

Systematic review

# Oral and maxillofacial surgery and dental health education in undergraduate medicine: a systematic review

Sean Glossop<sup>1,†</sup>, Hamza Duffaydar<sup>2,†</sup>, Harri Jones<sup>2</sup>, Ethan Peters<sup>2</sup>,  
Timothy Ryan<sup>2</sup>, Francesca Saleh<sup>2</sup>, Lily Scourfield<sup>3</sup>, Arwel Poacher<sup>4,\*;‡</sup>

<sup>1</sup> Cardiff University School of Medicine, Cardiff, United Kingdom

<sup>2</sup> Cardiff and Vale University Health Board, University Hospital of Wales, Cardiff, United Kingdom

<sup>3</sup> King's College Hospital NHS Foundation Trust, London, United Kingdom

<sup>4</sup> Cardiff University, School of Biosciences, United Kingdom

Received 19 February 2024; revised 21 July 2024; accepted in revised form 26 July 2024 Available online 16 August 2024

## Abstract

Undergraduates in medicine should receive a basic education to ensure understanding of dental concepts, including oral cancer, basic dental health advice, and oral and maxillofacial surgery (OMFS). This review aims to explore the exposure of OMFS and dental education in the UK medical undergraduate curriculum and follows PRISMA protocols. Four databases were used to search for literature: MEDLINE, EMBASE, SCOPUS, and Google Scholar. A three-tier reviewer panel was used to appropriately evaluate data. The Medical Education Research Quality Instrument (MERSQI) was used to assess research quality amongst the included literature. A total of 14 papers were included for review. Surveys assessing medical students' perceptions of OMFS education indicate a need for improvement of the speciality in undergraduate medicine. Mean exposure of graduating medical students to OMFS was 22% (95%CI 11 to 29%). Knowledge of relevant anatomy, physiology, and OMFS-related data was very poor across all surveys. Likewise, oral cancer teaching appears to have room for improvement, only 7% (95%CI 4.1 to 10.3%) of final year medical students can identify oral cancer and less than 20% felt confident in oral assessment and diagnosis. This appears to transfer over into postgraduate medicine where only a mean of 22% of general practitioners can correctly diagnose oral cancer. The results of this review indicate that OMFS and oral cancer are not well covered in the medical curriculum. Doctors require a basic understanding of the OMFS speciality for appropriate referrals and clinical management. Furthermore, the ability of doctors to correctly deal with oral medical problems should be improved to optimise patient outcomes.

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**Keywords:** oral and maxillofacial surgery (OMFS); undergraduate medicine; dental education; medical education

## Introduction

Medicine and dentistry are traditionally viewed as distinct undergraduate disciplines, preparing students for two differ-

ent career pathways. However, there exists an important overlap for which concurrent topics such as oral health, oral cancer, and oral and maxillofacial surgery (OMFS) scenarios contain crucial knowledge for both doctors and dentists, to provide a gold standard of multidisciplinary care.<sup>1</sup>

With the increasing privatisation of the dental sector, our most vulnerable and in need patients may present to NHS medical professionals in need of dental care. Oral health is a pivotal part of undergraduate medical training in the United Kingdom, as students must be able to recognise signs and symptoms of oral disease which may be dental in nature or pathologically related to other medical conditions and body systems, to guide referral to a dentist and ongoing care. Likewise, OMFS is listed as an approved speciality in postgraduate curricula according to the General Medical Council (GMC),<sup>2</sup> although remains a significant educational gap in undergraduate curricula, despite being a part of the most

\* Corresponding author at: Arwel Poacher, Cardiff University, School of Biosciences, Cardiff, United Kingdom.

