

# Factors Influencing Dental Practitioner Performance: A Summary of a Recent Literature Review

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## Abstract

**Aims:** The aims were to perform a literature review of the factors that impact upon dentist performance, to identify gaps in the literature, and to suggest areas of further research. **Methods:** A range of potential factors was identified from a previous review of factors influencing poor performance in medical doctors. Search terms relevant to these factors were devised and the Medline database was searched for relevant papers. Further papers were identified from the reference lists of those identified via Medline. Directors and senior managers of organisations involved in the management of dentists with performance concerns were contacted and provided details of reports, websites and other grey literature, relevant to the review. **Results:** The review suggested that there are increasing numbers of factors that have the potential to influence the performance of a dental practitioner. These include the gender ratio, ethnicity, and skill-mix of the dental workforce. Most dental schools in Europe are now accepting more females than males, and there are increasing numbers of dentists from the European Union (EU) and overseas working in the United Kingdom (UK). Other factors include health, changing working patterns, workload, and the environment. The quality of many of the studies reviewed was often rather poor. A wide range of areas for further research was identified. **Conclusions:** The findings from this work may be applicable to the global community of dentists and could contribute to the ongoing research programmes of international organisations. It would also be extremely useful if future studies could be undertaken in partnership with all organisations that collect information and data on poorly performing dentists.

*Key Words: Dentist Performance, Influencing Factors, Literature Review*

## Introduction

### (Background to the Literature Review)

The National Clinical Assessment Service (NCAS) works throughout the United Kingdom (UK) with healthcare organisations and individual practitioners to advise on handling concerns about the performance of dentists, doctors and pharmacists. The organisation serves to clarify these concerns, understand what is leading to them, and help those involved to resolve their concern or concerns.

NCAS also runs a programme of evaluation, research and development to support its initiatives and services. One such initiative has been the literature review described in this paper, which exam-

ines the factors that influence dentists' performance.

Some clinicians are referred to NCAS after disciplinary action has been taken following complaints from patients. Others are referred by colleagues or employers who can see that the practitioner concerned has a problem, so as to try to resolve the problem before there is a patient complaint. By 31st March 2011, 640 dentists had been referred to NCAS over an eight-year period [1]

A preliminary assessment, which was informed by a previous review of factors underpinning poor performance in doctors [2] (not dentists), suggested that there were an increasing numbers of

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factors that have the potential to influence the performance of a dental practitioner. These included the gender ratio, ethnicity, skill-mix and context of practice. Most dental schools in Europe are now graduating more females than males [3] and there are increasing numbers of dentists from the European Union (EU) and overseas working in the United Kingdom (UK). On 31st December 2009, just under 10,000 out of the 37,000 dentists registered to practise in the UK had qualified from dental schools outside the UK [4]. Of these, just under 6000 came from EU member states (97% came from 19 EU member states with, among others, 980 from Sweden, 849 from Poland, 344 from Romania, 202 from Hungary and 167 from Bulgaria) [4]. Other factors appeared to include health, changing working patterns, workload and the environment [2].

It is important to understand what is meant by “performance concerns”. NCAS defines the term as any aspects of a practitioner’s performance or conduct which:

- Pose a threat or potential threat to patient safety.
- Expose services to financial or other substantial risk.
- Undermine the reputation or efficiency of services in some significant way.
- Are outside acceptable practice guidelines and standards [1].

The literature review took place against this background.

The full literature review can be accessed from the Publications Section of the NCAS website [www.ncas.npsa.nhs.uk/publications](http://www.ncas.npsa.nhs.uk/publications), under the heading “Evaluation, research and development”. This paper summarises the review.

### **Aims of the Review**

The aims of the review were:

- To perform a literature review of the factors that impact upon dentists’ performance.
- To identify gaps in the literature, and suggest areas of further research.

### **Methodology**

For the purposes of this review, the terms “dentist” or “clinician” include dental practitioners working in all areas of dentistry (private and public general

practice, universities, hospitals, etc.), although as 90% of dentists in the UK work in general practice, the review focused primarily on this group.

In keeping with the scope of this review, the literature search was primarily focused on UK-based studies and reports. However, when gaps in the UK-based evidence were identified, attempts were made to find information from studies based outside the UK. Relevant studies were identified using PubMed Medline up to 30th June 2010, from references cited in the papers obtained from this database and from government and other reports, and grey literature.

In order to help identify such reports and grey literature and gain insights into performance problems that have occurred, directors, senior managers and clinicians from 12 UK organisations, that are involved when dentists have such problems, were contacted. These organisations included regulatory bodies, such as the General Dental Council, counselling associations, such as the British Dental Association’s Sick Dentists Scheme, dental indemnity insurance providers, dental health insurers, and other groups.

A previous literature review that considered factors influencing poor performance of (medical) doctors [2] suggested that the following factors were relevant. They were therefore investigated for dental practitioner performance and were:

1. A consideration of demographic factors.
2. The impact of health on performance.
3. Stress, burnout and other work place related illnesses in dentistry.
4. Smoking, and the misuse of drugs and alcohol in dentistry.
5. Psychological factors related to performance.
6. The role of education and training.
7. The impact of work-related factors upon performance.
8. Leadership in National Health Service (NHS) dentistry.

The search terms that were used appear at the beginning of each subsection of the results.

It should be stressed that the review was not a systematic review. However, the search strategy outlined was designed to be comprehensive, and to allow for the selection of the most pertinent primary studies, reports and relevant review papers and a general assessment of their quality.

## Results

Results are presented under the eight headings listed previously, along with recommendations for further research.

### A consideration of demographic factors

The search terms used were:

*Demographics*

*United Kingdom*

*Ethnicity*

*Gender*

*Female dentists*

*Performance of dentists*

*Dentist gender and performance*

*Dentist gender and poor performance*

*Dentist gender and disciplinary measures*

*Dentist gender and performance concerns*

*Dentist age and performance concerns*

*Dentist age and poor performance*

*Overseas dentists and performance concerns*

*Overseas dentists and poor performance*

*Dental profession*

*Communication skills*

*Culture*

*Statistics of dentists in the UK*

*Gender differences*

*Minority groups in dentistry*

*Afro-Caribbean students in dentistry*

*Black students/dentists*

The proportion of female general dental practitioners (GDPs) is steadily growing in the UK, USA, and many parts of Europe [5-9]. Such changes have had a significant impact on working patterns of the dental workforce, as female dentists are more likely to work part-time than their male counterparts [7,10,11] and not all female dentists will return to dental practice after a career break [11]. This may have implications for the dentist in terms of productivity and workload [7,10,12]. However, conversely, this could also mean a better work-life balance, which could enhance clinical performance.

