Specialist competencies in occupational medicine: appraisal of the peer-reviewed literature

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Background A re-assessment of competencies and therefore learning outcomes for higher specialist training in occupational medicine (OM) is being undertaken. Although peer-reviewed literature on the subject exists, it is limited and needs appraisal.

Aims To search, and critically appraise the peer-reviewed literature on specialist competencies in OM.

Methods Systematic search of a range of databases of peer-reviewed literature, followed by criterion based appraisal and categorization of the findings.

Results Two hundred and thirty five papers were found of which only 20 were left after application of the grading and exclusion criteria. These addressed competencies from four perspectives: peer consensus, client, educational and legal.

Conclusions Limited evidence can be obtained from the peer-reviewed literature on specialist competencies in OM. However, it suggests the main paradigms for deriving these competencies as well as indicating gaps and the manner in which these might be filled.

Key words Competencies; occupational medicine; review; specialist.

Introduction

The need to determine and re-evaluate competencies and therefore learning outcomes for higher specialist training in occupational medicine (OM) is widely acknowledged. In keeping with this, the Faculty of Occupational Medicine (FOM) of the Royal College of Physicians of London is developing an educational strategy to determine how postgraduate training in the specialty will be developed and assessed over the next 10 years. Therefore, it was considered essential to conduct an appraisal of the peer-reviewed evidence base regarding the competencies and learning outcomes which higher specialist training in OM should accomplish.

This paper presents the results of this exercise, discusses the methodological issues involved and makes recommendations on how further progress may be made.

Methods

For the purposes of this study, a ‘valid evidence base’ in the context of setting competencies and learning outcomes for trainee occupational physicians was principally defined as those peer referenced papers adopting a recognized research design. Other peer referenced papers identified which were based on other factors such as legal, ethical or educational approaches were included if judged particularly relevant to considerations of competencies or outcomes.

It was appreciated that formally searching the scientific literature might not identify all the published work, since it has to be acknowledged that the ‘grey literature’ also contributes to this subject. Nevertheless, since the peer-reviewed literature is clearly defined with bibliographic criteria, this exercise was limited to these sources only (however, some consideration of grey literature is included in the Discussion section).

A search of Medline (as Pubmed) was undertaken using the terms ‘occupational’ and (‘education’ or ‘specialist’ or ‘accreditation’ or ‘postgraduate’) ‘industrial’ (‘education’ or ‘specialist’ or ‘accreditation’ or ‘postgraduate’). Those
not in English, obviously not relevant (e.g. relating to occupational therapy, undergraduate education, nursing education, individual opinion), or published before 1980 (judged to be a reasonable cut-off) were automatically excluded. A repeat search was undertaken using the same terms for the NIOSHTIC and HSEline databases (accessed via OSHROM) to identify any additional papers not identified by the Medline search.

Each reference was given a score, using a five-point scale (1 = no value, 5 = very valuable), based on the following criteria:

(i) Recognized study design (none = 1, low strength = 2, valid method = 3).
(ii) Contains identifiable competence implications (=1, if not = 0).
(iii) Contains identifiable learning outcomes associated with competence implications found in (ii) (=1, if not = 0).

References scoring 2, or less, were discarded unless reviewers considered them to have a specific value outweighing the above criteria.

Results

The initial Medline search identified 235 papers. Combination with the NIOSHTIC and HSEline searches and application of the exclusion and grading criteria reduced the relevant papers to 20 [1–20]. Due to the relatively small number of identified papers, a review of their reference lists was undertaken to identify other relevant documents [21–29].

Interpretation of these papers suggested that several main ‘drivers’ underpinning the views expressed on required competencies were identifiable. These were given the titles ‘educational’ (reflecting educational and management theory), ‘legal’ (based on national professional and legislative practice), ‘client’ (based on needs and opinion of stakeholders in occupational health other than doctors) and ‘peer’ (based on peer professional opinion) driven.

The main drivers for each paper scoring 2 or more were considered in full, being 13 peer-based [6,11,15–19, 21–23,25–28], 9 legal [2,5,7,9,10,13,14,17,27], 10 educational [1,3,4,8,11,12,14,19,20,24] and 1 client-driven [29]. This imbalance is of concern, when research suggests a disparity between peer and client perspectives of key competencies for occupational health physicians (OHPs). This is an empirical classification with obvious weaknesses (e.g. the drivers are not in some cases mutually exclusive, so double counting may be possible) but identifies the principal aspects of the papers.

A summary of the key findings for the 29 key references identified is provided in Table 1. (A fuller version of this table is available as Supplementary data at Occupational Medicine Online).