E-mail addresses: [glossopsc@cardiff.ac.uk](mailto:glossopsc@cardiff.ac.uk) (S. Glossop), [hamzaduffaydar@gmail.com](mailto:hamzaduffaydar@gmail.com) (H. Duffaydar), [hgjones44@gmail.com](mailto:hgjones44@gmail.com) (H. Jones), [ethan.p0706@gmail.com](mailto:ethan.p0706@gmail.com) (E. Peters), [timryan716@icloud.com](mailto:timryan716@icloud.com) (T. Ryan), [francesca.saleh@wales.nhs.uk](mailto:francesca.saleh@wales.nhs.uk) (F. Saleh), [lily.scourfield@nhs.net](mailto:lily.scourfield@nhs.net) (L. Scourfield), [PoacherA1@cardiff.ac.uk](mailto:PoacherA1@cardiff.ac.uk) (A. Poacher).

† Joint first authors.

‡ Senior author.

recent Royal College of Surgeons National Undergraduate Curriculum.<sup>3</sup>

Concerningly, existing literature has already demonstrated deficits in surgical education across the country with potential for improvement,<sup>4–9</sup> including for oral and maxillofacial surgery.<sup>10</sup> Whilst medical students do not require an in-depth understanding of such a specialised surgical field, a basic understanding of oral and maxillofacial conditions is necessary so that appropriate oral care for patients can be identified and coordinated.

This review aims to evaluate the provision of oral health, oral cancer, and OMFS-related topics in undergraduate medicine in the United Kingdom.

## Methods

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines<sup>11</sup> were followed throughout the review process to appropriately assess papers and to allow a systematic approach to this review.

The databases MEDLINE, EMBASE and SCOPUS were searched for literature using the following search terms:

('undergraduate' OR 'medical student\*' OR 'medical school') AND ('teaching' OR 'education' OR 'knowledge' OR 'prepared\*' OR 'confidence' OR 'awareness') AND ('maxillofacial trauma' OR 'maxillofacial surgery' OR 'OMFS' OR 'dental trauma' OR 'oral health' OR 'oral cancer' OR 'facial trauma' OR 'periodontal disease' OR 'dental health') AND ('United Kingdom' OR 'UK').

Additionally, reference lists of each article were searched for suitable literature after passing title/abstract assessment. A manual search of Google Scholar was also undertaken to obtain any relevant articles that did not appear in database searches.

### Inclusion and exclusion criteria

Articles that met the criteria of inclusion (Table 1) were considered for review and assessment by the authors for suitability. To be included in this review, articles had to be written in English and published within the last 20 years (2003 to 2023) to retain relevance in terms of modern-day teaching in undergraduate medicine.

The inclusion and exclusion criteria used to assess article suitability for this review.

### Title and abstract review

Two authors (SG, FS) independently assessed titles and abstracts of all papers according to the inclusion and exclusion criteria. Articles that met the agreed inclusion criteria were placed in a Microsoft Excel<sup>®</sup> (version 2310) spreadsheet for the full text review stage.

### Full-text review

Two authors (HJ, HD) each analysed the full texts of articles following the title and abstract review, to assess suitability in accordance with the criteria of inclusion. Articles for which both authors agreed on suitability were selected to be included and articles that both authors decided were not suitable were thus excluded. For any articles where both authors disagreed on suitability, a third review panel (EP, AP) undertook independent assessment to come to a final decision (Fig. 1).

Quality assessment was completed by two authors (HJ, HD) using the Medical Education Research Quality Instrument (MERSQI).<sup>12</sup> This assesses papers on six domains (study design, sampling, type of data, validity of evaluation instrument, data analysis, and outcomes). Five of these domains have a minimum score of 1 and all domains have a maximum score of 3, giving a possible score range of 5 to 18. A score of 5 indicates poor research quality and a score of 18 indicates high research quality.

## Results

Fourteen papers were included for review and had a mean (SD) MERSQI score of 10.8 (1.2), demonstrated by Table 2.

Medical Education Research Quality Instrument (MERSQI) scores for 14 of the papers included in this review.

### Exposure to the speciality of oral and maxillofacial surgery

Mahalingam et al<sup>13</sup> conducted a survey of first-degree final year medical students across five different universities, with a total of 186 responses. They discovered that 76% (141/186) of students indicated no exposure to the speciality at all, with the majority of those who did have OMFS exposure (37/45) answering that it was not part of any timetabled activity.