The literature demonstrates how in both verbal and non-verbal communication, men and women communicate differently [5,13]. Furthermore, communication skills have been found to be superior in women, and this may lead to more effective interactions and relationships with patients [14].

The numbers of dentists originating from other EU member states and from overseas already registered and working with the NHS in the UK have increased significantly in the last 10 years [4,8,15].

One small study demonstrated how the UK general public is most likely to choose a white male as their dentist, but that there was only limited evidence to suggest that individuals matched their choice of dentist to their own ethnicity [6].

Areas for future research include investigating:

- The impact of gender upon clinical performance, due to the differences in working patterns in women and men, as well as the low numbers of female dentists that return to clinical practice after a break.
- How to improve the employment opportunities of female dentists, especially after a career break [7].
- What training courses could be implemented to support dentists in returning back to work after a career break?
- The different communication styles that exist between male and female dentists, particularly given the increasing influx of young female dentists into the profession [13].

### The impact of health on performance

The search terms used were:

*Impairment*

*Sick*

*General health*

*Occupational health*

*Physical disabilities*

*Dentists with HIV*

*Dentists with hepatitis B*

*Dentists with hepatitis C*

*Dentists with tuberculosis*

It is difficult to ascertain the numbers of dentists that are sick, but the data from various organisations suggest that the problems encountered by dentists are similar to doctors in terms of their behaviour, health problems [16-19] or reasons for referral to a support organisation [19, 20-24].

When compared to the UK population, obesity is considered a particular problem in dentistry [25,26] and the prevalence of musculoskeletal complaints in dentists also appears to be high [27-29]. Back pain, neck, shoulder and hand/wrist complaints are a particular issue [27] and it was found that dentists sometimes experienced such high levels of physical pain that it limited their ability to work [26-29].

Infectious diseases are reported to be important health issues for dentists [30]. The management of a hepatitis B infected clinician is relatively straight-

forward in that there is clear guidance about fitness to perform certain exposure-prone procedures [31,32]. However, the situation for the HIV-infected dentist is less clear [33-38].

Finally, it is suggested that dentists with a high professional burnout risk report health problems to a greater extent than dentists with a low burnout risk [39].

Areas for future research include:

- Investigating the incidence and prevalence of musculoskeletal disorders in dentists.
- An in-depth analysis of the psychosocial factors and coping strategies involved in the occurrence and persistence of illnesses.
- Undertaking qualitative studies to investigate the prevalence of physical illness, especially neoplastic disease, in dentists and how this impacts upon clinical performance.
- Examining the impact of diseases such as tuberculosis, hepatitis C and sexually transmitted diseases (other than HIV) upon clinical performance.
- Investigating cognitive impairment; its relevance to clinical practice and methods of assessment.

### **Stress, burnout and other workplace-related illnesses in dentistry**

The search terms used were:

*Stress*

*Stressed*

*Job demands*

*Burnout*

*Stress management*

*Workload*

*Depression*

*Suicide*

*Dentist stress and performance*

Numerous papers have reported high levels of workplace stress, burnout and other “work-related” mental illness in dentists both in the UK and abroad [16,26,28,29, 39,40-48]. There also appears to be an emerging link between such factors and alcohol and/or drug misuse [26,28,29,39].

Numerous sources of stress are reported in the literature [26,28,29,41-48], beginning as early as dental school and vocational training (internship in the year after graduation) [49,50-54]. A nationwide cross-sectional survey of 2441 GDPs in the UK demonstrated that factors in the dental surgery contributed to nearly half of the overall stress in a GDP’s life, especially fragility of dentist–patient

relationship, time and scheduling pressures, staff and technical problems, job dissatisfaction, proportion of work performed under NHS contract and number of hours worked per week [26]. Dentists may be embarrassed by the thought of seeking professional help, due to the challenges of stigma and the dynamics of their professional role, which can further compromise performance [16,54,55].

Clinical disorders such as burnout and depression may develop as a result of chronic long-term occupational stress [56-65]. The literature reveals that depressive disorders are observed frequently in dentists [26,28,29,44,46,48,49,52,54]. It is also reported that, as a profession, dentists show high rates of suicide, providing some objective evidence of high levels of psychological distress [66,67].

Areas for future research include investigating:

- Causes of stress, burnout and depression in dental practitioners working in all clinical settings [26,68,69].
- The impact of stress upon performance through longitudinal studies, as well as physiological measures (e.g., 24-hour blood-pressure monitoring) and biological measures (e.g., salivary cortisol) [26].
- Relationship between alcohol abuse and stress [26].
- Pressures faced by new graduates [51].
- Coping strategies for stress and the role of personal attributes in the relationship between working conditions and levels of engagement [68].
- Monitoring levels of burnout risk [69].
- Gender-related differences in dentist burnout [70].
- Depressive disorders and the possible association with suicide [71].
- Incidence rates and prevention of suicides in dentists [71].

### **Smoking and drug and alcohol misuse in dentistry**

The search terms used were:

*Drug, substance misuse*

*Smoking*

*Alcoholism in dentistry*

*Workload*

*Alcohol consumption*

*Drug use*

*Dentist alcohol misuse and performance*

*Dentist drug misuse and performance*

Prevalence studies seem to demonstrate relatively high rates of alcohol and substance misuse amongst dentists [26,28,29,39], especially younger dentists and dental students [26,72-76].

Dental students appear to be drinking above the recommended levels of alcohol at university and often engage in “binge drinking” activities [74,76]. Health and wellbeing studies have also demonstrated significant levels of alcohol consumption in GDPs, often strongly correlated to feelings of stress [26,28,29,39].

Despite these findings, there is little evidence from the prevalence data to suggest that dentists are at a greater risk of developing alcohol or other drug-use problems than the general population [77,78].

Generally, dentists appear to be smoking less than the equivalent cohort (age, gender) in the general population [49,79], and the reduction in the numbers of dentists smoking mirrors the reduction in the general population [74,80,81]. Low numbers of dentists appear to be smoking after they have been qualified for two years [26,28,39].

