



UNIVERSITY OF LEEDS

This is a repository copy of *Health, Burnout and Wellbeing of UK Cardiology Trainees: Insights from the British Junior Cardiologists' Association Survey*.

White Rose Research Online URL for this paper:

<https://eprints.whiterose.ac.uk/216519/>

Version: Accepted Version

---

**Article:**

Jenner, W.J., Brown, O.I., Moore, A. et al. (5 more authors) (Cover date: November 2024)  
Health, Burnout and Wellbeing of UK Cardiology Trainees: Insights from the British Junior  
Cardiologists' Association Survey. *Heart*, 110 (22). pp. 1327-1335. ISSN 1355-6037

<https://doi.org/10.1136/heartjnl-2024-324418>

---

© Author(s) (or their employer(s)) 2024. This is an author produced version of an article published in *Heart*. Uploaded in accordance with the publisher's self-archiving policy.

**Reuse**

Items deposited in White Rose Research Online are protected by copyright, with all rights reserved unless indicated otherwise. They may be downloaded and/or printed for private study, or other acts as permitted by national copyright laws. The publisher or other rights holders may allow further reproduction and re-use of the full text version. This is indicated by the licence information on the White Rose Research Online record for the item.

**Takedown**

If you consider content in White Rose Research Online to be in breach of UK law, please notify us by emailing [eprints@whiterose.ac.uk](mailto:eprints@whiterose.ac.uk) including the URL of the record and the reason for the withdrawal request.



[eprints@whiterose.ac.uk](mailto:eprints@whiterose.ac.uk)  
<https://eprints.whiterose.ac.uk/>

1           **Health, Burnout and Wellbeing of UK Cardiology Trainees:**  
2           **Insights from the British Junior Cardiologists' Association Survey**

3  
4           Authors

5           William John Jenner<sup>1\*</sup>, Oliver Ian Brown<sup>2\*</sup>, Abigail Moore<sup>3</sup>, Thomas Gilpin<sup>4</sup>, Holly Morgan<sup>5</sup>  
6           Sarah Bowater<sup>6</sup>, Denise Braganza<sup>1</sup>, Christian Fielder Camm<sup>3</sup>

7  
8           Author Affiliations

9           <sup>1</sup> Royal Papworth Hospital, Cambridge, UK

10          <sup>2</sup> Leeds Institute of Cardiovascular and Metabolic Medicine, University of Leeds, UK

11          <sup>3</sup> University of Oxford, UK

12          <sup>4</sup> Faculty of Medicine, University of Southampton, Southampton, UK

13          <sup>5</sup> King's College London, London, UK

14          <sup>6</sup> Queen Elizabeth Hospital, Birmingham, UK

15  
16          \*Joint First Authors

17  
18          Correspondence to

19          Dr Oliver Ian Brown

20          Leeds Institute of Cardiovascular and Metabolic Medicine

21          University of Leeds

22          Clarendon Road, Leeds LS2 9JT,

23

24

1 Abstract

2

3 Background

4

5 Cardiology training is demanding and associated with high workloads. Poor lifestyle and  
6 health amongst clinicians may stretch workforces and may impact patient care. It has not  
7 been established what impact training in cardiology has on the doctors undertaking it. We  
8 aimed to establish the prevalence of physical and mental illness, burnout, and the ability to  
9 maintain a healthy lifestyle amongst cardiology trainees in the United Kingdom.

10

11 Methods

12

13 The 2023 British Junior Cardiologists Association (BJCA) training survey included questions  
14 on ill health, burnout, healthy living, and invited responders to complete screening  
15 questionnaires for depression (PHQ-9) and anxiety (GAD-7). Significant anxiety and  
16 depression was defined as scoring within the moderate or severe range (PHQ-9  $\geq 10$ ; GAD-7  
17  $\geq 10$ ). Burnout was a self-reported outcome. Poisson regression was used to determine  
18 prevalence ratios (PR) between univariate predictors of anxiety, depression, and burnout.

19

20 Results

1 Of 398 responders, 212 consented to answer health and wellbeing questions. Prior physical  
2 and mental health conditions were reported by 9% and 7% of trainees respectively.  
3 Significant depression and anxiety symptoms were reported by 25% and 18% of trainees  
4 respectively. Burnout was reported by 76% of trainees. Less than full time trainees reported  
5 greater anxiety (PR 2.92, 95% CI:1.39-6.16,  $p<0.01$ ) and depression (PR 3.66, 95% CI:2.24-  
6 5.98,  $p<0.01$ ); whilst trainees with dependents reported less burnout (PR 0.77, 95% CI:0.65-  
7 0.92,  $p<0.01$ ). Exercise, good sleep quality and maintaining a healthy diet was associated  
8 with less burnout and depressive symptoms ( $p<0.05$ ). Half of trainees reported training  
9 having a negative impact on wellbeing, driven by the amount of service provision, curriculum  
10 requirements and lack of training opportunities.

11

12 Conclusions

13

14 The prevalence of anxiety, depression and burnout is high amongst cardiology trainees.  
15 Further work should establish the impact of cardiology trainee health on the quality of patient  
16 care. Training bodies should consider how occupational factors may contribute to health.