Table 1  
The inclusion and exclusion criteria used to assess article suitability for this review.

Criteria	Inclusion	Exclusion
Research participant	Studies discussing undergraduate medical students at any point of their course	Studies that solely focus on students not studying undergraduate medicine
Location	United Kingdom studies only	Any studies that are not based in the United Kingdom
Study type	Original research	Conference abstracts, reviews, correspondence
Timescale	Last 20 years (2003 to 2023)	Any studies published before 2003
Methodology	Mixed methodology (quantitative or qualitative)	Not applicable

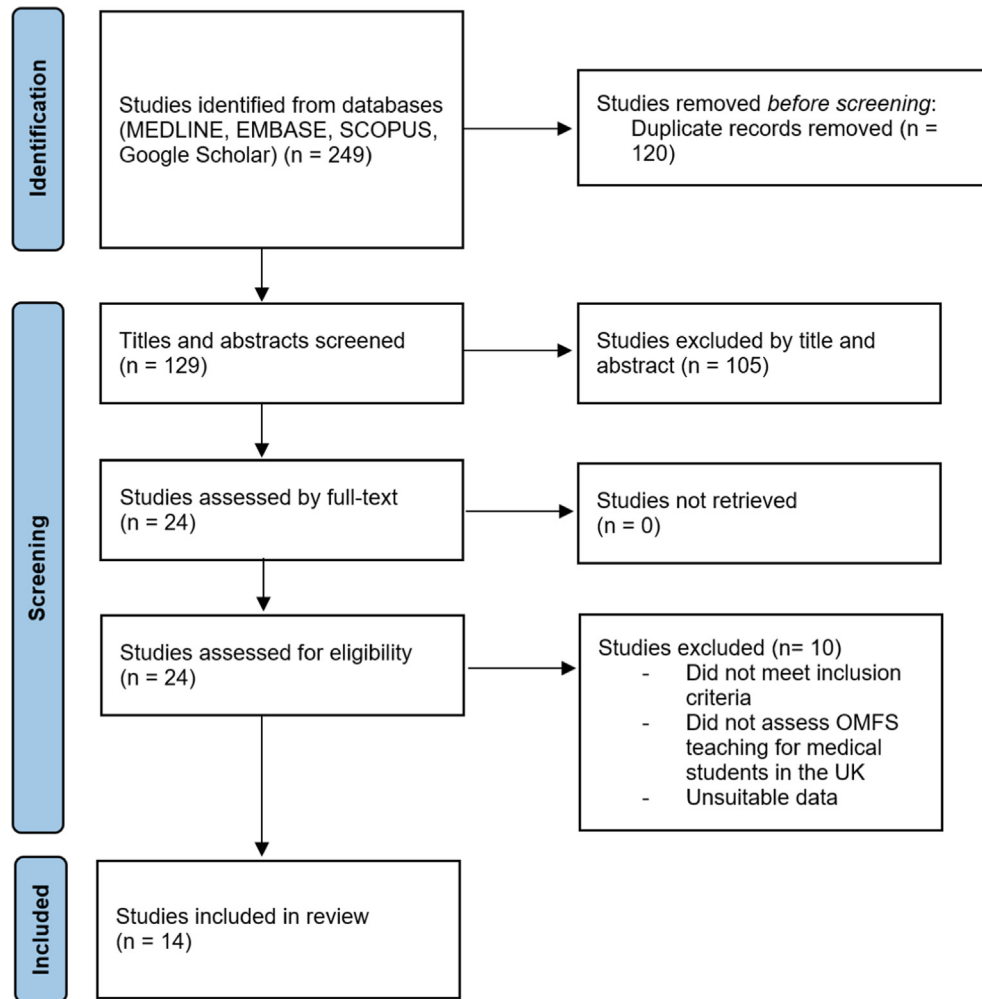


Fig. 1. A PRISMA flow chart outlining the article selection process.

