practice test is another limitation
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26 of the study, however the interview participants deemed the current
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28 Foundation-Year doctors to be competent in MSK radiology. It is
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30 acknowledged that the findings of this study may not be generalizable
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32 beyond UoN.
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42 **CONCLUSIONS**

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44 Overall, while medical students believe that MSK radiology teaching is not
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46 sufficient, this view was not shared by recent graduates of the same course,
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48 or senior medical professionals. Implementation of a set of specific learning
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50 objectives is recommended to help students better understand what MSK
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52 radiology knowledge is expected of them at various stages throughout their
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training, thereby increasing confidence. Students may then realize they are sufficiently capable for their level of training.

For Peer Review

Appendix 1: **Undergraduate-entry and postgraduate-entry medical programs at the University of Nottingham**

The UoN runs a five-year MBChB program for undergraduate-entry students and a four-year MBChB program for postgraduate-entry students. Every year approximately 240 undergraduate-entry and 90 postgraduate-entry medical students begin their studies at the UoN. The five-year course is split into pre-clinical years (years one and two) and clinical years (years three to five). The four-year course has one pre-clinical year (year one) before combining with the undergraduate-entry students for the clinical years (years two to four). There are no noticeable differences between undergraduate-entry and postgrad-entry grades attained during clinical years and all graduates compete for the same Foundation-Year doctor jobs. The majority of undergraduate-entry students are 18 years old when they start their medical degree, whereas postgraduate-entry students are aged between 22 and 45 when starting. Undergraduate-entry students are selected based on their grades achieved at high school, their UK Clinical Aptitude Test score, and an interview. Postgraduate-entry students can be a graduate of any discipline having achieved a 2.1 honors degree and are selected based on their Graduate Medical School Admission Test (GAMSAT) score and an interview. Both courses utilize lectures, tutorials and practical sessions with the undergraduate-entry course centered on a Lecture-Based

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Learning approach and the postgraduate-entry course centered on Problem-Based Learning.

For Peer Review

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FIGURE LEGENDS

Figure 1. Percentage of pre-clinical students, clinical students and Foundation-Year doctors that thought musculoskeletal (MSK) radiology teaching is sufficient, neutral or not sufficient in preparing students for the MSK radiology demands of being a Foundation-Year doctor. As shown, more Foundation-Year doctors think MSK radiology teaching is sufficient than not sufficient, and the opposite can be said for pre-clinical and clinical students. Students could answer 'unsure', to allow for the fact students, particularly preclinical students, may not yet appreciate what radiology demands Foundation-year doctors' face.

Figure 2. Pre-clinical students, clinical students and Foundation-Year doctors' views of how confident they feel with musculoskeletal (MSK) radiology. Values close to 5 represent that they are 'very confident' with MSK radiology, and values close to 1 equate to 'not very confident at all' with MSK radiology. Error bars are standard deviation. As shown, pre-clinical students, clinical students and Foundation-year doctors all do not feel confident with MSK radiology.

Table 1. Formal radiology and musculoskeletal (MSK) radiology specific contact hours during the pre-clinical years for undergraduate-entry and postgraduate-entry medical students at the University of Nottingham

Course	Lectures (hours)	During Practical Anatomy Teaching (hours)
Undergraduate-entry course (anatomy teaching is dissection-based)	<ul style="list-style-type: none"> • Radiology (8) • MSK radiology specifically (2) 	<ul style="list-style-type: none"> • Radiology (8) • MSK radiology specifically (2)
Postgraduate-entry course (anatomy teaching is prosection-based)	<ul style="list-style-type: none"> • Radiology (2) • MSK radiology specifically (1) 	<ul style="list-style-type: none"> • Radiology (6) • MSK radiology specifically (2)

Medical School.

Note this table does not include informal radiology teaching during other disciplines in lectures.

Table 2. Participating interview participants' specialties.

Occupation	Number of participants n (%)	Number involved in teaching medical students n (%)
Radiology Consultant	2 (15)	0
Radiology Trainee	2 (15)	2 (100)
Orthopaedics Consultant	3 (23)	2 (67)
Orthopaedics Trainee	1 (8)	1 (100)
Rheumatology Consultant	2 (15)	1 (50)
Emergency Medicine Consultant	1 (8)	1 (100)
Sports and Exercise Medicine Consultant	1 (8)	0
Nurse Practitioner	1 (8)	1 (100)
Total	13 (100)	8 (62)

Note the majority of participants are involved in medical education at the University of Nottingham Medical School.

