

HELPING FUTURE HEALERS: EVALUATING STUDENT EXPERIENTIAL WELLBEING IN LIGHT OF A PROACTIVE SUPPORT FRAMEWORK

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ABSTRACT: Medical students require a foundation of good physical and mental health to help prepare them for the healthcare systems of the 21st century. At the [name deleted to maintain the integrity of the review process] (UK), undergraduate medical students' perceived wellbeing has been assessed following incorporation of a student-focussed support framework within the curriculum. Considering the unprecedented challenges faced by medical students during academic years 2019/20 and 2020/21, we provide an assessment and reflection on the effectiveness of current embedded support. Students' perceived wellbeing was assessed through two questionnaires given to cohorts of first- and second-year students at the start and end of the autumn semester during the academic years of 2019/20 and 2020/21. The data showed that second-year medical students' maintained feelings of positivity, displayed undiminished levels of confidence and satisfaction with their course – even in the face of the global COVID-19 pandemic. However, first-year medical students showed lower levels of mood compared to previous years, as well as increased levels of stress and nervousness. This study has highlighted the strengths of face-to-face teaching in small groups for a student body (year 2) facing difficulties. However, it also revealed that students who are transitioning to higher education in environments of limited face-to-face teaching would benefit from the implementation of extra wellbeing strategies to compensate for this deficit. Here, we discuss how support at stress “chokepoints” of the course is vital, and when combined with regular monitoring, must be primed to evolve for new challenges – even in the form of a global pandemic.

KEYWORDS: Undergraduate medical students, Wellbeing, Support, Proactive interventions

INTRODUCTION

A mental health crisis amongst medical students, involving notable increases in the prevalence of depression, anxiety, burnout, and suicidal ideation has been ongoing for decades (Keller, 2014). This crisis is formed from complexities aligned to the socialization of medical students, with influences including personality, environmental factors, coping strategies and health outcomes (Wolf, 1994). Interestingly, studies suggest medical students often self-report as exhibiting greater mental health issues compared to the general population (Puthran et al., 2016, Farrell et al., 2019). With stress dominant in this narrative, it is unsurprising that students are vulnerable to poor mental wellbeing when exposed to medical school environments. Within this context, students encounter increased high stake assessments, high workload, clinical placements and peer competition – just a few of the stressors identified (Bramness et al., 1991, Nechita et al., 2014). As a reflection, it is concerning that these stressors, potentially evolving into mental ill health, are not confined to medical school, but may emerge during subsequent professional careers. Unfortunately, as a consequence, studies suggest an increase in attrition, exhaustion, or suicide rates that are considered higher than those of the general population (Slavin et al., 2014, Dyrbye and Shanafelt, 2016). Aligned to the above concerns is the fact that many of the aforementioned stress-inducing experiences likely result from medical students struggling to cope with their encountered pressures (Rahimi et al., 2014, Thompson et al., 2016). Therefore, a key component for a mitigatory approach is the application of proactive coping strategies (Folkman et al., 1986, Moffat et al., 2004, Schiller et al., 2018). To address this need, and align impactful support mechanisms, it is important to investigate the evidence-basis of current higher education challenges, alongside establishing the local needs of students relative to their institutional setting. Thus, this study's overarching objective was to establish and explore a robust mechanism for measuring the wellbeing of medical

students at the *[name deleted to maintain the integrity of the review process]* (XXX). In doing so, the motive was to gain inherent knowledge of their needs and provide contextual evidence for change in order to maximise support provided within an ever-changing educational environment.

It is essential to acknowledge that the medical student mental health crisis/concept has gained recognition as a significant problem, both nationally in the United Kingdom (UK) and internationally (Cuttlan et al., 2016, Ruhomaulu et al., 2020, Syeda Rubaba, 2020). This has led to a realisation amongst stakeholders that medical student mental health and wellbeing should be a higher education sector priority. Reassuringly, this messaging is reinforced by UK public bodies, such as the General Medical Council (GMC), focussing on wellbeing as part of their agendas (General Medical Council, 2013). Consequently, medical schools are increasingly implementing wellbeing interventions within their curricula (Velez et al., 2019, *[citation deleted to maintain the integrity of the review process]*). With interventions broadly categorised into ‘reactive’ or ‘proactive’, reactive interventions involve supporting individual students who develop/experience psychological distress whilst in medical school. This approach-style may include; (1) improving access to psychological therapy, (2) educating students about various mental health issues, (3) and shifting cultural stigmas associated with seeking psychological help (Slavin et al., 2014). Complementarily, proactive measures have included wellness programs which aim to reduce the impact of negative experiences encountered within a student’s learning environment (McGrady et al., 2012, Slavin et al., 2014).