Discussion

The process of identifying a scientifically valid evidence base infers that the definition of what an OHP is and does is commonly accepted, and that by defining the tasks to be accomplished, specialist-level standards of competence and therefore corresponding learning outcomes for trainee specialists may be identified. Many of the reviewed papers were descriptions of practice in different countries [5,6,7,9,10,18] which served to highlight that no such consensus currently exists internationally, by virtue of tradition or legal imperative. This study showed substantial variation in what an occupational physician is regarded as being, and therefore as needing to learn. Dinman [24] offers a useful definition of competence and perhaps consensus needs first to be sought at this level before further progress can be made in identifying specific competencies.

We found that for all areas of occupational health practice, those standards of competence which have been published at best derive from structured peer review (Delphic) methods rather than a more robust scientific evidence base. Those papers addressing issues of competence and outcomes instead represent a variety of dominant influences which we refer to as ‘key drivers’ and which are discussed further below. The lack of an ‘objective’ validity for the lists of competencies which currently exist confirms the views of previous authors [25].

A valid research-derived evidence base to support the setting of standards of competence required for accreditation as a specialist in OM could not be identified. Neither did any one paper discuss how an evidence-based approach could be developed. Additionally, most papers fell short as regards specifying the required outcomes and competencies for specialist training. For those that did only a minority provided any prioritization of their suggested subjects. Therefore a less scientific, more pragmatic, approach was required.

The circular, reiterative, quality improvement process proposed by Franco and Bisio [4] for the basis of curriculum development lends itself to audit and continuous improvement in the face of changing social priorities. However, Franco’s client-driven approach is not necessarily the only or best means of progress, as discussed below. Such a cycle may be deemed to commence from ‘standard setting’. In turn, this determines competencies and therefore, for educational purposes, learning outcomes. These are determined by delivery followed by assessment (such as examination or other means).