17

18 Keywords:

19 cardiologists, burnout, wellbeing,

20

1 Key Messages

2 *What is already known on this topic*

3

4 Ill health and burnout are common amongst doctors and may directly impact patient care  
5 through higher rates of prescription error and near-misses. However, the prevalence of  
6 physical and mental illness, burnout and the ability to maintain healthy lifestyles amongst  
7 cardiology trainees in the United Kingdom is unknown.

8

9 *What this study adds*

10

11 We have identified that the prevalence of anxiety, depression and burnout is high among  
12 cardiology trainees. Whilst exercise, good sleep quality and maintaining a healthy diet are  
13 protective factors against burnout and depression, half of trainees reported training having a  
14 negative impact on wellbeing. This was driven by largely modifiable occupational factors  
15 including excessive service provision, curriculum requirements and lack of training  
16 opportunities.

17

18 *How this study might affect research, practice or policy*

19

20 Based upon our work, training bodies should consider how occupational factors may  
21 contribute to adverse trainee health and healthy living. Furthermore, our recommendations  
22 should be considered when devising strategies to improve trainee wellbeing, thereby  
23 safeguarding high-quality patient care in the future.

1 Introduction

2

3 Cardiology is a medical speciality that has historically been viewed as a rewarding career,  
4 providing high job satisfaction, prestige and the opportunity to translate research to the  
5 bedside [1]. In the United Kingdom (UK), accreditation in cardiology requires at least ten  
6 years postgraduate training, encompassing general medicine, general cardiology as well as a  
7 subspecialty [2]. However, training demands and other occupational stressors, some unique to  
8 cardiology and others consistent with other highly skilled professions, may be contributing to  
9 ill health in those training in the profession [3].

10

11 Factors contributing to poor wellbeing amongst cardiology trainees may include bullying,  
12 burnout and psychological stress [4]. Ill health and burnout in cardiologists may directly  
13 impact patient care through higher rates of physician error and near-misses, absenteeism and  
14 difficulties with retention [5]. To that end, in 2021 an international collaboration of major  
15 cardiac organisations provided an opinion on the necessity to address cardiology healthcare  
16 workers well-being as a priority [6]. They describe clinician burnout as being an extreme  
17 negative component of a wellbeing spectrum, influenced by workload demands and work-life  
18 integration amongst others [6].

19

20 Understanding the scale of poor well-being is fundamental to guide resource allocation.

21 However, the prevalence of physical and mental ill health within cardiology trainees is  
22 presently unknown. There is also a lack of data as to which trainee groups are more likely to  
23 report physical and mental ill health. There is also uncertainty as to the impact of work on  
24 trainee health, and how occupational wellbeing services help those in need. Finally, it is  
25 uncertain whether trainees can maintain healthy lifestyles and how that might be associated

1 with wellbeing. To that end, we sought to understand the current state of health and wellbeing  
2 of cardiology trainees in the UK.

3  
4

## 5 Methods

6  
7 *British Junior Cardiologists' Association Survey*

8

9 The British Junior Cardiologists' Association (BJCA) is a professional body which represents  
10 845 cardiology trainees in the UK and conduct an annual survey of trainees working lives [4].  
11 The 2023 BJCA training survey sought to assess the current health and wellbeing of trainees.  
12 Therefore, in addition to questions on demographics and experiences of cardiology training,  
13 questions relating to health, healthy living, burnout and support for wellbeing were included  
14 (Tables S1 and S2). We also invited responders to complete screening questionnaires for  
15 anxiety and depression symptoms (Table S3). Survey advertising was via the BJCA mailing  
16 list, local trainee representatives and training programme directors.

17

### 18 *Assessing health, burnout and a supportive working environment*

19

20 Responders were invited to report the presence of physical or mental health conditions lasting  
21 over one year. The Patient Health Questionnaire 9 (PHQ-9) was used as a depression  
22 screening tool [7]; this has previously been determined to have high sensitivity and  
23 specificity for major depressive disorders in occupational settings [8]. The Generalised  
24 Anxiety Disorder 7 (GAD-7) questionnaire was used as a screening tool for anxiety disorders  
25 [9]. Severity of anxiety and depression symptoms over the previous two weeks were

1 classified as none, mild, moderate or severe, and deemed significant if scoring in the  
2 moderate or severe range (PHQ-9  $\geq$  10; GAD-7  $\geq$  10). Burnout was self-reported and deemed  
3 significant if responders indicated they were either “somewhat” or “very” close to burnout.  
4 Impact of work on health, availability of occupational support for health conditions, and if  
5 wellbeing support had previously been offered was also assessed. Responders were asked  
6 about regularity of physical activity, alcohol intake, smoking, sleep patterns and ability to  
7 maintain a healthy diet.

8

### 9 *Statistical analysis*

10

11 Responders were eligible for inclusion if they consented to take part in the health and  
12 wellbeing survey questions, and if they had completed three basic demographic questions on  
13 age, gender, and whether they held a cardiology national training number. All analyses were  
14 performed using Stata/MP statistical software (StataCorp LLC, Texas, US). All statistical  
15 tests were two-sided with statistical significance defined as  $p \leq 0.05$ . Continuous data are  
16 presented as means with standard deviations (SD), and p values calculated using independent  
17 samples t-tests between groups. Categorical data are presented as counts with percentages,  
18 and p values calculated between groups using Chi<sup>2</sup> test. Poisson regression with robust error  
19 variance was used to determine associations between univariate predictors of burnout,  
20 anxiety and depression. Results are presented as prevalence ratios (PR) with 95% confidence  
21 intervals (CI). Missing data were not imputed.