Table 2  
Medical Education Research Quality Instrument (MERSQI) scores for 14 of the papers included in this review.

Study, by first author and reference	MERSQI Score
Mahalingam <sup>13</sup>	10.5
Jaibaji <sup>14</sup>	10.5
Hamid <sup>15</sup>	13
Harris <sup>16</sup>	12.5
Goodson <sup>17</sup>	12
Rehman <sup>18</sup>	12.5
Rehman <sup>19</sup>	10
Carter <sup>20</sup>	9.5
Keat <sup>21</sup>	9.5
Carter <sup>22</sup>	11
McCann <sup>23</sup>	10
Shanks <sup>24</sup>	10
Zargaran <sup>25</sup>	12
Khalil <sup>26</sup>	10

Authors report that 89% of the students (166/186) thought that exposure was not sufficient. Jaibaji et al<sup>14</sup> reported on another survey in which their data also suggested poor exposure. Of 76 final-year students across 15 different medical schools, 69 reported not having any placements related to

OMFS during their degree (90.8%) and over half (42/76, 55.2%) not having any OMFS teaching within their curriculum. Similar findings are shown by Hamid et al<sup>15</sup> with their study on final year medical student knowledge of OMFS. One hundred students from each of two medical schools (n = 200) were included, with 89% reporting no OMFS rotation weeks, and 64% reported not having any lectures in the speciality. However, 36% (72/200) did have 'at least one lecture in OMFS'. To corroborate these findings, a cross-sectional survey conducted by Harris et al<sup>16</sup> builds on the neglect of the OMFS speciality, with 77.2% of students (230/299) reporting no exposure to OMFS during their undergraduate degree, and 14.1% (42/299) reporting 'incidental exposure' on placement. Similar results are demonstrated by Goodson et al<sup>17</sup> with 72.3% of respondents across two medical schools (total respondents n = 253) having no form of exposure to OMFS. Only 70 students in this study had undertaken a placement in the speciality.

Rehman et al have conducted several studies surrounding undergraduate teaching of the OMFS speciality, one of which focuses on facial trauma education.<sup>18</sup> Of the 237 students who responded to a survey, 158 of them claimed to

have had no teaching on facial trauma. For the students who had experienced such teaching, 69 reported having had it during clinical placement and 10 learnt through surgical society events. This study found that 205 of the students felt that facial trauma examination should be taught, with 223/237 stating that they would attend a medical student course for facial injury examination and management. This demonstrates a significant desire from medical students to improve their knowledge and understanding of the clinical specialty, suggesting an awareness of students that it will be necessary in their future careers, which has not been reflected in their curriculum.

Another study by Rehman et al<sup>19</sup> researched the attitudes of medical students to OMFS careers. In a study involving 198 medical students, 61.1% had had no exposure to OMFS, while 24.8%, 12.1%, and 2% had 1–7 days, 1–4 weeks, and 4–8 weeks of exposure, respectively. Additionally, 43.4% of students from two medical schools reported the absence of OMFS societies, and 48.5% were uncertain about their presence. Furthermore, 97% of students were unable to identify resources or organisations for those interested in OMFS, with only 1% being aware of the British Association of Oral and Maxillofacial Surgeons (BAOMS). Given the generally decreasing competition ratios for OMFS training over the last five years<sup>27,28</sup> and the significant relationship between early exposure and career motivation, this is concerning for the future of the specialty.

#### *Oral cancer and dental education teaching*

Carter et al<sup>20</sup> assessed oral cancer knowledge amongst medical and dental students at a single British university, with 255 medical student responses and 109 dental student responses. When asked an open question regarding the ability to list risk factors for oral cancer, the dental students were able to list a greater number of risk factors than the medical students ( $p < 0.001$ ). Concerningly, 61% of the medical students had the opportunity to examine oral lesions in patients compared with 88% dental students ( $p = 0.0122$ ) and dental students felt significantly more informed about the appearance of oral cancer than the medical students ( $p < 0.001$ ).