As authors we are involved in providing support to medical students at our respective institution. Specifically, we support students in the early years of the *[name deleted to maintain the integrity of the review process]* medical undergraduate programme (years 1-3) where they are exposed to the knowledge and skills to become a doctor, complete a third-year research project, and attain a Bachelor of Medical Sciences (BMedSci) degree. This is followed by the programme’s second part – the clinical phase (years 3-5) – where students apply their learning on placement at hospitals and General Practice surgeries, to qualify with a Bachelor of Medicine, Bachelor of Surgery (BMBS) degree. Of interest, is the fact that we have embedded within our support system a myriad of interventions as part of the BMedSci degree *[citation deleted to maintain the integrity of the review process]*. In taking a holistic approach, creating these interventions necessitated a framework designed to give students autonomy to engage with more proactive mental health strategies. The specific initiatives introduced were a wide-ranging mix including ‘goal setting’, ‘study skills’, ‘nutrition’, and ‘mental health’ (*[citation deleted to maintain the integrity of the review process]*). Embedding these proactive support strategies occurred before the COVID-19 pandemic. Yet, it is paramount that we acknowledge the potentially long-lasting effects that the global pandemic has had on medical student mental health and wellbeing. Moreover, the major disruption to higher education, including of own institution, generated the need for a rapid shift to a mode of delivery of teaching and learning that still guaranteed we met the standards and requirements of our governing body (Sani et al., 2020) (**Table 1**).

Activity	2019/20	2020/21
<i>Clinical skills</i>	In-person clinical skills sessions integrated throughout the semester.	In-person clinical skills sessions delivered for one week in November 2020.
<i>GP and hospital placements</i>	GP and hospital placements integrated throughout the autumn semester.	GP and hospital placements cancelled in the autumn semester.
<i>Lectures</i>	All lectures delivered in-person.	Combination of live stream and pre-recorded on-line lectures.
<i>Anatomy practicals*</i>	In-person anatomy sessions delivered in large half-year cohorts (n=~140 students).	In-person anatomy sessions delivered in small (n=40) groups.
<i>Workshops/seminars</i>	All workshops/seminars delivered in-person.	All workshops/seminars delivered online.

Table 1: Comparisons of autumn semester teaching delivery before (2019/20) and during (2020/21) the COVID-19 pandemic for first- and second-year medical students at the *[name deleted to maintain the integrity of the review process]* (*note year 2 students attended weekly anatomy in-person practical classes and year 1 students attended one introductory anatomy class in both 2019/20 and 2020/21).

Other disruptions such as bereavement, financial constraints, loss of peer interaction and social connectivity due to lockdown, and the overall disruption to daily living likely exacerbated stressors even further (Lyons et al., 2020). Reflecting on medical students’ known vulnerability to poor mental health and wellbeing, it is no surprise that the COVID-19 pandemic aftermath has seen an increase in mental health issues (especially anxiety and burnout) (Chandratre, 2020, Sani et al., 2020). Our study looked to compare the wellbeing of medical student cohorts who

commenced their studies before, or during, the COVID-19 pandemic. Our objective was to investigate if support interventions employed within the medical programme were successful in supporting students through an unprecedented educational period, with a reflection on additional needs identified. It is of note that the impact of the COVID-19 crisis meant that most of our embedded interventions (**Table 2**) required reasonable modification to align to what we conceived to be the ‘new norm’ in the virtual learning environment. As we emerge from the global pandemic, we must look beyond COVID-19 and reflect on our experiences. Consequently, whilst the pandemic appears to be receding, we must support medical students who are still struggling with mental ill health. Whilst not surprising, as the pandemic’s impact will manifest for a significant time to come, we are keen to improve our medical students’ wellness by fostering an environment that permits them to thrive both within education as well as in professional careers. Furthermore, this desire led us to undertake a comprehensive exploration of the literature to determine what proactive supportive interventions have been implemented ‘post’ COVID-19 for medical students. The yield of limited results became a driver for our advocacy on the importance of investigating the outcomes of our proactive interventions aimed at promoting student wellness. Looking forward, we aspire to embed a robust support system that proactively ameliorates the aforementioned concerns attributed to poor mental wellbeing manifestation amongst our medical students. Furthermore, this aspiration forms part of our agenda of empowering our students to adopt active coping strategies that benefit them both within their academic studies and professional careers. In applying our original principles, this paper set out to establish the effectiveness of our current wellbeing interventions formulated as part of our strategy, and to discern potential improvements to be employed going forward.