Areas for future research include:

- The prevalence of alcohol and drug misuse among dentists and dental care professionals.
- The factors that cause or sustain alcohol and drug misuse, and the impact upon clinical performance and patient care.
- The relative risks of developing addiction problems.
- The process and implementation of specialised services.
- The impact of education and specialised programmes in managing addiction.
- Attitudes to drug and alcohol testing in educational establishments and in the workplace linked to treatment and rehabilitation programmes.

### **Psychological factors related to performance**

The search terms used were:

*Culture*

*Psychological factors*

*Performance of dentists*

*Personality*

*Values*

*Interpersonal skills*

*Behavioural issues*

*Workload*

*Personal attributes*

### *Job satisfaction*

#### *Dentist clinical errors*

The literature demonstrated that there are potentially fundamental ways in which personality and other individual characteristics can affect the performance of dentists [19,82-87].

Dentists’ attitudes can impact upon their ability to complete a task to a pre-determined standard, both in a positive and negative sense [58,82,88-90]. Similarly, core values can have a significant impact upon performance, both as an individual dentist and within the dental team. In particular, the way that individuals behave will vary according to the nature and strength of their basic core values. When this is extended to the dental practice, a practice with defined and known core values will be more successful [91]. Such benefits may indirectly impact upon the performance of a dentist.

High levels of work engagement are deemed to improve productivity and efficacy of the dental team [92,93]. Engaged employees have been described as dynamic, and see themselves as fully able to manage the demands of their job [94].

The literature indicates clearly how a person with a high level of job satisfaction may invariably hold positive attitudes towards their job, whereas a person who is dissatisfied may hold negative attitudes about their job [92]. Job satisfaction has been reported to be a factor that impacts upon productivity, staff turnover and absenteeism, and could also be related to stress and burnout [95,96].

Areas for future research include:

- Assessing changes in dentists’ personality traits at different career stages.
- Using personality profiling to develop interventional strategies and career advice programmes.

### **The role of education and training**

The search terms used were:

*Academic*

*Dentistry*

*Dental education*

*Undergraduate dental education*

*Postgraduate dental education*

*Continuing professional development in the UK*

*Statistics of dentists migrating to the UK*

*Dentists with special interests*

*Dental students*

*Post-qualification training*

*Vocational training*

*Foundation training*

*Place of qualification*

*Complaints in dentistry*

Undergraduate and postgraduate education appears to have a fundamental role in the performance of future dental professionals [5,13,97-107].

It appears that the country of qualification does impact upon dental performance, in that a distinct lack of uniformity of the curricula in dental schools across EU member states [106], and other countries can mean that dentists graduating from these countries may possess varying clinical skills, knowledge, attitudes and may thus demonstrate different working patterns [106,107].

Vocational and dental foundation training schemes (internships) may play a vital role in the development of the dental graduate, immediately post-qualification [108,109]. Dental foundation training programmes, in particular, provide trainees with a wider range of opportunities to develop their communication, team-working, and clinical and management skills, when compared to stand-alone posts in each service within the NHS [99,110].

Lifelong learning, continuing professional development and the availability of postgraduate qualifications appear to be very important in enhancing and updating the professional skills of practising dentists [101,111,112]. For dentists, the ability to expand and develop their careers is considered very important. This is both in terms of long-term job satisfaction, and in the prevention of burnout [113].

It has been highlighted that only a small proportion of dental practitioners attend retraining courses after a career break [11,112]. This may impact upon the quality of care delivered, but it is difficult to ascertain to what extent.

Areas for future research include investigating:

- How to support and induct dental practitioners qualifying outside the UK to working in the UK.
- The role and benefits of the dental foundation training programmes.
- The uptake, impact and learning outcomes of CPD among dentists [114].
- The uptake, impact, perceived benefits and learning outcomes of competency frameworks for dentists with special interests.

**The impact of work-related factors upon performance**

The search terms used were:

*Communication skills*

*Complaints*

*Patients*

*Dental workforce*

*Relationship with the dental team*

*Competence*

*Team work*

*Work environment*

*Performance of dentists*

*Dental performance and outcome measures*

*Dentist performance and outcome measures*

*Disciplinary measures and dentists*

*Disciplinary measures and dentistry*

*Dentists and censure*

*Complaints in dentistry*

*Dentist clinical mistakes*

*Dentist appointment times*

*Management skills*

*Dental practice*

*The role of a dentist*

*Job satisfaction*

*Working patterns in dentistry*

*Dental private practice*

*NHS dental practice*

*Private dental practice*

*Public dental practice*

*Contractual arrangements in dentistry*

*Dental care professionals*

*Patient satisfaction*

*Leadership*

*Organisational behaviour in dentistry*

*Retention of dental workforce*

*Organisational culture in dentistry*

*Environment in dental practice*

*Culture in dentistry*

*Dental materials and equipment*

*Staff turnover in dental practice*

*Facilities in dental practice*

*Dental body corporate*

*Recruitment of dentists*

*Dentist's experience*

In dentistry, the quality of clinical performance appears to be strongly related to the ability to respond to change. This may be manifested in a variety of ways, including the ability to deliver different treatments appropriate to changing oral health needs, undertaking new governance procedures in line with emerging regulations, or participating in continued learning and self-development [115]. An inability to undertake such tasks and respond to change may result in poor performance.

This has been demonstrated at a national level through the implementation of the new NHS con-

tract in 2006 in England and Wales [96,116-118], which has been linked to a reduction in levels of job satisfaction among GPs [119]. Although there is no evidence to suggest a likely association between the 2006 contractual changes and poor clinical performance, it is clear that such a transition could inevitably impact upon job satisfaction and the quality of clinical work undertaken, both potentially directly contributing to poor performance [115-123]. In addition, these challenges and additional workload contribute to stress, anxiety and burnout [26,28,39,69].

Professional networks, both formal and informal, were seen to have a major influence over the performance of dentists [124,125]. Dental practitioners who did not belong to any network and were professionally isolated lacked support mechanisms that could compromise performance [124]. Thus networks can provide a preventive help mechanism for dentists who are having problems.

Career development is an important factor in the prevention of burnout, and is thus an important consideration [113]. Job satisfaction, another variable in stress and burnout, was also shown to vary according to clinical setting [26,28,39,69].