Quality improvement cycles may be entered at any point. However, because learning outcomes may be extrapolated from desired clinical outcomes, the latter may prove the logical point of entry. OM suffers as a specialty since its required practical outcomes are less readily apparent, and arguably more numerous, than for other specialties. Acute surgical and medical specialties have
<table>
<thead>
<tr>
<th>Reference number</th>
<th>Study type</th>
<th>Competency implications</th>
<th>Associated learning outcomes (if apparent)</th>
<th>Overall relevance (1 = very little, 5 = highly relevant)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Controlled study of problem-based versus traditional lectures as means of training occupational physicians (OPs).</td>
<td>Supports problem-based learning.</td>
<td>Knowledge, performance indicators and satisfaction. Educational driver.</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>Questionnaire-based self-assessment of general and individual training.</td>
<td>Lists legally based competencies of Polish OPs.</td>
<td>None. Educational driver.</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>Establishes the effectiveness of postgraduate educational interventions in ensuring evidence-based practice by OPs.</td>
<td>Provides a model for evaluating postgraduate training programmes by establishing performance indicators.</td>
<td>None. Educational driver.</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>Discussion paper, considering total quality management (TQM) as applied to medical education, using OM as worked example.</td>
<td>Proposes a mechanism, using TQM principles.</td>
<td>Addresses factors relevant to defining objectives of the process. Educational driver.</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>Discussion paper. Emphasizes new needs and expectations for OPs.</td>
<td>Emphasizes need for OPs to be self-learning/continually improving.</td>
<td>Describes need for an active approach to learning to be imbued in new OPs. Educational driver.</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>Demographic study of Singapore’s occupational health (OH) needs.</td>
<td>Comment on postgraduate OP training in Singapore.</td>
<td>Differences between EU countries are more influenced by differences in national legislation than clinical issues.</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td>Comparison of OP postgraduate training requirements in some EU countries.</td>
<td>Supports and argues the need for good epidemiology skills for OHPs.</td>
<td>All support the inclusion of clinical, practical, investigatory and research training elements. Legal driver.</td>
<td>3</td>
</tr>
<tr>
<td>8</td>
<td>Discussion paper, emphasizing need for environmental epidemiology training for doctors.</td>
<td>Supports need for epidemiology/research skills.</td>
<td>Training in epidemiology for OHPs. Educational driver.</td>
<td>3</td>
</tr>
<tr>
<td>9</td>
<td>Description of postgraduate training in OM in China.</td>
<td></td>
<td>Legal driver.</td>
<td>2</td>
</tr>
<tr>
<td>10</td>
<td>Description of the UK system of specialist training.</td>
<td></td>
<td>Outdated now.</td>
<td>2</td>
</tr>
<tr>
<td>11</td>
<td>UK-developed questionnaire circulated to Polish OPs.</td>
<td>Three dimensions identified: substantive, personal and comparative.</td>
<td>Relative importance of knowledge, skills and experience for each competence identified. Educational driver.</td>
<td>4</td>
</tr>
<tr>
<td>12</td>
<td>Study of the potential role of the Internet in training in OH.</td>
<td>Emphasizes utility of web-based teaching packages.</td>
<td>Concludes wide range of identified training could be Internet delivered. Educational driver.</td>
<td>4</td>
</tr>
<tr>
<td>13</td>
<td>Describes the state of OH provision in Yugoslavia in 1987.</td>
<td>None</td>
<td>Concluded now outdated. Legal.</td>
<td>2</td>
</tr>
<tr>
<td>14</td>
<td>Descriptive paper on specialist-level qualification.</td>
<td>None</td>
<td>None. Educational driver.</td>
<td>1</td>
</tr>
<tr>
<td>15</td>
<td>Focus group-based development of draft consensus on role of business ethics in practise of OM.</td>
<td>Supports the needs for training in ethics for OPs.</td>
<td>Ability of OPs to adapt their ethical approach to the varying relationships involved in OM. Peer driver.</td>
<td>3</td>
</tr>
<tr>
<td>16</td>
<td>Postal questionnaire study of OPs perceived CPD needs.</td>
<td>Demonstrates OPs perceived needs of continuing professional development.</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Reference number</td>
<td>Study type</td>
<td>Description</td>
<td>Competency implications</td>
<td>Associated learning outcomes (if apparent) + main driver</td>
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<tr>
<td>17</td>
<td>Describes specialist training in OM in Denmark.</td>
<td>Supports need for research training. Predicts need for greater emphasis on work psychology and less obvious environmental disease determinants.</td>
<td>Legal driver.</td>
<td>2</td>
</tr>
<tr>
<td>18</td>
<td>Descriptive paper on the obstacles and possible ways to progress the development of preventive medicine.</td>
<td>Descriptive paper.</td>
<td>Peer driver.</td>
<td>2</td>
</tr>
<tr>
<td>19</td>
<td>US Delphic study of OPs perceptions of CPD needs for OH law.</td>
<td>Scores preferred areas of competency for OPs.</td>
<td>Peer driver.</td>
<td>4</td>
</tr>
<tr>
<td>20</td>
<td>Editorial referring to new training arrangements for OPs.</td>
<td>Statement of the core value guiding the work of physicians. Presents 10 areas to be covered in postgraduate education of OPs.</td>
<td>Educational driver.</td>
<td>2</td>
</tr>
<tr>
<td>21</td>
<td>Opinion-based description of learning priorities in OM and allied professions.</td>
<td></td>
<td>Requirement for evaluation of teaching programmes for by measuring impact on World Health Organization health indicators.</td>
<td>2</td>
</tr>
<tr>
<td>22</td>
<td>Summarizes background to the UK FOM paper on good medical practice for OHPs. Covers development process and recommended standards.</td>
<td>Need for doctors to meet basic minimum standards, including care provided, CPD, probity and ethical behaviour.</td>
<td>Peer driver.</td>
<td>5</td>
</tr>
<tr>
<td>23</td>
<td>Delphic study of core competencies for European OPs.</td>
<td>Provides ranked list of respondents' views on core competencies ratings from most important.</td>
<td>Peer driver.</td>
<td>5</td>
</tr>
<tr>
<td>24</td>
<td>Review based on educational theory.</td>
<td>Describes multistep process of education as three sequential phases: knowledge transfer, competence development and professional inculcation.</td>
<td>Competency development should include integration of multiple stores of information applicable to the management of a clearly defined task with a clearly measurable outcome.</td>
<td>3</td>
</tr>
<tr>
<td>25</td>
<td>Editorial referring to the Glasgow conference proceedings published by McDonald et al.</td>
<td></td>
<td>Educational driver.</td>
<td>3</td>
</tr>
<tr>
<td>26</td>
<td>Questionnaire study of perceived ethical needs of 70 OPs in Netherlands, UK and Singapore.</td>
<td>Emphasizes need for awareness of ethical issues as a required competency area.</td>
<td>Training in medical ethics for OH implies that a formal examination is necessary.</td>
<td>3</td>
</tr>
<tr>
<td>27</td>
<td>Project identifying competencies in the preventive medicine specialties. Peer group opinion-based approach.</td>
<td>Emphasis on competencies related to preventive services and health care management.</td>
<td>Peer driver.</td>
<td>3</td>
</tr>
<tr>
<td>28</td>
<td>Account of a training programme for physicians interested in occupational health.</td>
<td>Seven content areas are described.</td>
<td>Legal driver.</td>
<td>3</td>
</tr>
<tr>
<td>29</td>
<td>Delphic survey of employers and employees from public and private organizations.</td>
<td>Law/ethics, occupational hazards, disability, fitness for work and communication more important than competence in management, health promotion, research methods and environmental issues.</td>
<td>Client driver.</td>
<td>4</td>
</tr>
</tbody>
</table>
tangible endpoints, cure and/or control. Although these are also desirables for OM, they are not the only required outcomes. In particular, OM is primarily a preventive specialty with ‘negative’ outcome of disease avoidance a required outcome. OM involves numerous relationships: doctor–patient, doctor–employer, doctor–enforcer and so on, each of which entails its own separate defined objectives. This perspective acknowledges that OM is not an invariably scientifically driven but is in large part driven by non-scientific considerations such as legal or managerial. Thus, a scientifically evidence-based approach, although desirable, may for large elements of practice prove unrealistic.