Intervention	Activity
Mental Health First Aid [#]	<i>Individual:</i> An eLearning course providing a concise briefing of mental health and common mental health issues to students. The context was to empower students to support their peers in distress.
Near-Peer Mentoring ^{#*}	<i>Group/individual:</i> Year 1 students receive the support of a near-peer mentor. Year 2 mentors receive training and contact their mentees at specific times of the year identified as “trigger” points (e.g., before the first formative examination, first anatomy suite session, housing) identified by the student body that is annually reviewed. A minimum of 6 contact points per year.
Nutrition [#]	<i>Group:</i> An interactive session, that aims to get students to: (a) reflect on their own eating habits (b) understand the importance of a balanced diet, and (c) appreciate the connection between nutrition and mental health.
Reflection wheel for effective goal setting and planning ^{#*}	<i>Individual:</i> Students review progress on the course with their personal tutor (focussing on attitudes, behaviour and wellbeing). Consequently, students rate their engagement within several domains: (1) attendance & engagement; (2) academic progress & development; (3) careers preparation & planning; (4) clinical experiences & skill development; (5) personal interests & hobbies; (6) planning & organisation; (7) finance; and (8) wellbeing. A minimum of 4 pastoral tutorials per year, timeframe estimated ~30mins. Staff receive training aligned to delivering pastoral tutorials, enabling them to signpost to support. Tutors care supported by Senior Tutors (4) and monthly drop in help-sessions.
Study skills [*]	<i>Group:</i> Delivered via testimonials, this near-peer student-led session focuses on the different approaches to studying medicine. There are two 1-hour session delivered in a lecture-setting attended by all year 1 students. Additionally, the medical society (MedSoc) used this provision to promote welfare services/activities available to students.

Table 2: Summary of proactive interventions embedded into the early years (years 1 and 2) medical curriculum at [name deleted to maintain the integrity of the review process] led by teaching staff[#] and/or near-peers^{*}, delivered in 2019-20 and 2020-21 academic years.

MATERIALS AND METHODS

POPULATION SELECTION

The UK-based (*[name deleted to maintain the integrity of the review process]*) Medical School runs a five-year undergraduate-entry Medicine program featuring a variety of teaching modalities (lectures, seminars, workshops, and practical cadaveric dissection classes) centered around a clinical case-based approach. Early year (years 1-3) students are taught the foundations of medical sciences, alongside early clinical exposure (primary/secondary care placements). Students sit regular formative assessments (every 6 weeks) to chart progress before sitting end-of-year summative assessments that take the form of Objective Structured Practical and Clinical Examinations, and knowledge/theory-based papers. Years 3-5 see students in clinical placements preparing for the GMC Medical Licensing Assessment and graduation as a doctor entering into the UK Foundation Programme (General Medical Council, 2018).

Year 1 and 2 undergraduate students studying Medicine, within the academic years 2019/20 and 2020/21, contributed to this study. The cohorts represented early year medical students studying the traditional “pre-COVID-19” course (2019/20) and those who entered a “blended teaching” course-approach implemented under COVID-19 UK restrictions (2020/21). Notably, within each cohort there are designated places reserved for international (~10%) and Widening Participation access-route (~10%) students. At *[name deleted to maintain the integrity of the review process]* we see a slightly higher proportion of students who identify as female, compared with males, which is representative of trends observed nationally (Moberly, 2018). Additionally, most students are 18-19 years of age at course commencement. Student participation remained voluntary and anonymous throughout the investigation. The study received ethical approval from the *[name deleted to maintain the integrity of the review process]* School of Life Sciences Ethics Committee (No. B021019YM).