The concept of dental care being delivered by a multi-skilled team and the importance of team working are fully acknowledged in the dental literature [126-131]. Effective team working will indirectly impact upon the performance of a dentist, principally due to a reduced workload [132-134], and the benefits of reduced stress and burnout from a more efficient work environment [129].

Areas for future research include investigating:

- How the impending changes in the organisations of the NHS may impact upon practitioner performance, with particular reference to the NHS White Paper, *Equity and Excellence: Liberating the NHS* [135].
- The levels of job satisfaction in varying clinical provider settings (general dental practice, salaried services and dental bodies corporate), particularly in light of its association with stress, a factor which can compromise performance in some individuals, both in NHS and private dental practice.
- The factors which affect levels of job satisfaction in varying clinical settings.
- Job satisfaction, treatment outcomes and patient satisfaction in practices run by dental bodies corporate, given their recent growth in the dental market and commercial ethos, they may need specific consideration.

- The drivers behind the different attitudes to self-development in different clinical settings.
- The association between organisational culture and the performance of dentists
- Team work and the deployment of the full range of skill-mix within the dental team [135].

### **Leadership in NHS dentistry**

The search terms used were:

*Leadership*

*Team work*

*The role of a dentist*

Strong clinical leadership in NHS dentistry is viewed as paramount. It needs to be promoted actively, and included in other NHS leadership initiatives, as well as in local engagement at primary care organisation level. It was identified that the individual dental practitioner can play a role in driving change and influencing policy, but this is not widely undertaken [121].

NHS dentistry has undergone significant structural and contractual change in the last few years and is about to undergo a further change [136].

The House of Commons Health Select Committee [123] and Department of Health [119] reports produced subsequent to the 2006 contractual changes highlighted a lack of dental leadership at Strategic Health Authority (SHA) (regional) and Primary Care Trust (PCT) (local) level as a strong causative factor for some of the challenges experienced during the transitional stages [137].

At a more local level, leadership within the dental team is vital [138]. The productivity, level of satisfaction and clinical performance of the dental team were identified as being strongly influenced by the dentist [129,139]. Gender and age were also identified as playing an important role in leadership and the relationships developed between the dentist and dental nurse [5,13].

It was found that male and female dentists differ in their leadership style [5,13], and younger dentists, with less experience of clinical dentistry, may lack experience in staff management [5,119].

Areas for future research include investigating:

- The dentist's wider leadership role, beyond clinical practice. Future research could investigate how dentists, as individuals and as a profession, could play a greater role in informing policy nationally.
- The differences between the leadership skills of a dental team leader, and the leadership skills required to run a business.
- The long term impact of leadership development programmes for dental students
- Students' perceptions of the importance of leadership abilities and/or their interest in developing leadership skills during dental school, to inform the design of leadership development programmes [98].

### Discussion

This was not a systematic review, so the intention was not to report on every study examining these questions. However, the search strategy outlined was designed to be comprehensive, and to allow for the selection of the most pertinent primary studies and relevant review papers. The directors and senior managers who were contacted helped to identify a wide range of reports and other documents which can be classed as grey literature (they do not appear in databases such as Medline).

The review concentrated on the UK. A number of the factors, such as the recent contractual changes for dentistry in the NHS, are specific to England and Wales. Nevertheless, there are contractual changes in all countries and most of the factors that were investigated may well be common to dentists in many other countries. The findings are highly relevant to the 10,000 dentists who graduated outside the UK but are currently registered to work in the UK and to dentists from overseas who are considering working in the UK.

A general observation, applicable to many subject areas, is that there is a lack of solid scientific evidence to demonstrate definitively associations or findings upon which robust conclusions can be based. The principal limitations of this review into the performance of dentists are due to the constraints of self-reported questionnaires and use of studies that are opinion or experience based, of which there are many. The factors causing poor performance are not amenable to assessment in randomised controlled trials. Furthermore, the vast majority of workplace-related illness studies involve small numbers and are cross-sectional, self-reported, with variable or uncertain participation rates, and are thus potentially prone to bias.

Generalisation can also be a problem in small studies which may not have obtained a representative sample, or when there is a lack of uniformity of methodologies and definitions of usage. This is certainly the case in the UK, where there are few studies that are based in, or include, Northern Ireland or Scotland. Similarly, conclusions made on studies based on other professional groups, such as doctors, may not in all cases be fully applicable to dentists. Thus the quality of the research reported in the majority of papers that were reviewed may be questionable.

A number of areas for further research, in a variety of domains, were identified. Research undertaken on other health care professionals could serve as a foundation to future work in dentistry. Issues may be highlighted which are applicable and relevant for dentistry. They could identify specific areas where gaps exist and demonstrate a tested methodology to investigate the areas concerned.

Where possible, high-quality prospective longitudinal studies would take account of reverse causation, and develop more robust associations between chronology and causality. The use of more objective measures in the self-reported questionnaire might also be useful.

As mentioned previously, contacts with directors and managers of organisation who are involved when dentists have performance problems generated significant volumes of information and data. These are currently being simultaneously collected and collated by individual organisations including the General Dental Council, Dental Complaints Service, NCAS, NHS Dental Services, Deaneries, Professional Indemnity Societies. Pooling this information could help to generate an understanding of the magnitude of the problem, and might also reveal the source of the problems; namely, understanding why dentists perform poorly and what can be done to remediate this?

These organisations are thus in a strong position to develop a portfolio of research on a variety of factors. Such studies will require an initial investment of research funds, but have the potential both to improve outcomes within the dental workforce, and to inform policy.

### Conclusion

This review has provided a comprehensive summary of work already undertaken on poor performance in dentistry, or in similar fields such as medicine, as well as identifying any additional contributing factors. Alongside this, areas for further research, in a variety of domains, have been identified.



The review reflects both current and future trends, and incorporates information from the UK, as well as countries such as the USA and EU member states. It has brought together information from a wide range of sources, and has considered the findings from published primary studies, previous reviews, policy statements, grey literature and the opinions of a wide range of experts.

The findings from this work are also applicable to the global community of dentists, and could contribute to the ongoing research programmes of international organisations. It would be extremely useful if future studies could be undertaken in partnership with such organisations.