An uncritical attempt to list the competencies on the basis of merging the various views which have been expressed in the literature is not to be recommended. Such an effort would represent no more than an amalgamation of peer-consensus-driven opinions from the various countries which have published such views. It is known, though not necessarily documented in the peer-reviewed literature, that many ‘grey’ reports draw on each other’s content, and therefore automatically appear to corroborate or reinforce each other—but in an artefactual and potentially biased manner. Thus, it is essential to have an ongoing process for maintaining competencies, learning outcomes and hence a syllabus which adequately reflects occupational health practice and maintains its validity. This approach is similar to that proposed by Macdonald et al. [23]. The key drivers identified in our study—peer-based, legal, client and educational drivers—could be used as a basis for analysing the transactions conducted by specialist OHPs in the UK, from which learning outcomes and competencies may be derived. In keeping with the multi-faceted nature of OM’s transactions, the ‘client-driven’ category for those activities performed at the request of the various clients served, e.g. employers, is important, but of itself can be limited and narrow in perspective. This category has recently been recognized by the Health and Safety Executive, as is discussed below [30]. None of the papers identified addressed competency or learning outcomes related to sickness absence advice from OHPs. This function represents a considerable element of UK OHP professional activity [17] and is of considerable interest to organizations funding occupational health services. The absence of a literature base on this subject in relation to OHP training may in itself be symptomatic of a failure by the profession to analyse and evaluate this area of practice.

These four categories (which should not be regarded as mutually exclusive) are to be recommended as a basis from which competencies, learning outcomes and hence a suitable syllabus for postgraduate training could be derived.

A suitable baseline review of the syllabus would consist of the following.

Peer review perspective

The professional behaviours set out in ‘Good Medical Practice for Occupational Physicians’ should be included in the revised syllabus. This document also underpins the core curriculum for Foundation training [31]. This would integrate specialist training with the behaviours and activities involved in revalidation under the new General Medical Council requirements, thus equipping emerging specialists with revalidation skills and habits. Account of developments in postgraduate OM training within other European Union (EU) countries will also help achieve consistency of practice on the basis of an increasingly common occupational health and safety legislative base. A further workshop to consider the European dimension of training: the implications of European equivalence of specialist qualification identified that a common approach, i.e. a common syllabus within Europe is highly desirable (provided it can address the difficulty of OHPs having different roles in each EU country). In reviewing grey literature from Europe and beyond, it is clear that a number of key competencies are replicated across training strategies, and agreement on these core competencies would provide a useful platform on which to build. As Dinman [24] highlights, there will continue to be varying needs at the level of specialist or augmentative knowledge; however, consensus on core knowledge and therefore core competencies should be achievable. A paper collating the views of EU OHPs on core training requirements has recently been published [32].

Client perspective

This could be progressed in line with the recommendations from Harrington and Ewan McDonald [29]. There is a growing acknowledgement of the value of consultation across stakeholder groups, and this is particularly relevant in the multidisciplinary field of occupational health and safety. Educational bodies need to join government and regulatory bodies in ensuring competencies take account of client views and changing needs, and that all groups work towards developing innovative ways of delivering cost-effectives occupational health services relevant to sector specific size and needs.

Educational perspective

Suitable academic medical educational input should assist the development of syllabus content, competencies and learning outcomes. Published literature highlights a number of educational strategies as being of benefit, these include problem-based learning [1], defining appropriate performance indicators and learning outcomes [3], a total quality approach encompassing self-learning and continuous improvement and development [4,5,16,22], an assessment process which provides both
formative and summative components [4] and which acknowledges changing societal needs [4,17]. Clearly much work has been done by the working group on 'Modernising Medical Careers' [30] and the Academy of Medical Royal Colleges [31] in devising training strategies which meet the future needs of medical practitioners and it is essential that OM as a speciality both reflects best practice and has a central role within the ongoing evolution of medical training.