QUESTIONNAIRE DESIGN

All participants were asked a series of 52 questions relating to their own mental and physical wellbeing. Likert scale questions, were utilised to determine personal attributes and relaxation methods allowing alignment to a perceived stress scale (Andreou et al., 2011). As with our previous studies (*[citation deleted to maintain the integrity of the review process]*), FANTASTIC (family, friends, activity, nutrition, toxins, alcohol, stress, sleep, personality type, insight, and career) lifestyle assessment questions were included, scoring on a 3-point Likert scale from 0 (hardly ever), 1 (some of the time), to 2 (almost always) (Wilson et al., 1984). This assessment approach is commonly used in medical education, with its advantages and disadvantages reported elsewhere in the literature (Sullivan and Artino Jr, 2013, Wilhelm et al., 2016). The tools are routinely used, and validated with psychometric analysis, with medical student populations (Martins et al., 2022, Agarwal et al., 2020). Students completed the questionnaire at the start (T1; October) and end of the Autumn semester (T2; December). Student cohorts in 2019/20 were provided with hard copy questionnaires, whereas due to COVID-19-restrictions the 2020/21 cohorts received an on-line version. On-line delivery was via Microsoft Forms (Microsoft Office 365) with an access hyperlink advertised at the beginning of a lecture and via a virtual learning environment announcement.

DATA ANALYSIS

Collected data were stored and analysed in Microsoft Excel (Version 2107 [Build 14228.20250]). Analysis methods were as with our previous study (*[citation deleted to maintain the integrity of the review process]*): quantitative Likert scale data were allocated numerical values ranging 1-5 or 0-2 for FANTASTIC lifestyle scoring. Percentages were computed as follows: (ordinal category response)/(total respondents for questionnaire) x 100; data presented is rounded to 2 decimal place. Percentages were calculated for aggregated ordinal categories (composed of options 1+2; 4+5). Aggregate option (1+2) was generally considered a ‘negative response’ to the question; aggregate option (4+5) was generally considered ‘positive’; option 3 was considered a ‘neutral’ student opinion (n.b., positivity allocation was dependent on question phrasing). Graphical plots (clustered column and diverged stack) were composed using percentages calculated as above and figures were approximated to two decimal places. Categories deemed to represent negative responses were awarded a negative weighting, as appropriate, when applied to graphical representations. Quantitative analysis of the data was carried out using Mann Whitney statistical tests using GraphPad PRISM (Version 7.03), with p-values reported as appropriate. For qualitative data, the authors (*[name deleted to maintain the integrity of the review process]*) performed a ‘Constant Comparison Method’ to identify trends and recurring themes (Dye et al., 2000). The minimum number of comments that had similar views were required to meet the 5% threshold to be classed as a represented opinion. All questions on the 2020/21 on-line questionnaires were compulsory. For 2019/20 data all data was included from questionnaires that had a minimum 95% completion rate. Missing data or errors for individual questions were discounted from ordinal categories but questionnaires still contributed to the total number of respondents.

RESULTS

Years 1 and 2 undergraduate medical students’ understanding of their own wellbeing was surveyed in two academic years, presenting cohorts who experienced traditional teaching delivery (2019/20) and a new blended-teaching approach introduced to align with UK COVID-19 restrictions (2020/21).

COHORT RESPONSE RATE AND DEMOGRAPHICS

Response rates obtained for both year cohorts (**Table 3**) were notably higher at T1 (October) compared with T2 (December), an unfortunate trend that is common with longitudinal studies, often associated with questionnaire fatigue. Additionally, online questionnaires (2020/21) received a reduced response rate compared to hard copy distributions (2019/20). At all sampled time points, students self-identifying as ‘Female’ displayed higher response rates (63.57% - 100%) than those self-identifying as ‘Male’ (0% - 36.42%). Students self-identifying as ‘Other’ or declining to state identity responded at rates between 0% - 5.5%. At all sample points, students identifying as ‘Home/EU-Funding status’ were the majority respondents (85.05% - 92.8%). Students identifying as ‘International Student Funding status’ were the minority with response rates between 7.18% and 14.95%, which aligns with expected institutional program demographics.