## References

1. National Clinical Assessment Service. Casework Activity Reports, 31 March 2011. Accessed (2011 Aug 7) via: [www.ncas.npsa.nhs.uk](http://www.ncas.npsa.nhs.uk)
2. Cox J, King J, Hutchinson A, McAvoy P, editors. *Understanding Doctors' Performance*. Oxford: Radcliffe Publishing; 2006.
3. Council of European Chief Dental Officers. Data of oral healthcare in Europe. Accessed (2011 Aug 7) via: [www.ccedo.org](http://www.ccedo.org)
4. General Dental Council (GDC). *EEA Qualified Dentists by Country and Year*. London: GDC; 2010.
5. Gorter RC, Bleeker JC, Freeman R. Dental nurses on perceived gender differences in their dentist's communication and interaction style. *British Dental Journal* 2006; **201**: 159-164.
6. Newton T, Davenport-Jones L, Ide M, Patel M, Setchell A, Turpin C. Patients' perceptions of general dental practitioners: The influence of ethnicity and sex of dentist, *Social Behavior and Personality* 2001; **29**: 601-606.
7. Murray JJ. Better opportunities for women dentists: a review of the contribution of women dentists to the workforce. *British Dental Journal* 2002; **192**: 191-196.
8. The NHS Information Centre. *NHS Dental Activity and Workforce Report England*. 31 March 2006. London: NHS IC; 2006.
9. Cooper LA, Beach MC, Johnson RL, Thomas S. understanding how race and ethnicity influence relationships in health care. *Journal of General Internal Medicine* 2006; **21**: S21-27.
10. Wilson AA, Branch LG, Niessen LC. Practice patterns of male and female dentists. *Journal of the American Dental Association* 1988; **116**: 73-77.
11. Seward M. *Better Opportunities for Women Dentists*. London: Department of Health; 2001. Accessed (2010 Apr 22) via: [www.dh.gov.uk/prod\\_consum\\_dh/groups/dh\\_digitalassets/@dh/@en/documents/digitalasset/dh\\_4019217.pdf](http://www.dh.gov.uk/prod_consum_dh/groups/dh_digitalassets/@dh/@en/documents/digitalasset/dh_4019217.pdf)
12. Del Aguila MA, Leggott PJ, Robertson PB, Porterfield DL, Felber GD. Practice patterns among male and female general dentists in a Washington state population. *Journal of the American Dental Association* 2005; **136**: 790-796.
13. Gorter RC, Freeman R. Dentist-assistant communication style: perceived gender differences in The Netherlands and Northern Ireland. *Community Dentistry and Oral Epidemiology* 2005; **33**: 131-140.
14. Firth-Cozens J. Doctors with difficulties: why so few women?. *Postgraduate Medical Journal* 2008; **84**: 318-320.
15. General Dental Council (GDC). *The Registration of Dental Care Professionals*. London: GDC; 2005.
16. Harvey SB, Laird B, Henderson M, Hotopf M. The mental health of healthcare professionals: A review for the Department of Health. London: DH; 2009.
17. Pitkanen M, Hurn, J, Kopelman M. Doctors' health and fitness to practice: performance problems in doctors and cognitive impairments. *Occupational Medicine* 2008; **58**: 328-333.
18. NHS Practitioner Health Programme. *Report on the First Year of Operation*. January 2010.
19. National Clinical Assessment Service. *Analysis of NCAS Casework: The First Eight Years*. London: NHS; 2009.
20. General Dental Council (GDC). *GDC Annual Review 2006*. Accessed (2010 Apr 27) via: <http://www.gdc-uk.org/News+publications+and+events/Publications/About+the+GDC/>
21. General Dental Council (GDC). *GDC Annual Review 2007*. Accessed (2010 Apr 27) via: <http://www.gdc-uk.org/News+publications+and+events/Publications/About+the+GDC/>
22. General Dental Council (GDC). *GDC Annual Review 2008*. Accessed (2010 Apr 27) via: <http://www.gdc-uk.org/News+publications+and+events/Publications/About+the+GDC/>
23. General Dental Council (GDC). *GDC Annual Report and Accounts 2009*. Accessed (2011 Aug 2) via: <http://www.gdc-uk.org/NR/rdonlyres/E570B9A4-420B-474B-809A-E4DFAC25D5A1/0/GDCannrep09web.pdf>
24. General Dental Council (GDC). Health Committee. Accessed (2010 Apr 27) via: <http://www.gdc-uk.org/About+us/How+we+work/Health+Committee>
25. Health and Social Care Information Centre. *Statistics on Obesity, Physical Activity and Diet*. London: NHS Information Centre; 2010.
26. Myers HL, Myers LB. 'It's difficult being a dentist': stress and health in the general dental practitioner. *British Dental Journal* 2004; **197**: 89-93.
27. Alexopoulos EC, Stathi IC, Charizani F. Prevalence of musculoskeletal disorders in dentists. *BMC Musculoskeletal Disorders* 2004; **9**: 5-16
28. Kay E, Lowe J. A survey of stress levels, self-perceived health and health-related behaviours of UK dental practitioners in 2005. *British Dental Journal* 2008; **204**: (E19) 1-10.

## Contributions of each author

JB commissioned the review, gave advice and checked drafts.

LA gave advice and checked drafts.

KAE provided overall academic leadership and edited all drafts.

RP wrote the paper.

AG searched for the literature.

VR searched for the literature.

## Statement of conflict of interests

Janine Brooks and Louise Adams were employed by NCAS at the time of the review

The remaining authors have no known conflicts of interest.