22

### 23 *Qualitative analysis*

24



1 As part of the survey, participants were asked: “*What could be done to improve wellbeing and*  
2 *health amongst cardiology trainees*”. Free text answers were imported into NVivo for Mac  
3 (Lumivero, Denver, USA) to support data management and analysis. Thematic analysis was  
4 completed using the stages of familiarisation, generating initial codes, searching for themes  
5 and writing of a narrative summary.

6

### 7 *Patient and public involvement*

8 Survey questions were designed by cardiology trainees and results were discussed with the  
9 patient representative of the cardiology Specialty Advisory Committee.

10

## 11 Results

12

13 Of the 398 responders to the 2023 BJCA survey (398 of 845 BJCA affiliated trainees ,47%  
14 response rate), 391 were eligible for inclusion of whom 212 consented to answer health and  
15 wellbeing questions and were included in data synthesis (Figure S1). Baseline demographics  
16 are shown in Table 1.

17

### 18 *Physical health, mental health and burnout*

19

20 Of the included cohort of 212, 18% (n=38) reported a health condition lasting more than 12  
21 months, with 9% (n=19) reporting a physical health condition only, 7% (n=14) a mental  
22 health condition only, and 2% (n=5) both. A quarter of responders (26%, n=56) reported  
23 being very close to burnout and 49% (n=104) responded being somewhat close.

24

1 Within the cohort of 137 who completed the PHQ-9/GAD-7 questionnaires, 25% (n=34 of  
2 137) reported moderate or severe depression and 18% (n=24 of 137) reported moderate or  
3 severe anxiety (Figure 1A and 1B). When combined, 28% (n=39 of 137) of responders had  
4 depression or anxiety scores that were at least moderate, the majority of whom were not  
5 known to have a co-existing mental health condition (Figure 1C). When asked about thoughts  
6 of self-harm or suicide, 12% (n=17 of 137) reported that they had had these thoughts at least  
7 once in the preceding two weeks (Figure 1D). Health and burnout results are shown in Table  
8 S4.

9

#### 10 *Impact of cardiology training on health*

11

12 When asked about the perceived impact of training on physical and mental health and  
13 availability of support (Figure 2, Table S5), 43% (n=90 of 211) and 47% (n=98 of 208)  
14 responded that training has a negative or very negative impact on their physical and mental  
15 health, respectively. For those with physical health conditions, 79% (n=19 of 24) agreed that  
16 they had felt appropriately supported at work or in the training programme for their  
17 condition. However, only 37% (n=7 of 19) of those with a mental health condition felt the  
18 same. When asked whether they have been offered wellbeing support and guidance most  
19 responders were unsure if it were available, either by their trust (56%, n=76 of 137) or  
20 deanery (56%, n=77 of 137). The most common occupational factors trainees associated with  
21 poor wellbeing were the *amount of service provision* (56%, n=79 of 140), *curriculum*  
22 *requirements* (48%, n=67 of 140), and *lack of training opportunities* (46%, n=64 of 140)  
23 (Figure 3).

24

1 *Factors associated with anxiety, depression and burnout*

2

3 Trainees with dependents reported lower rates of burnout than those without dependents (PR  
4 0.77, 95% CI: 0.65-0.92,  $p<0.01$ ). LTFT trainees reported higher rates of anxiety (PR 2.92,  
5 95% CI 1.39-6.16,  $p<0.01$ ) and depression (PR 3.66, 95% CI: 2.24-5.98,  $p<0.01$ ). No other  
6 associations between demographics, training factors, and burnout, anxiety, or depression  
7 were identified (Table 2, Table S6).

8

9 *Lifestyles of trainees and associations with burnout and mental health*

10

11 We assessed whether current cardiology trainees had healthy lifestyles (Figure 4, Table S7).  
12 Only 1% (n=2 of 211) of responders were current smokers, with 6% (n=12 of 211) reporting  
13 being an ex-smoker. In total, 6% (n=13 of 211) of trainees reported alcohol consumption  
14 above the UK recommended limit of 14 units per week. Only 14% (n=29 of 211) of trainees  
15 regularly achieved 30 minutes of moderate or 15 minutes of intense exercise on at least 5  
16 days per week. Most trainees (80%, n=167 of 211) obtained adequate sleep on four or fewer  
17 nights each week and only 37% (n=78 of 211) of trainees agreed or strongly agreed that they  
18 were able to maintain a healthy diet on most days.

19

20 We investigated associations between lifestyle factors and the presence of burnout, anxiety  
21 and depression (Table 2). Higher frequency of exercise was associated with lower rates of  
22 burnout (PR 0.85, 95% CI: 0.74-0.98,  $p=0.02$ ) and depression (PR 0.76, 95% CI 0.40-1.32,  
23  $p<0.01$ ). Better sleep was associated with lower rates of burnout (PR 0.95, 95% CI 0.90-0.99,  
24  $p=0.01$ ), anxiety (PR 0.76, 95% CI 0.63-0.93,  $p<0.01$ ) and depression (PR 0.71, 95% CI  
25 0.58-0.87,  $p<0.01$ ). Maintaining a healthy diet was associated with low rates of burnout (PR

1 0.60, 95% CI 0.45-0.80,  $p < 0.01$ ), anxiety (PR 0.60, 95% CI 0.37-0.97,  $p = 0.04$ ) and  
2 depression (PR 0.27, 95% CI 0.11-0.69,  $p < 0.01$ ).