Cohort	Academic year	T1 % response rate (n=)	T2 % response rate (n=)
Year 1	2019/20	87.77 % (245/296)*	61.49 % (182/296)*
	2020/21	51.51% (154/299)	27.42% (82/299)
Year 2	2019/20	51.76% (147/284)	53.52% (152/284)
	2020/21	35.91% (107/298)	6.04% (18/298)

Table 3: Response rates of completed questionnaires for years 1 and 2 medical students in academic year 2019-20 (studying pre-COVID-19) and 2020-21 (studying with COVID-19 restrictions) at the beginning (T1) and end (T2) of the autumn semester. (* : previously reported in [*citation deleted to maintain the integrity of the review process*])

SECOND YEAR STUDENTS REPORTED BEING BETTER ABLE TO FACE CHALLENGES FACED IN 2020/21

Second year students studying medicine in 2020/21 reported feeling significantly more confident ($p = 0.0104$) in their ability to handle personal problems compared with the previous 2019/20 second year cohort (with positive aggregate responses for ‘very often’ and ‘often’ at T2 being 61.11% compared to 33.55% or 11/18 to 51/152 respondents in 20/21 to 19/20 respectively; **Figure 1A**). Interestingly, this trend of increased confidence was not noted when analysis compared year 1 medical students studying in 2020/21 with those of 2019/20 (T1 – $p = 0.7023$; T2 – $p = 0.8108$). Moreover, within the 2020/21 second-year cohort, time management skills were also self-reported to have improved during the Autumn semester, compared with data collated in 2019/20 ($p = 0.0024$, respectively). For example, aggregate negative responses such as ‘very poor’ and ‘poor’ in assessments of time management skills at T2 equated to 5.56% (or 1/18 respondents), where previously aggregate negative responses had equated to 15.79% (or 24/152 respondents). Alongside feeling significantly more confident and with increased time management capabilities, year 2 students in 2020/21 appeared less overwhelmed with work, compared with year 2 students in the previous academic cohort. For example, perceived negative aggregate responses such as ‘very often’ or ‘fairly often’ were 5.56%, at T2 in 2020/21 compared to 20.39% in 2019/20 – yet a non-significant result suggests instead an overall “parity” in feeling with previous cohorts ($p = 0.8411$). It is of interest to note that this is similar to the situation reported by year 1 medical students. Self-reported responses indicated the cohort was beginning to feel work was piling up in 2020/21, compared with the 2019/20 cohort, but yet analysis still registered a lack of significance – again suggesting a general parity with previous years ($p = 0.1748$). Second year medical students reported a general continuance of course satisfaction in 2020/21, compared with 2019/20 ($p = 0.6387$; **Figure 1B**). Strikingly this trend differs to that seen in year 1 medical students in 2020/21, who reported feeling significantly less satisfied with their course than students who entered the course in 2019/20 ($p = 0.0001$; e.g. 10/82 versus 8/182 responding ‘Hardly Ever’ at T2, **Figure 1C**).