29. Kay E, Scarrott DM. A survey of dental professionals' health and well-being. *British Dental Journal* 1997; **183**: 340-345.
30. Cleveland JL, Cardo DM. Occupational exposures to human immunodeficiency virus, hepatitis B virus, and hepatitis C virus: risk, prevention, and management. *Dental Clinics of North America* 2003; **47**: 681-696.
31. Department of Health. *Health Clearance for Tuberculosis, Hepatitis B, Hepatitis C and HIV: New Healthcare Workers*. London: HMSO; 2007.
32. Department of Health. *Protecting Healthcare Workers and Patients From Hepatitis B. Recommendations of the Advisory Group on Hepatitis*. London: HMSO; 1993.
33. Department of Health (DH). Expert Advisory Group on Aids. Providing Expert Scientific Advice on HIV. Annual Report 2006. London: DH; 2007.
34. Department of Health. *HIV-Infected Health Care Workers: Guidance on Management and Patient Notification*. Annual Report. August 2005 (replacing 1998 version). Accessed (2010 Apr 27) via: [http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/Browsable/DH\\_4118230](http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/Browsable/DH_4118230)
35. Williams M. The HIV positive dentist in the United Kingdom: a legal perspective. *British Dental Journal* 2009; **207**: 77-81.
36. Lewis K. Unacceptable treatment. *British Dental Journal* 2006; **201**: 687.
37. Martin MV. Illogical guidance. *British Dental Journal* 2006; **201**: 687.
38. Hancocks S. Blood-borne one year on. *British Dental Journal* 2007; **203**: 439.
39. Gorter RC, Eijkman MA, Hoogstraten J. Burnout and health among Dutch dentists. *European Journal of Oral Science* 2000; **108**: 261-267.
40. Te Brake H, Smits N, Wicherts JM, Gorter RC, Hoogstraten J. Burnout development among dentists: a longitudinal study. *European Journal of Oral Science* 2008; **116**: 545-551.
41. Blinkhorn AS. Stress and the dental team: a qualitative investigation of the causes of stress in general dental practice. *Dental Update* 1992; **19**: 385-387.
42. Wilks C. Occupational stress in dentistry. *British Dental Journal* 1995; **179**: 9.
43. Wilson RF, Coward PY, Capewell J, Laidler TL, Rigby AC, Shaw TJ. Perceived sources of occupational stress in general dental practitioners. *British Dental Journal* 1998; **184**: 499-502.
44. Cooper C, Watts J, Kelly M. Job satisfaction, mental health and job stressors among general dental practitioners in the UK. *British Dental Journal* 1987; **162**: 77-81.
45. Moore R, Brodsgaard I. Dentists' perceived stress and its relation to perceptions about the anxious patients. *Community Dentistry and Oral Epidemiology* 2001; **29**: 73-80.
46. Gale EN. Stress in dentistry. *New York State Dental Journal* 1998; **64**: 30-34.
47. Dunlap J, Stewart J. Survey suggests less stress in group offices. *Dental Economics* 1982; **72**: 46-54.
48. Möller AT, Spangenberg JJ. Stress and coping amongst South African dentists in private practice. *Journal of the Dental Association of South Africa* 1996; **51**: 347-357.
49. Newbury-Birch D, Lowry RJ, Kamali F. The changing patterns of drinking, illicit drug use, stress, anxiety and depression in dental students in a UK dental school: a longitudinal study. *British Dental Journal* 2002; **192**: 646-649.
50. Humphris G. Improved working conditions and professional support will benefit young dentists. *British Dental Journal* 1999; **186**: 25.
51. Willet J, Palmer NOA. An investigation of the attitudes and fears of vocational dental practitioners in England and Wales in 2007. *Primary Dental Care* 2009; **16**: 103-110.
52. Baldwin PJ, Dodd M, Rennie JS. Young dentists: work, wealth, health and happiness. *British Dental Journal* 1999; **186**: 30-36.
53. Baldwin PJ, Dodd M, Rennie JS. Postgraduate dental education and the 'new' graduate. *British Dental Journal* 1998; **185**: 591-594.
54. Rada RE, Johnson-Leong C. Stress, burnout, anxiety and depression among dentists. *Journal of the American Dental Association* 2004; **135**: 788-794.
55. Lavine SR, Drumm JW, Keating LK. Safeguarding the health of dental professionals. *Journal of the American Dental Association* 2004; **135**: 84-89.
56. Gorter RC, Albrecht G, Hoogstraten J, Eijkman MAJ. Professional burnout among Dutch dentists. *Community Dentistry and Oral Epidemiology* 1999; **27**: 109-116.
57. Freudenberger HJ. Staff burn-out. *Journal of Social Issues* 1974; **30**: 159-165.
58. Maslach C, Jackson SE. *The Maslach Burnout Inventory Manual*. 2nd ed. Palo Alto, CA: Consulting Psychologists Press; 1986.
59. Van Dierendonck D, Schaufeli WB, Sixma H. Burnout among general practitioners: a perspective from equity theory. *Journal of Social and Clinical Psychology* 1994; **13**: 86-100.
60. Osborne D, Croucher R. Levels of burnout in general dental practitioners in the south-east of England. *British Dental Journal* 1994; **177**: 372-377.
61. Te Brake JHM, Bouman A-M, Gorter R, Hoogstraten J, Eijkman M. Professional burnout and work engagement among dentists. *Eur J Oral Sci*. 2007; **115**: 180-185.
62. Gorter RC, Albrecht G, Hoogstraten J, Eijkman MA. Measuring work stress among Dutch dentists. *International Dental Journal* 1999; **49**: 144-152.
63. Croucher R, Osborne D, Marcenes W, Sheiham A. Burnout and issues of the work environment reported by general dental practitioners in the UK. *Community Dental Health* 1998; **15**: 40-43.
64. Denton DA, Newton JT, Bower EJ. Occupational burnout and work engagement: a national survey of dentists in the United Kingdom. *British Dental Journal* 2008; **205**: E13; discussion 382-383.
65. Gorter RC, Storm MK, te Brake JHM, Kersten HW, Eijkman MAJ. Outcome of career expectancies and early professional burnout amongst newly qualified dentists. *International Dental Journal* 2007; **57**: 279-285.
66. Meltzer H, Griffiths C, Brock A, Rooney C, Jenkins R. Patterns of suicide by occupation in England and Wales: 2001-2005. *British Journal of Psychiatry* 2008; **193**: 73-76.
67. Kelly S, Bunting J. Trends in suicide in England and Wales, 1982-1996. *Population Trends* 1998; **92**: 29-41.
68. Hakanen JJ, Bakker AB, Demerouti E. How dentists cope with their job demands and stay engaged: the moderating role of job resources. *European Journal of Oral Science* 2005; **113**: 479-487.
69. te Brake JHM, Bouman AM, Gorter RC, Hoogstraten J, Eijkman MAJ. Using the Maslach Burnout Inventory among dentists: burnout measurement and trends. *Community Dentistry and Oral Epidemiology* 2008; **36**: 69-75.