3

#### 4 *Suggestions for improvement to wellbeing and health*

5

6 31% of trainees (n=65 of 212) responded to the free text prompt. Some described the  
7 different facets of wellbeing that were important to them, including physical fitness, good  
8 nutrition and adequate rest. In addition, some respondents said they valued being able to  
9 settle, as well as having a short commute and having employment and financial security. The  
10 current structure of the cardiology training programme as well as pressures within the NHS  
11 were perceived as negatively impacting on all these aspects.

12

13 Several respondents described the stress of the job with high demands, in some cases  
14 exacerbated by staff shortages. For many respondents, it was particularly the requirement for  
15 General Internal Medicine (GIM) work and its additional curriculum that contributed to this  
16 burden. Some felt that service provision resulted in them not meeting the large volume of  
17 curriculum requirements and their own perceived training needs. Several respondents  
18 described how long and/or anti-social working hours as well as the need to undertake  
19 additional non-clinical work (e.g. teaching, quality improvement, courses) encroached on  
20 their own time and limited a good work-life balance. Some respondents were left not feeling  
21 valued by the institutions they worked for or by their colleagues.

22

23 Participants made suggestions for improving trainee wellbeing. Most of these were in  
24 response to the issues highlighted above. For example, reducing or removing the GIM  
25 requirements from training, increasing staffing levels, improving pay and fewer on call shifts  
26 and anti-social hours. However, others highlighted the importance of a culture change within

1 the speciality, with increased support, empathy and understanding for individual  
2 circumstances. Some suggested that training and feedback for the departments and  
3 consultants may help change attitudes. Finally, several respondents suggested that peer  
4 support and mentoring might be of benefit to foster a better sense of community amongst  
5 trainees.

## 6 Discussion 7 8

### 9 *Anxiety and depression amongst cardiology trainees*

10

11 In the most comprehensive assessment of the physical and mental wellbeing of UK  
12 cardiology trainees, we have shown a high prevalence of anxiety, depression and burnout.  
13 The prevalence of poor mental wellbeing has been recently described in a global survey of  
14 over five thousand cardiologists, which showed 1 in 4 cardiologists had a pre-existing mental  
15 health condition [10].

16

17 The UK Office of National Statistics data from 2021 and 2022 reported 16% of adults have  
18 moderate to severe depressive symptoms, and 23% high levels of anxiety [11,12]. Our  
19 observed rates of depressive symptoms in 25% of cardiology trainees were numerically  
20 higher than these, and are comparable with a recent analysis of 3,577 international medical  
21 residents reporting 21% had at least moderate depressive symptoms [13]. A study of UK  
22 doctors reported depressive and anxiety symptoms in 22% and 26% respectively which is  
23 broadly similar to our results [14]. Mental health problems are associated with doctors  
24 reducing working hours and lower job satisfaction [15]. Vitaly, poor mental health has  
25 previously been associated with worse patient outcomes including greater rates of medical  
26 errors and provision of sub-optimal care [16]. As such, whilst rates of anxiety and depression

1 are high across a range of medical specialties, the high absolute levels in cardiology remain  
2 important findings requiring prompt action.

3

4 Of further concern, more than 1 in 10 trainees described recent thoughts of suicide and self-  
5 harm. High rates of depression and suicidal ideation have been previously reported in  
6 medical trainees [13], with excessive or conflicting job demands, work-life imbalance, study  
7 and examination time as identifiable risk factors [3]. Physicians have higher rates of suicide  
8 compared with other graduate occupations [17], independent of other socioeconomic factors  
9 [18].

10

11 Most trainees with high anxiety and depression scores were not known to have a prior mental  
12 health condition, suggesting underdiagnosis. This may be attributable to a negative stigma  
13 associated with the reporting of mental health concerns in medicine [19]. If trainees do not  
14 feel they will be supported in their mental health condition, then this might reduce reporting  
15 and help-seeking behaviours.

16

### 17 *Burnout amongst cardiology trainees*

18

19 Significant associations have been demonstrated between physician burnout and rates of  
20 depression and suicidal ideation [20]. Our reported high rates of burnout are consistent with  
21 the 2023 UK General Medical Council trainee survey, which reported 47% of those working  
22 within cardiology felt work-related burnout to a high degree [21]. High rates of burnout were  
23 also observed in 1159 predominately US-based interventional cardiologists, with 69% of  
24 survey participants stating burnout was having a negative impact on their life, a finding  
25 predominantly driven by being worn out, working too hard or being emotionally exhausted

1 with work [22]. Another study of 2313 US cardiologists found that fellows in training  
2 reported lower rates of burnout compared with other stages of cardiology career [23].