These results are corroborated by a recent survey by Keat et al,<sup>21</sup> with responses from 50 dental students and 59 medical students. When asked regarding whether they routinely examine patients' oral mucosa, 98% ( $n = 49$ ) of dentistry students replied 'yes' compared with just 17% ( $n = 10$ ) of the medical students ( $p < 0.0001$ ). Additionally, 86% ( $n = 43$ ) of the dental students thought they had sufficient knowledge to 'detect and offer preventative advice for oral cancer' compared with just 7% ( $n = 4$ ) of the medical students, with 80% of the dental students and 95% of the medical students agreeing that more oral cancer training would be beneficial.

Carter et al<sup>22</sup> more recently questioned UK medical schools on their teaching of oral cancer in the curriculum. Of the 20 medical schools that responded, 55% were involved with OMFS surgeons as well as 65% for ENT surgeons. They also found that teaching time for oral health and

oral cancer varied from one hour, to a four-to-five-week course. Additionally, the format of such teaching showed variance, from didactic methods to clinical exposure. Similar findings were found by a study by McCann et al<sup>23</sup> with only 11 out of the 21 medical schools surveyed incorporating oral pathology teaching into their curriculum. Shanks et al<sup>24</sup> found that 243/334 medical students had not received tuition on how to examine the oral cavity and only 13/86 felt confident in diagnosing an oral cancer.

#### *Teaching interventions*

Only two reported intervention papers were found in the literature in relation to undergraduate medical students and OMFS. Zargaran et al<sup>25</sup> reported results of a one-day OMFS simulation course taken by 47 medical students (of which 36 completed the before, immediately after, and six-weeks after questionnaires). It was found that immediately following the course, all domains regarding knowledge increased significantly; anatomy ( $p < 0.01$  for each of regional, clinically applied, structural, and pathological), emergency management of patients ( $p < 0.01$  for risk factors, treatments, investigation and  $p = 0.03$  for presentation), OPG interpretation ( $p < 0.01$ ), and training pathway ( $p < 0.01$ ).

A study by Khalil et al<sup>26</sup> studied a mixture of dental and medical students and clinicians. The intervention was a webinar series of five episodes which attracted 183 participants. Topics covered included the subspecialties of OMFS, a week in the life, and an OMFS trauma lecture. Of the feedback obtained by 70 participants, 96% stated their knowledge had improved with 86% more likely to pursue a career in OMFS.

#### **Discussion**

This review highlights that exposure to both OMFS and dental health education in the UK undergraduate medical education could be improved.<sup>29</sup> The absence of specific guidance from both the General Medical Council (GMC) and Medical Schools Council (MSC) and the apparent lack of coverage in medical school curricula creates a significant gap in undergraduate medical training. Studies have recorded the advantage of physicians having the ability to identify oral diseases across diverse segments of the population to enable early identification and access to treatment.<sup>30,31</sup> This has the potential to reduce clinician confidence in identifying oral disease, impacting recruitment to OMFS and ultimately patient outcomes. One study found that OMFS awareness amongst postgraduate medical trainees was very low,<sup>32</sup> with another study reporting 87.1% of surveyed medical students believing more teaching on head and neck cancer would be beneficial,<sup>33</sup> indicating scope for potential improvement in both undergraduate and postgraduate curricula.

Disease stage at the time of diagnosis is acknowledged as a crucial prognostic indicator for oral cancer.<sup>34,35</sup> A significant proportion, specifically two-thirds of patients, still receive a diagnosis at an advanced disease stage, resulting