70. Te Brake H, Bloemendal E, Hoogstraten J. Gender differences in burnout amongst Dutch dentists. *Community Dentistry and Oral Epidemiology* 2003; **31**: 321-327.
71. Alexander RE. Stress-related suicide by dentists and other health care workers. Fact or folklore? *Journal of the American Dental Association* 2001; **132**: 786-794.
72. Underwood B, Fox K. A Survey of alcohol and drug use among UK based dental undergraduates. *British Dental Journal* 2000; **189**: 314-417.
73. Newbury-Birch D, White M, Kamali F. Factors influencing alcohol and illicit drug use amongst medical students. *Drug and Alcohol Dependency* 2000; **59**: 125-130.
74. Underwood B, Hackshaw A, Fox K. Smoking, alcohol and drug use among vocational dental practitioners in 2000 and 2005. *British Dental Journal* 2007; **203**: 701-705.
75. Underwood B, Fox K, Nixon PJ. Alcohol and drug use among vocational dental practitioners. *British Dental Journal* 2003; **195**: 265-268.
76. Underwood B, Fox K, Manogue M. Tobacco, alcohol and drug use among dental undergraduates at one English university in 1998 and 2008. *British Dental Journal* 2010; **208**: 164-165.
77. Kenna GA, Wood MD. The prevalence of alcohol, cigarette and illicit drug use and problems among dentists. *Journal of the American Dental Association* 2005; **136**: 1023-1032; erratum 1224.
78. Barber MW, Fairclough A. A comparison of alcohol and drug use among dental undergraduates and a group of non-medical, professional undergraduates. *British Dental Journal* 2006; **201**: 581-584.
79. Ashton CH, Kamali F. Personality, lifestyles, alcohol and drug consumption in a sample of British medical students. *Medical Education* 1995; **29**: 187-192.
80. The NHS Information Centre for Health and Social Care. Statistics on Smoking, England 2009. Accessed (2010 Apr 21) via: <http://www.ic.nhs.uk/statistics-and-data-collections/health-and-lifestyles/smoking/statistics-on-smoking-england-2009>
81. Office for National Statistics. Cigarette smoking. Slight fall in smoking prevalence. Accessed (2010 Apr 21) via: <http://www.statistics.gov.uk/cci/nugget.asp?id=866>
82. National Clinical Assessment Service. King J, Wozniak M. Report on the development of personality norms for UK dentists. Bristol, UK: Edgecumbe Consulting; 2009.
83. Holland JL. *Making Vocational Choices: A Theory of Personalities and Work Environments*. Odessa, FL: Psychological Assessment Resources; 1997.
84. Chamberlain TC, Catano VM, Cunningham DP. Personality as a predictor of professional behavior in dental school: comparisons with dental practitioners. *Journal of Dental Education* 2005; **69**: 1222-1237.
85. Firth-Cozens and King. Are psychological factors linked to performance? In: Cox J, King J, Hutchinson A, McAvoy P, editors. *Understanding Doctors' Performance*. Oxford: Radcliffe Publishing; 2006. p. 61-77.
86. David W, Chambers EM. The role of dentists in dentistry. *Journal of Dental Education* 2001; **65**: 1430-1440.
87. Hogan R, Hogan, J. *Hogan Development Survey Manual*. 2nd ed. Tulsa, OK: Hogan Assessment Systems; 1997.
88. Gatrell J, White T. *The Specialist Registrar Handbook*. Oxford: Radcliffe Medical Press; 1999. p.119-131.
89. De Monchy C, Richardson R, Brown RA, Harden RM. Measuring attitudes of doctors: the doctor-patient (DP) rating. *Medical Education* 1988; **22**: 231-239.
90. Evans AW. Assessing competence in surgical dentistry. *British Dental Journal* 2001; **190**: 343-346.
91. Newsome PRH. Current issues in dental practice management Part 1. The importance of shared values. *Primary Dental Care* 2003; **10**: 37-39.
92. Maslach C, Leiter MP. *The Truth About Burnout: How Organizations Cause Personal Stress and What to do About it*. San Francisco, CA: Jossey-Bass; 1997.
93. Gorter RC, te Brake HJHM, Hoogstraten J, Eijkman MAJ. Positive engagement and job resources in dental practice. *Community Dentistry and Oral Epidemiology* 2008; **36**: 47-54.
94. Schaufeli WB, Salanova M, González-romá V, Bakker AB. The measurement of engagement and burnout: A two sample confirmatory factor analytic approach. *Journal of Happiness Studies* 2002; **3**: 71-92.
95. Robbins SP. *Organizational Behaviour: Concepts, Controversies, Application*. 5th ed. New Jersey: Prentice-Hall International; 1998. p. 142.
96. Harris RV, Ashcroft A, Burnside G, Dancer JM, Smith D, Grieveson B. Facets of job satisfaction of dental practitioners working in different organisational settings in England. *British Dental Journal* 2008; **204**: E1; discussion 16-17.
97. General Dental Council (GDC). *The First Five Years 1997*. 3rd ed. London: GDC; 2008.
98. Gallagher JE, Patel R, Donaldson N, Wilson NHF. The emerging dental workforce: why dentistry? A quantitative study of final year dental students' views on their professional career. *BMC Oral Health* 2007; **7**: 7.
99. Department of Health (DH). *A Curriculum for UK Dental Foundation Programme Training*. London: DH; 2006.
100. Victoroff KZ, Schneider K, Perry C. Leadership development for dental students: what do students think? *Journal of Dental Education* 2008; **72**: 982-988.
101. Victoroff KZ, Schneider K, Perry C. Tomorrow's leaders, starting today: a pilot leadership development program for dental students. *Journal of Dental Education* 2009; **73**: 311-318.
102. Wagner J, Arteaga S, D'Ambrosio J, Hodge C, Ioannidou E, Pfeiffer CA, et al. Dental students' attitudes toward treating diverse patients: effects of a cross-cultural patient-instructor program. *Journal of Dental Education* 2008; **72**: 1128-1134.
103. Wagner J, Redford-Badwal D. Dental students' beliefs about culture in patient care: self-reported knowledge and importance. *Journal of Dental Education* 2008; **72**: 571.
104. Yoshida T, Milgrom P, Coldwell S. How do U.S. and Canadian dental schools teach interpersonal communication skills? *Journal of Dental Education* 2002; **66**: 1281-1288.
105. Hannah A, Lim BT, Ayers KM. Emotional intelligence and clinical interview performance of dental students. *Journal of Dental Education* 2009; **73**: 1107-1117.
106. Bucur MV. A Profile of Dental Education in the Accession Countries to the European Union. Thesis submitted for the degree of Master of Science, Trinity College, Dublin. July 2004.
107. Shanley DB, Barna S, Gannon P, Kelly A, Teljeur C, Munck C, et al. Undergraduate training in the European Union. Convergence or divergence? *European Journal of Dental Education* 1997; **1**: 35-43.
108. Allen WR. Mandatory vocational training for the General Dental Services. *British Dental Journal* 1993; **175**: 188.