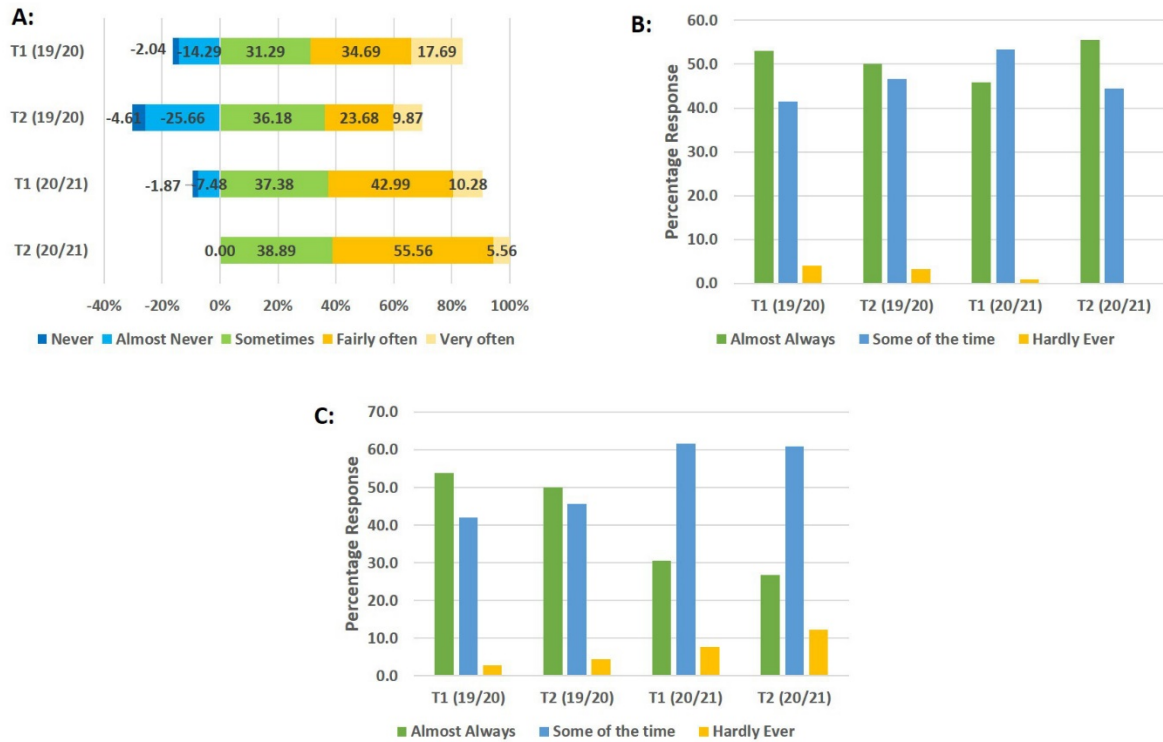


Figure 1: Increased confidence in handling problems (A) and course satisfaction (B) in year 2 medical students in 2020/21 compared with 2019/20. C) Course satisfaction in 2019/20 and 2020/21 in year 1 medical students
Note: negative responses awarded a negative rating; T1 = October; T2 = December.

AN INCREASE IN POOR MOOD AND FEELINGS OF DEPRESSION IN FIRST-YEAR MEDICAL STUDENTS DURING 2020/21

Medical students in years 1 and 2 were asked a series of questions related to their lifestyle, mood, and perceived mental health in 2019/20 and again in 2020/21. Overall, student mood was positive in 2019/20 at the start (T1) and end (T2) of the Autumn semester (e.g., year 1 students with positive answer aggregates at T1 of 58.37%, and 58.79% at T2). A similar pattern was observed in year 2 students in 2019/20, and their perceived mood was comparable to the following academic cohort (2020/21). Indeed, self-reported mood appeared slightly more positive at the end of the Autumn semester (T2), compared to the start (T1). In contrast, year 1 participants showed a statistically significant reduction in mood in the academic year 2020/21, compared to 2019/20 ($p = 0.0251$). For example, year 1 students displayed negative aggregate scores of ‘very poor’ and ‘poor’ mood at T2 of 21.95% (or 18/82 respondents), compared to the earlier scores of 10.39% (or 16/154 respondents) at T1. A worrying trend observed in both year cohorts was the statistically significant increased feelings of depression in 2020/21, compared to previous cohorts in 2019/20 (Figure 2; Year 1 – $p = <0.0001$, e.g. 49/82 versus 14/182 ‘Almost Always’ respondents (T2, 2019/20 & 2020/21); Year 2 – $p = <0.0001$, e.g. 10/18 versus 13/152 ‘Almost Always’ respondents (T2, 2019/20 & 2020/21)).

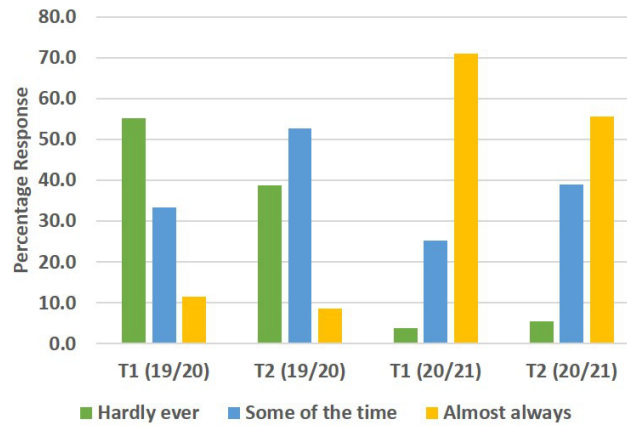


Figure 2: Increased feelings of depression in year 2 medical student cohorts in 2020/21, compared with 2019/20. Note: T1 = October; T2 = December.