3

#### 4 *Associations with negative wellbeing*

5

6 In our study, the only demographic or workplace association for a higher risk of depression  
7 and anxiety was being a LTFT trainee. This association does not mean causality, indeed those  
8 suffering from symptoms of ill health may choose to work LTFT, which has been adopted in  
9 the UK as one strategy to improve wellbeing [24]. Those with dependents reported lower  
10 rates of burnout, which is consistent with a survey of UK anaesthetic trainees [25]. Others  
11 have found that exposure to work-related stressful events, suffering financial issues, and  
12 work-related burnout as associated with a physician's risk of suicidal ideation [20]. The  
13 temporality and causality of these associations are not clear; experiences may lead to  
14 misattributing drivers of negative wellbeing when other non-workplace and unmeasured  
15 factors may be contributing to ill health.

16

17 Concerningly, a high proportion of respondents felt training impacted negatively on their  
18 health, and most were unaware of any wellbeing initiatives. Trainees associated several  
19 modifiable training factors with poor wellbeing, including a high burden of service provision  
20 impacting training opportunities and meeting curriculum requirements. These factors go  
21 hand-in-hand: curriculum requirements pressure trainees to ensure their progress is of an  
22 adequate standard for the training programme. However, if trainees are covering shortfalls in  
23 service provision, then training opportunities are eroded and a clear mismatch becomes  
24 evident.

25

1 Other negative factors highlighted by trainees included difficulty in settling in one place,  
2 inability to maintain physical health, and training specifics including the curriculum. Our  
3 results differ to the wellbeing survey of predominantly US-based interventional cardiologists,  
4 where high rates of paperwork, insufficient compensation and excess bureaucracy were the  
5 major contributors to negative wellbeing [22].

6

### 7 *How healthy are cardiology trainees?*

8

9 Our results show that, compared with the UK average adult, cardiology trainees are less  
10 likely to be smokers (1% vs 12%) and to drink more than 14 units alcohol per week (6% vs  
11 21%) [26]. A survey of UK anaesthetists reported similarly low smoking rates (2%) but  
12 greater numbers with higher alcohol intake (18%) [25]. The European Society of Cardiology  
13 recommend at least 150 minutes moderate intensity activity in multiple sessions per week,  
14 yet many of our survey responders did not meet this recommendation [27].

15

16 Further analysis identified significant associations between exercise, sleep and diet with  
17 burnout, depression and anxiety, although causality cannot be inferred. However, physical  
18 activity is well established as improving mental health, including an antidepressant effect  
19 [28], and is recommended in various aspects of physical health longevity including  
20 cardiovascular disease prevention [29]. Even more notable then that many trainee  
21 cardiologists do not ‘practice what they preach’.

22

### 23 *The impact on patients*

24



1 Ability to care for ourselves and exposure to psychological stress may impact how we listen,  
2 engage and ultimately provide care to our patients. In 184 US internal medicine residents,  
3 West *et al.* demonstrated an association between high rates of burnout and depression with  
4 increased medical errors [16]. A study of 2773 US anaesthesiology residents found those at  
5 higher risk of burnout and depression more frequently reported medication errors, mistakes  
6 with negative patient consequences and gave less attention to patients [30]. Moreover, a  
7 systematic review assessing clinician wellbeing and burnout, found poor staff wellbeing to be  
8 associated with impaired patient outcomes, including near misses and medical errors [5].  
9 Whilst strategies to improve trainee wellbeing may improve patient care, confirmation  
10 studies would be required.

11

## 12 *Recommendations*

13

14 Based upon comments from trainees in the survey, author experience of wellbeing, and as  
15 nationally elected representatives of UK cardiology trainees, we have put forward  
16 recommendations to help improve trainee health (Figure 5). Whilst we anticipate these  
17 recommendations will be of benefit, further work is required to demonstrate how to improve  
18 trainee health outcomes. We urge trainees in difficulty to contact a support service, for  
19 example NHS practitioner health ([www.practitionerhealth.nhs.uk](http://www.practitionerhealth.nhs.uk)).

20

## 21 *Limitations*

22

23 Whilst this study provides a comprehensive assessment of multiple health and wellbeing  
24 outcomes, we acknowledge that survey data has limitations. Burnout was a self-reported  
25 outcome, and therefore responses were dependent on an individual's interpretation of

1 burnout. We cannot exclude response bias, attempts were made to ensure questions were  
2 neutral and non-judgmental where possible. In addition, we have missing data for several  
3 questions and this may not be missing due to random factors. We did not collect information  
4 pertaining to specific prior mental or physical health illnesses. Our results are observational,  
5 so causality cannot be inferred.

6

## 7 Conclusion

8 The prevalence of burnout, anxiety and depression is concerningly high amongst UK  
9 cardiology trainees, highlighting work-related burnout, trainee health, and the lack of support  
10 trainees feel towards their mental health. Training bodies should consider how occupational  
11 factors contribute to adverse trainee health, and devise strategies to better preserve trainee  
12 wellbeing to safeguard high-quality patient care for the future.

13

## 14 Supplementary material

15 See attached supplementary results

16

## 17 Acknowledgments and affiliations

18 Many thanks to Sarah Brown, RCP Specialty Advisory Committee patient representative, for  
19 the patient perspectives on this work.

20 We would like to thank colleagues from across the UK for completing this survey, and hope  
21 that this article helps to improving their working lives.