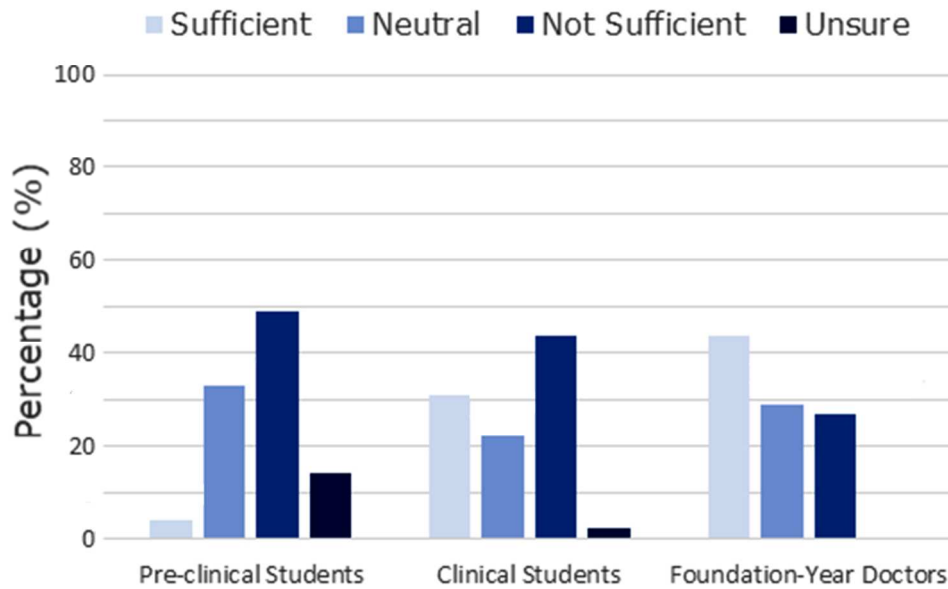


Figure 1. Percentage of pre-clinical students, clinical students and Foundation-Year doctors that thought musculoskeletal (MSK) radiology teaching is sufficient, neutral or not sufficient in preparing students for the MSK radiology demands of being a Foundation-Year doctor. As shown, more Foundation-Year doctors think MSK radiology teaching is sufficient than not sufficient, and the opposite can be said for pre-clinical and clinical students. Students could answer 'unsure', to allow for the fact students, particularly preclinical students, may not yet appreciate what radiology demands Foundation-year doctors' face. Figure 1.

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94x61mm (300 x 300 DPI)

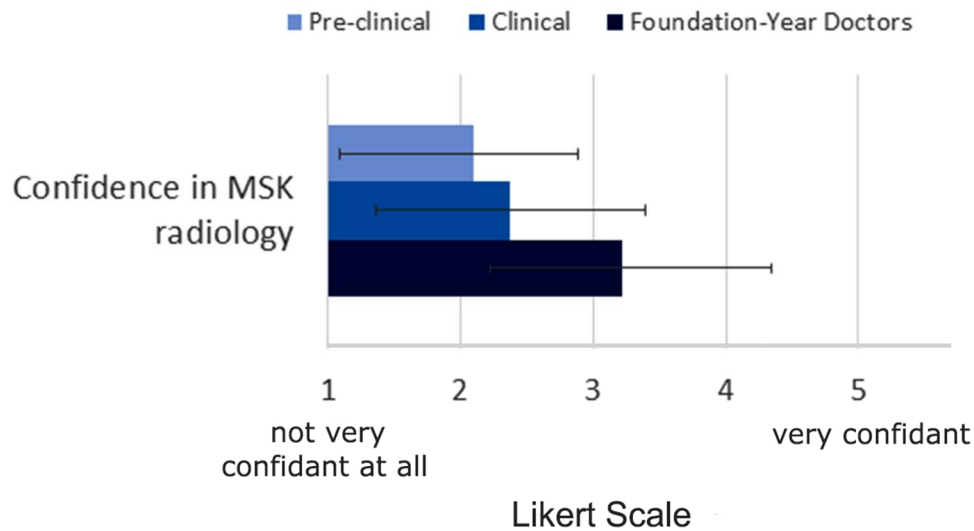


Figure 2. Pre-clinical students, clinical students and Foundation-Year doctors' views of how confident they feel with musculoskeletal (MSK) radiology. Values close to 5 represent that they are 'very confident' with MSK radiology, and values close to 1 equate to 'not very confident at all' with MSK radiology. Error bars are standard deviation. As shown, pre-clinical students, clinical students and Foundation-year doctors all do not feel confident with MSK radiology.

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