INCREASED LEVELS OF STRESS AND REDUCED ABILITY TO COPE WITH STRESS AND ANXIETY OBSERVED IN 2020/21

All participating student cohorts were asked to rate their levels of stress and nervousness and how they felt they were able to manage these in academic years 2019/20 and 2020/21. Perhaps unsurprisingly, students reported feeling significantly more stressed and nervous in 2020/21 compared with 2019/20 ($p = 0.0136$), in all cohorts irrespective of year group (for example, for year 1 students at T1, negative aggregates for responses such as ‘Very Often and Often’ increased from 38.78% (or 95/245) to 47.4% (or 73/154 respondents)).

Further analysis investigated the students’ qualitative responses to ascertain potential causes of stress in the month preceding questionnaire completion. In 2019/20 (T1), for year 1 students entering the medical course, the top stressors were related to academic concerns (22.9%), relationship problems (20%), and feelings of homesickness (17.1%). In 2020/21, these were generally comparable, although personal health and COVID-19 concerns (18.4%) were ranked third behind academic (31.3%) and relationship issues (23.7%). By the end of the semester in 2019/20 (T2) for year 1 students, academic concerns were no longer raised as a cause of stress, with housing issues (50%), “other” (16.7%; e.g., world politics, personal time-management) and relationships, homesickness bereavement and sporting activities (8.3%) featuring instead. This differed from the response given at the end of the autumn semester (T2) for the 2020/21-year 1 cohort, where academic concerns still remained the highest cause of stress (29.2%), followed by relationship (23%) and housing (12.4%) difficulties.

In comparison, the second-year medical students reported a mixture of stressors at the start of the Autumn semester (T1) in 2019/20. These included issues classed as “other” (36.7%; e.g., diet, cultural difficulties), housing (30%) and relationship difficulties (10%). It is interesting to note however, that in 2020/21, the main cause of stress centred around academic issues (32.1%) which did not feature in the 2019/20 data. This was accompanied with reports of stressful events related to relationship (20.5%) and COVID-related concerns (16.3%) – a similar pattern to year 1 responses. At the end of the semester (T2) in 2019/20, “other” (36.4%), homesickness (27.3%) and relationship (18.2%) difficulties were reported as the greatest cause of concern and stress. In 2020/21, the main cause at the end of the semester (T2) mirrored those seen at the start (T1), with academic (29.3%), relationships (24.4%) and COVID-19 concerns (14.6%) being widely cited as stressors within the cohort.

Although both year cohorts report feeling significantly more stressed in 2020/21, it is encouraging to observe the positive trend of year 2 students feeling as able to manage their stress levels, when compared to year 2 students in 2019/20 ($p = 0.7$, e.g., at T2, negative aggregate scores such as ‘Very Poor’ and ‘Poor’ were 12.50% in 19/20 and 5.56% in 20/21; **Figure 3B**). Importantly, the year 2 students in 2020/21 self-reported a greater ability to control anxiety during the Autumn semester ($p = 0.0032$, e.g. T2: 27.63%, 42/152 in 2019/20 compared to 16.67% or 3/18 respondents in 2020/21). Unfortunately, year 1 students reported a similar response in relation to their ability to manage stress and a slight decrease in their ability to control anxiety in 2020/21, compared with 2019/20 (**Figure 3A**).

INCREASED LEVELS OF UPSET AND ANGER AND REDUCED LEVELS OF PHYSICAL HEALTH IN SOME STUDENTS IN 2020/21

Participating students were asked to consider events in the last month that had upset or angered them. Year 1 students reported statistically significant increased amounts of unexpected and upsetting events in the Autumn

semester in 2020/21, compared with 2019/20 ($p < 0.0001$; e.g. negative aggregates at T2: 15.38% compared with 23.17% respectively; **Figure 3C**). Interestingly, year 2 students in the Autumn semester of 2020/21 showed levels comparable (or reduced occurrences) to 2019/20 ($p = 0.1929$, e.g. negative respondents at T2: 16.67%, 3/18, compared to 35.53%, 54/154); **Figure 3D**). Year 1 students reported a statistically significant increase in events that angered them during the semester in 2020/21 compared with 2019 ($p = 0.0046$, e.g. T2 showing an increase in negative response from an aggregate of 18.68% to 31.71%, 34/182 to 26/82 respondents), with year 2 showing a similar (although not statistically significant) increase ($p = 0.1211$). A dichotomy was encountered with perceived levels of physical health which declined in the year 1 cohort ($p = 0.0364$; e.g. negative respondents at T2: 16/82 in 2020/21, 14/182 in 2019/20) but not for the year 2 cohort ($p = 0.6741$). Furthermore, year 1 students reported a statistically significant reduction in their ability to relax in 2020/21 compared with 2019/20 ($p = 0.0062$, e.g. negative respondents at T2: 13/82 in 2020/21, 14/182 in 2019/20), with year 2 students showing comparable levels to previous 2019/20 data ($p = 0.3825$).