22

## 23 Measurements and abbreviations

24 ACF academic clinical fellow

25 ACL academic clinical lecturer

- 1 BAME Black, Asian and minority ethnic
- 2 BJCA British Junior Cardiologists' Association
- 3 CI confidence interval
- 4 DGH district general hospital
- 5 GAD-7 Generalised Anxiety Disorder 7
- 6 GIM General Internal Medicine
- 7 LTFT less than full time
- 8 NHS National Health Service
- 9 NTN national training number
- 10 PR ratio
- 11 PHQ-9 Patient Health Questionnaire 9
- 12 RCP Royal College of Physicians
- 13 SD standard deviation
- 14 UK United Kingdom
- 15 US United States
- 16
- 17 Funding
- 18 Not applicable
- 19
- 20 Data Availability
- 21 Data are available upon reasonable request
- 22
- 23 Research Ethics
- 24 Formal ethical approval was not required for this study.
- 25

1 Competing interests

2 None to declare

3

4

5 Contributorship statement

6

7 WJJ and OIB analysed the results, wrote the manuscript and are joint first authors. AM

8 analysed the results and reviewed the manuscript. TG planned the survey and collected the

9 results. HM, SB, DB reviewed and contributed to the manuscript and advised on

10 recommendations for trainees. CFC planned the survey, collected the results, reviewed the

11 manuscript and is the guarantor. All authors reviewed final manuscript.

## 1 References

- 2 1 Coyle C, Evans H. A career in cardiology: why? *Heart*. 2019;105:498. doi:  
3 10.1136/heartjnl-2018-314292
- 4 2 Joint Royal Colleges of Physicians Training Board. Cardiology Training. Cardiology  
5 Training. <https://www.thefederation.uk/training/specialties/cardiology> (accessed 14 April  
6 2024)
- 7 3 Harvey SB, Epstein RM, Glozier N, *et al.* Mental illness and suicide among physicians.  
8 *Lancet*. 2021;398:920–30. doi: 10.1016/S0140-6736(21)01596-8
- 9 4 Camm CF, Joshi A, Moore A, *et al.* Bullying in UK cardiology: a systemic problem  
10 requiring systemic solutions. *Heart*. 2022;108:212–8. doi: 10.1136/heartjnl-2021-319882
- 11 5 Hall LH, Johnson J, Watt I, *et al.* Healthcare Staff Wellbeing, Burnout, and Patient Safety:  
12 A Systematic Review. *PLoS One*. 2016;11:e0159015. doi: 10.1371/journal.pone.0159015
- 13 6 Mehta LS, Elkind MSV, Achenbach S, *et al.* Clinician Well-Being: Addressing Global  
14 Needs for Improvements in the Health Care Field A Joint Opinion From the American  
15 College of Cardiology, American Heart Association, European Society of Cardiology, and  
16 the World Heart Federation. *Journal of the American College of Cardiology*. 2021;78:752–  
17 6. doi: 10.1016/j.jacc.2021.04.043
- 18 7 Kroenke K, Spitzer RL, Williams JB. The PHQ-9: validity of a brief depression severity  
19 measure. *J Gen Intern Med*. 2001;16:606–13. doi: 10.1046/j.1525-1497.2001.016009606.x
- 20 8 Volker D, Zijlstra-Vlasveld MC, Brouwers EPM, *et al.* Validation of the Patient Health  
21 Questionnaire-9 for Major Depressive Disorder in the Occupational Health Setting. *J*  
22 *Occup Rehabil*. 2016;26:237–44. doi: 10.1007/s10926-015-9607-0
- 23 9 Spitzer RL, Kroenke K, Williams JBW, *et al.* A brief measure for assessing generalized  
24 anxiety disorder: the GAD-7. *Arch Intern Med*. 2006;166:1092–7. doi:  
25 10.1001/archinte.166.10.1092
- 26 10 Sharma G, Rao SJ, Douglas PS, *et al.* Prevalence and Professional Impact of Mental  
27 Health Conditions Among Cardiologists. *J Am Coll Cardiol*. 2023;81:574–86. doi:  
28 10.1016/j.jacc.2022.11.025
- 29 11 UK Office of National Statistics. Cost of living and depression in adults, Great Britain  
30 - Office for National Statistics. 2022.
- 31 12 UK Office of National Statistics. Depression or anxiety in adults, Great Britain: 22  
32 September to 3 October 2021 , Opinions and Lifestyle Survey (COVID-19 module). 2021.
- 33 13 Mata DA, Ramos MA, Bansal N, *et al.* Prevalence of Depression and Depressive  
34 Symptoms Among Resident Physicians: A Systematic Review and Meta-analysis. *JAMA*.  
35 2015;314:2373–83. doi: 10.1001/jama.2015.15845
- 36 14 Johns G, Waddington L, Samuel V. Prevalence and predictors of mental health  
37 outcomes in UK doctors and final year medical students during the COVID-19 pandemic.  
38 *J Affect Disord*. 2022;311:267–75. doi: 10.1016/j.jad.2022.05.024