**Legal perspective**

While the difference in legislative practice across the EU is acknowledged, EU Framework directives do require a certain consistency of approach and this may provide a useful basis on which to develop a consensus for core competencies across member states. However, this implies the necessity of legal representation on the relevant syllabus committees and effective dialogue between these groups.

Though comparison with other specialties has not been made in this review, our specialty is unlikely to be alone in the challenges it faces in this area. During our work, we have become aware of a number of gaps in the evidence base. The peer drivers are often directed by senior members of the profession (the good and the great). To an extent, this may also be true of educational and legal drivers. Only two papers [1,3] explicitly sought to investigate means of ensuring understanding of, and compliance with, evidence-based guidelines relating to work-related health conditions. While this may reflect limitations in the search terms adopted in this study, it is of concern that the use of evidence-based data in both the education and revalidation of OHPs has not been investigated to a greater extent. On issues of ethics, there was no unanimity of opinion, even between OHPs from the same country, further complicating the identification of measurable learning outcomes [26]. However, core competencies do exist, as reflected in current training curricula, and further dialogue should be encouraged between relevant groups to achieve consensus.

Several authors emphasize the need to ensure an ‘open and enquiring mind’ as a competency of OHPs. While not explicitly stated, the method of establishing this competency in a number of EU countries appears to be the submission of a research project [8,9,17,21]. No alternative methods of assessment were noted from the literature related to the assessment of attainment of this training aim.

The experience of specialists who have recently completed their training is an important one. Such a study has been undertaken (J. Moore, R. Agius, F. Gallagher and A. Pilkington, in preparation) and will be reported upon shortly.

The current review of postgraduate training requirements across medical specialities and the proposals which have developed from Modernising Medical Careers [30] provide a timely opportunity for OM to review its training competencies. OM is unique in providing the clinical experience in both the National Health Service and industry. It is important that these differences are understood by those tasked with developing and implementing Foundation training programmes [31]. It is important that potential gaps in the clinical experience of those intending to pursue postgraduate training in OM are identified and addressed at an early stage of training to ensure a smooth transition between the foundation and specialist programmes.

This paper addresses ‘by definition’ those competencies to be achieved at or by the end of higher specialist training. However, Modernising Medical Careers [30] additionally envisages intermediate criteria required to progress to further higher training in the specialty. The literature review has not provided enough information to characterize these intermediate competencies. Nevertheless, it appears intuitive and efficient to aim for a congruency between these intermediate specialist training competencies and those intended for generalists with a special interest notably the Diploma of the FOM [33]. This may also facilitate the admission of non-specialists with such a qualification to a higher specialist training programme in OM.

All medical practitioners are faced with constant changes in clinical practice. This is particularly true in OM which has seen a significant decline in classical industrial diseases in recent decades and the emergence of a spectrum of health conditions which reflect both changes in technology and a greater awareness of the role of psychosocial factors. The practice of OM is also influenced by changing societal concerns and legislative practice. There is a need for the profession to keep pace and to be seen to address societal concerns such as environmental and sustainability issues. The changing face of the EU will continue to have a significant impact on the practice of OM within the UK. This all implies a knowledge base for specialist training which is proactive in addressing these needs.

It is acknowledged that there is currently a limited evidence base on which to develop competencies for the future training needs of OM. The establishment of such an evidence base is therefore essential to the success of future training initiatives and the credibility which OM has within both its peer group and wider society. The growth and accessibility of IT provide an opportunity to gather relevant data, disseminate good practice and ensure consistency of practice. Those who fund academic research have a responsibility to encourage the growth of evidence-based medicine, and those who publish peer-review journals should establish regular series which stimulate authors to submit relevant findings.

However, much of this discussion and the main drivers highlighted above suggest the need for a broader multidisciplinary approach than currently exists across medical
disciplines. Within OM, there is a need for all relevant stakeholders to be actively involved in shaping future training strategy. Given the variation in practice across the EU, there is also a need to identify individuals from each area of the EU to form a joint working group specifically charged with the task of agreeing competencies. If successful, this should have sufficient credibility to influence training needs across the wider global marketplace.

Conflicts of interest
None declared.

References
31. Curriculum for the Foundation Years in Postgraduate Education and Training. The Foundation Programme Committee of the Academy of Medical Royal Colleges, in co-operation with Modernising Medical Careers in the Departments of Health, 2005.