109. Ibbetson R. Choosing a career in dentistry. *Dental Update* 2003; **30**: 28-34.
110. Department of Health (DH). *Modernising Medical Careers. The response of the four UK Health Ministers to the Consultation on Unfinished Business: Proposals for Reform of the Senior House Officer Grade*. London: DH; 2003.
111. Bleakley A. Broadening conceptions of learning in medical education: the message from teamworking. *Medical Education* 2006; **40**: 150-157.
112. Buck D, Newton T. Continuing professional development amongst dental practitioners in the United Kingdom: how far are we from lifelong learning targets? *European Journal of Dental Education* 2002; **6**: 36-39
113. Gorter RC, Albrecht G, Hoogstraten J, Eijkman MA. Work place characteristics, work stress and burnout among Dutch dentists. *European Journal of Oral Science* 1998; **106**: 999-1005.
114. Walmsley AD, Frame JW. Dental practitioner attendances at postgraduate courses in a dental school. *British Dental Journal* 1990; **169**: 61-63.
115. Watt R, McGlone P, Evans D, Boulton S, Jacobs J, Graham S, *et al*. The prevalence and nature of recent self-reported changes in general dental practice in a sample of English general dental practitioners. *British Dental Journal* 2004; **197**: 401-405.
116. Department of Health (DH). *NHS Dental Reforms: One Year On*. London: DH; 2007.
117. Department of Health (DH). *Primary Care Dental Services: Implementation Of Local Commissioning*. London: DH; 2005.
118. Chestnutt IG, Davies L, Thomas DR. Practitioners' perspectives and experiences of the new National Health Service dental contract. *British Dental Journal* 2009; **206**: E18; discussion 476-477. Epub 2009 Apr 24.
119. Steele J. *NHS Dental Services in England: An Independent Review Led by Professor Jimmy Steele*. London: Department of Health; 2009.
120. Harris, R, Burnside G, Ashcroft A, Grieveson B. Job satisfaction of dental practitioners before and after a change in incentives and governance: a longitudinal study. *British Dental Journal* 2009; **207**: E4.
121. Holt VP. The need for leadership and vision in dentistry. A personal view. *Primary Dental Care* 2008; **15**: 113-119.
122. Denton AC, Newton JT, Bower EJ. Summary of: Occupational burnout and work engagement: a national survey of dentists in the United Kingdom. *British Dental Journal* 2008; **205**: 382-383.
123. House of Commons Health Committee. *Dental Services. Fifth Report of Session 2007-08*. Volumes I and II. London: HMSO; 2008. Accessed (2010 May 1) via: <http://www.publications.parliament.uk/pa/cm200708/cmselect/cmhealth/cmhealth.htm>
124. Watt R, McGlone P, Evans D, Boulton S, Jacobs J, Graham S, *et al*. The facilitating factors and barriers influencing change in dental practice in a sample of English general dental practitioners. *British Dental Journal* 2004; **197**: 485-489.
125. Iqbal A, Glenny A-M. General dental practitioners' knowledge of and attitudes towards evidence-based practice. *British Dental Journal* 2002; **192**: 587-591.
126. General Dental Council (GDC). *Principles of Dental Team Working*. London: GDC; 2009.
127. British Association of Dental Therapists (website). Accessed (2010 Jun 24) via: <http://www.badt.org.uk/public/history-dental-therapist.html>
128. Ross MK, Turner S, Ibbetson RJ. The impact of team working on the knowledge and attitudes of final year dental students. *British Dental Journal* 2009; **206**: 163-167.
129. Bonehill J, Roberts C, Wincott D. *Handbook for Dental Nurses*. Oxford: Blackwell; 2007. Accessed (2010 Apr 21) via: [http://www.blackwellpublishing.com/content/BPL/Images/Content\\_store/Sample\\_chapter/9781405128032/9781405128032\\_sample.pdf](http://www.blackwellpublishing.com/content/BPL/Images/Content_store/Sample_chapter/9781405128032/9781405128032_sample.pdf)
130. Baltutis L, Morgan M. The changing role of dental auxiliaries: a literature review. *Australian Dental Journal* 1998; **43**: 354-358.
131. Csikar, JI, Bradley S, Williams SA, Godson JH, Rowbotham JS. Dental therapy in the United Kingdom: part 4. Teamwork—is it working for dental therapists? *British Dental Journal* 2009; **207**: 529-536.
132. Douglass CW, Cole KO. The supply of dental manpower in the United States. *Journal of Dental Education* 1979; **43**: 287-302.
133. Croucher R, Osborne D, Marcenes W, Sheiham A. Burnout and issues of the work environment reported by general dental practitioners in the United Kingdom. *Community Dent Health* 1998; **15**: 40-43.
134. Harris RV, Haycox A. The role of team dentistry in improving access to dental care in the UK. *British Dental Journal* 2001; **190**: 353-356.
135. Gallagher JE, Kleinman ER, Harper PR. Modelling workforce skill-mix: how can dental professionals meet the needs and demands of older people in England? *British Dental Journal* 2010; **208**: E6.
136. Department of Health (DH). *Equity and Excellence: Liberating the NHS*. Gateway 14385. London: DH; 2010.
137. Department of Health (DH). *Improving Oral Health and Dental Outcomes: Developing the Dental Public Health Workforce in England. Summary of Key Issues for PCTs and SHAs*. Short report. Gateway 13937. London: DH; 2010.
138. General Dental Council (GDC). *Developing the dental team. Curricula frameworks for registerable qualifications for professionals complementary to dentistry (PCDs)*. London: GDC; 2004.
139. Chilcutt AS. Exploring leadership and team communication within the organizational environment of a dental practice. *Journal of the American Dental Association* 2009; **140**: 1252-1258.