- 1 15 Mihailescu M, Neiterman E. A scoping review of the literature on the current mental  
2 health status of physicians and physicians-in-training in North America. *BMC Public*  
3 *Health*. 2019;19:1363. doi: 10.1186/s12889-019-7661-9
- 4 16 West CP, Huschka MM, Novotny PJ, *et al*. Association of perceived medical errors  
5 with resident distress and empathy: a prospective longitudinal study. *JAMA*.  
6 2006;296:1071–8. doi: 10.1001/jama.296.9.1071
- 7 17 Hem E, Haldorsen T, Aasland OG, *et al*. Suicide rates according to education with a  
8 particular focus on physicians in Norway 1960-2000. *Psychol Med*. 2005;35:873–80. doi:  
9 10.1017/s0033291704003344
- 10 18 Agerbo E, Gunnell D, Bonde JP, *et al*. Suicide and occupation: the impact of socio-  
11 economic, demographic and psychiatric differences. *Psychol Med*. 2007;37:1131–40. doi:  
12 10.1017/S0033291707000487
- 13 19 Wijeratne C, Johnco C, Draper B, *et al*. Doctors’ reporting of mental health stigma  
14 and barriers to help-seeking. *Occupational Medicine*. 2021;71:366–74. doi:  
15 10.1093/occmed/kqab119
- 16 20 Diaz E, Abad-Tortosa D, Ghezal M, *et al*. Role of stressful life events and personality  
17 traits on the prevalence of wish to die among French physicians. *Front Public Health*.  
18 2024;12:1244605. doi: 10.3389/fpubh.2024.1244605
- 19 21 General Medical Council UK Education Data Tool. [https://edt.gmc-uk.org/indicator---](https://edt.gmc-uk.org/indicator---trainee)  
20 trainee (accessed 14 April 2024)
- 21 22 Simsek B, Rempakos A, Kostantinis S, *et al*. International Psychological Well-Being  
22 Survey of Interventional Cardiologists. *JACC Cardiovasc Interv*. 2023;16:1401–7. doi:  
23 10.1016/j.jcin.2023.03.033
- 24 23 Mehta LS, Lewis SJ, Duvernoy CS, *et al*. Burnout and Career Satisfaction Among  
25 U.S. Cardiologists. *Journal of the American College of Cardiology*. 2019;73:3345–8. doi:  
26 10.1016/j.jacc.2019.04.031
- 27 24 Enhancing Doctors’ Working Lives. Health Education England. 2017.  
28 <https://www.hee.nhs.uk/our-work/doctors-training/enhancing-working-lives> (accessed 14  
29 April 2024)
- 30 25 Looseley A, Wainwright E, Cook T m., *et al*. Stress, burnout, depression and work  
31 satisfaction among UK anaesthetic trainees; a quantitative analysis of the Satisfaction and  
32 Wellbeing in Anaesthetic Training study. *Anaesthesia*. 2019;74:1231–9. doi:  
33 10.1111/anae.14681
- 34 26 Health Survey for England, 2021: Data tables. NHS England Digital.  
35 [https://digital.nhs.uk/data-and-information/publications/statistical/health-survey-for-](https://digital.nhs.uk/data-and-information/publications/statistical/health-survey-for-england/2021/health-survey-for-england-2021-data-tables)  
36 [england/2021/health-survey-for-england-2021-data-tables](https://digital.nhs.uk/data-and-information/publications/statistical/health-survey-for-england/2021/health-survey-for-england-2021-data-tables) (accessed 14 April 2024)
- 37 27 Pelliccia A, Sharma S, Gati S, *et al*. 2020 ESC Guidelines on sports cardiology and  
38 exercise in patients with cardiovascular disease: The Task Force on sports cardiology and  
39 exercise in patients with cardiovascular disease of the European Society of Cardiology  
40 (ESC). *European Heart Journal*. 2021;42:17–96. doi: 10.1093/eurheartj/ehaa605

- 1 28 Kandola A, Ashdown-Franks G, Hendrikse J, *et al.* Physical activity and depression:  
2 Towards understanding the antidepressant mechanisms of physical activity. *Neuroscience*  
3 & *Biobehavioral Reviews*. 2019;107:525–39. doi: 10.1016/j.neubiorev.2019.09.040
- 4 29 Piepoli MF, Hoes AW, Agewall S, *et al.* 2016 European Guidelines on cardiovascular  
5 disease prevention in clinical practice: The Sixth Joint Task Force of the European Society  
6 of Cardiology and Other Societies on Cardiovascular Disease Prevention in Clinical  
7 Practice (constituted by representatives of 10 societies and by invited experts)Developed  
8 with the special contribution of the European Association for Cardiovascular Prevention &  
9 Rehabilitation (EACPR). *Eur Heart J*. 2016;37:2315–81. doi: 10.1093/eurheartj/ehw106
- 10 30 De Oliveira GSJ, Rahmani R, Fitzgerald PC, *et al.* The Association Between  
11 Frequency of Self-Reported Medical Errors and Anesthesia Trainee Supervision: A Survey  
12 of United States Anesthesiology Residents-in-Training. *Anesthesia & Analgesia*.  
13 2013;116:892. doi: 10.1213/ANE.0b013e318277dd65