in a five-year survival rate of 50% or lower.<sup>36</sup> Late presentation and clinical identification are contributory factors to this poor outcome, despite the advances in treatment. Furthermore, around 380,000 dental consultations are carried out in general practice annually in the UK.<sup>37</sup> Given the number of dental consultations by GPs, this may be a useful resource to capture a significant number of oral conditions, including oral cancers, early in the disease course. However, there is a fine balance between the number of referrals overwhelming the OMFS specialty and appropriate referrals which reduce unnecessary delays and likely result in a reduced burden on the service as a result of improving patient outcomes. This balance would likely be aided by improved education of medical practitioners in dental health. One meta-analysis does report that both GPs and dentists make the most oral cancer referrals to OMFS, with dentists most likely to refer cancers at earlier stages.<sup>38</sup> Further research into the true impact of and reasons for the later stage of medical compared to dental referrals would be useful, however, as the literature does not reach a clear conclusion.<sup>39–44</sup>

Evidence presented in this review suggests there is progress to be made in medical education to close this gap. Further, our results have highlighted the extent of disparity between medical and dental students when it comes to identifying oral pathology, and indicate a clear need for improved and cross-disciplinary education. Whilst traditional medical school curriculum included a combined pre-clinical course before further specialisation of dental and medical students in their later years of study, this is no longer the case. Whilst some of the papers included in this review may have included this mixed course, there is no way to review its impact in the literature. However, this may provide a solution to some of the deficits in understanding highlighted in this review.

The two intervention studies included in this review<sup>25,26</sup> indicate that knowledge of OMFS and oral cancer can be increased effectively in a short space of time with an online series. This may play a part in the future of OMFS and dental health teaching, working towards correcting disparities in clinical placement exposure dependent upon geographical location. However, it is evident that more research into undergraduate OMFS exposure is required and importantly, further interventional studies with a variety of teaching methods<sup>45</sup> to develop a gold standard for teaching which is pragmatic for integration in modern curricula. This should be continually re-assessed to ensure we are adequately equipping tomorrow's doctors. Interestingly, none of the studies analysed in this review reported on oral manifestations of systemic disease, a topic that could be explored in further research.

Despite described challenges, the incorporation of Student Selected Components (SSC) emerges as a potential avenue for exploration, allowing medical students to gain exposure to OMFS if able to self-arrange projects in this specialty. Prior experience in OMFS appears to be a factor contributing to students wishing to proceed with a dentistry degree following medicine.<sup>46</sup> The evolving landscape of

medical specialisation necessitates a reconsideration of traditional boundaries to ensure comprehensive and patient-centric education. Self-directed learning can also be beneficial, with the British Association of Oral and Maxillofacial Surgeons providing a useful resource for students and healthcare professionals to address gaps in education.<sup>47</sup>

It is suggested in the literature that students would benefit from incorporation of a structured curriculum for dental concepts. This could be combined with teaching of other topics such as anatomy, oncology, and other less well-resourced surgical specialties. For example ENT,<sup>48–51</sup> an area of medicine that faces similar issues to OMFS despite being a subject that makes up 50% of paediatric and 10% of adult referrals,<sup>51</sup> faces a similar issue to that of OMFS<sup>8</sup> and could be integrated into OMFS/surgical speciality teaching, to reduce the cost and time burden of these curriculum changes on medical schools.

The heterogeneity in methodology in current studies of medical education in OMFS and oral health makes direct comparison challenging and it should be noted that many systemic reviews of undergraduate teaching indeed show a deficit in understanding.<sup>4–6,8,10,52,53</sup> Going forward, collaborative studies with consensus in approach is important to accurately identify the learning needs of medical students in this area. The most logical initial step would be a cross-sectional evaluation of current OMFS exposure, across the UK, with correlation between exposure and outcomes such as basic science understanding, clinical ability, and career intention.<sup>54</sup> A methodologically-sound paper, that utilises the assessment of understanding rather than just subjective confidence, would improve awareness of the potential gap in undergraduate education in this area and encourage cross collaborative research going forward. The existing evidence as presented in this review suggests adequate education in dental health is key for medical understanding of OMFS and oral health, and therefore, vital for safe patient care.

### Conflict of interest

We have no conflicts of interest.

### Funding

Not applicable.

### Ethics statement/confirmation of patient permission

Not required.

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