14

		<b>Health and wellbeing responders</b>
<b>Demographic factors</b>		
Male		140 (66)
Age, years		34 ± 4
Ethnicity		
	White	95 (45)
	Mixed/Multiple	8 (4)
	Asian	81 (38)
	Black	7 (3)
	Other	21 (10)
Trainees with dependents <sup>1</sup>		
	Any dependents	89 (42)
	Dependents <18 years old	80 (38)
	Dependents ≥ 18 years old	19 (9)
<b>Training factors</b>		
Current NTN holder		206 (97)
Currently work LTFT (n=211)		26 (12)
Currently work in a tertiary centre (n=202)		125 (60)
UK undergraduate trained		146 (69)
Current ACF or ACL		14 (7)
Currently out of programme		39 (18)
On the new 2022 Cardiology curriculum (n=211)		130 (62)
<b>Current trainee location</b>		
England,		183 (89)
Northern Ireland		8 (4)
Scotland		9 (4)
Wales		5 (2)
<b>Current year of cardiology training (n=205)</b>		
1 <sup>st</sup> (ST3 old curriculum , ST4 new curriculum)		33 (16)
2 <sup>nd</sup>		28 (14)
3 <sup>rd</sup>		50 (24)
4 <sup>th</sup>		33 (16)
5 <sup>th</sup>		38 (19)
6 <sup>th</sup> (ST7 old curriculum, ST8 new curriculum)		16 (8)
Other / Non-training grade		7 (3)

**Table 1 – Baseline characteristics of the 2023 BJCA Health and Wellbeing survey.** Total n= 212 unless otherwise stated. Categorical data is presented as *n* (%) and continuous data is presented as mean (SD). Abbreviations: academic clinical fellow (ACF); academic clinical lecturer (ACL); Less Than Full Time Trainee (LTFT); national training number (NTN); standard deviation (SD).

<sup>1</sup> Ten responders had children both over 18 and under 18 years of age and are counted in both rows.



		Somewhat or very burnout		Moderate or more anxiety		Moderate or more depression	
	PR representation	PR (95% CI)	P value	PR (95% CI)	P value	PR (95% CI)	P value
<i>Demographic factors</i>							
<b>Age</b>	Per 1 unit increase	1.00 (0.98-1.02)	1.00	0.95 (0.86-1.06)	0.37	1.05 (0.97-1.12)	0.22
<b>Male sex</b>	Vs female sex	0.87 (0.75-1.01)	0.06	0.65 (0.32-1.36)	0.26	0.79 (0.44-1.43)	0.45
<b>Dependents, y/n</b>	Vs no dependents	0.77 (0.65-0.92)	<b>&lt;0.01</b>	0.84 (0.39-1.83)	0.66	1.18 (0.65-2.13)	0.58
<b>Ethnicity BAME</b>	Vs white	1.14 (0.98-1.34)	0.09	0.88 (0.43-1.83)	0.74	0.73 (0.40-1.32)	0.31
<i>Training factors</i>							
<b>LTFT trainee</b>	Vs non less than full time trainee	1.07 (0.87-1.31)	0.51	2.92 (1.39-6.16)	<b>&lt;0.01</b>	3.66 (2.24-5.98)	<b>&lt;0.01</b>
<b>Non-UK undergraduate training</b>	Vs UK undergraduate training	1.02 (0.87-1.19)	0.80	1.03 (0.46-2.30)	0.93	1.55 (0.87-2.79)	0.14
<b>Higher trainee</b>	Vs core cardiology trainee	0.89 (0.76-1.04)	0.15	0.77 (0.36-1.66)	0.51	1.00 (0.55-1.81)	1.00
<b>Academic trainee</b>	Vs non-academic trainee	1.12 (0.87-1.43)	0.47	0.95 (0.15-5.94)	0.96	N/A	N/A
<b>Current training location DGH</b>	Vs tertiary hospital	1.08 (0.93-1.26)	0.29	2.01 (0.95-4.26)	0.07	0.88 (0.48-1.64)	0.70
<i>Lifestyle factors</i>							
<b>Days of moderate or intense exercise per week</b>	Per 1 unit increase	0.85 (0.74-0.98)	<b>0.02</b>	0.83 (0.68-1.02)	0.08	0.76 (0.63-0.92)	<b>&lt;0.01</b>
<b>Alcohol consumption</b>	Per 1 unit increase	1.00 (0.97-1.04)	0.87	0.99 (0.93-1.04)	0.59	0.99 (0.96-1.303)	0.76
<b>Days of good night sleep per week</b>	Per 1 unit increase	0.95 (0.90-0.99)	<b>0.01</b>	0.76 (0.63-0.93)	<b>&lt;0.01</b>	0.71 (0.58-0.87)	<b>&lt;0.01</b>
<b>Agree able to maintain healthy diet</b>	Vs no	0.60 (0.45-0.80)	<b>&lt;0.01</b>	0.60 (0.37-0.97)	<b>0.04</b>	0.52 (0.35-0.79)	<b>&lt;0.01</b>

**Table 2** - Univariable demographic and lifestyle predictors of burnout, anxiety and depression from Poisson regression with robust error variance presented as prevalence ratios (PR) with 95% confidence intervals. Abbreviations: Black, Asian and minority ethnic (BAME); confidence interval (CI); district general hospital (DGH); Less Than Full Time Trainee (LTFT); national training number (NTN); prevalence ratio (PR); standard deviation (SD); yes (Y)