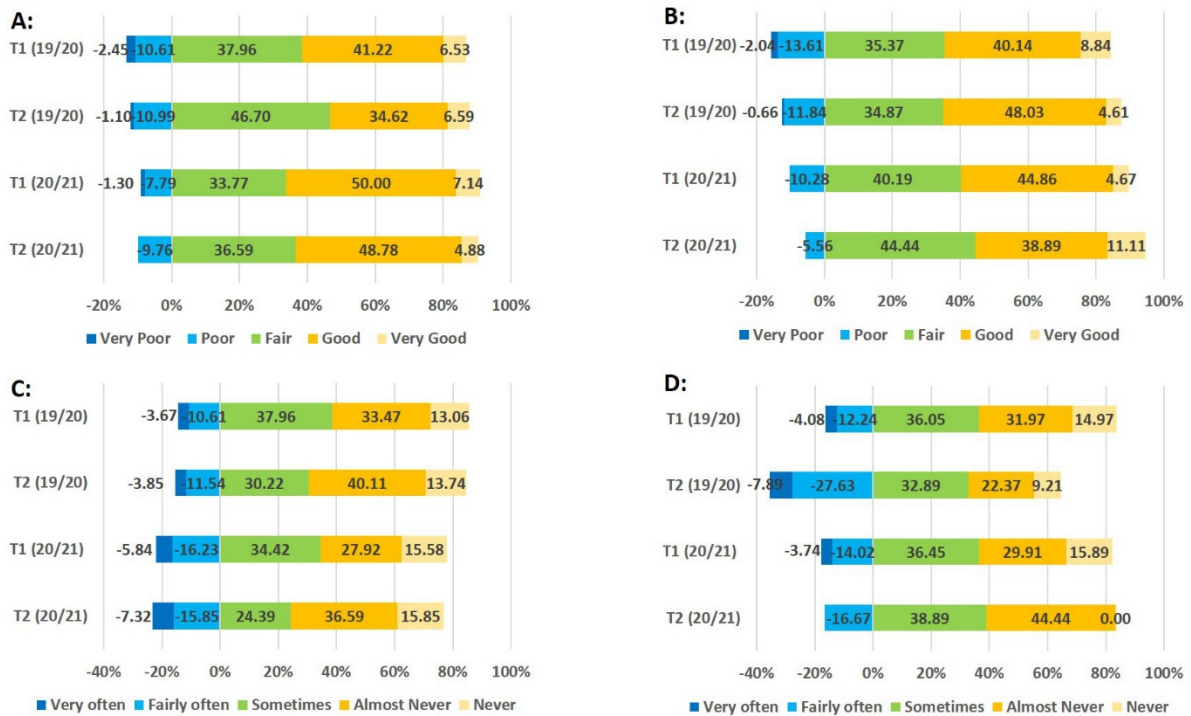


Figure 3: Self-reported levels of stress management in year 1 (A) and year 2 (B) medical students in academic years 2019/20 and 2020/21. Student levels of self-reported incidences of unexpected upsetting events in year 1 (C) and year 2 (D) medical students in the Autumn semester in academic year 2019/20 and 2020/21. Note: negative responses awarded a negative rating; T1 = October; T2 = December

DISCUSSION

Undergraduate study at medical school has always been inherently challenging. However, during the past 2 years, COVID-19 added yet further complexity to university life. This paper aimed to elucidate the pandemic's impact on the wellbeing of early years medical students studying at [name deleted to maintain the integrity of the review process]. Viewed through the prism of the embedded wellbeing framework, it hoped to establish if any negative affects related to the pandemic were mitigated and to identify lessons learnt for future interventions.

Year 1 and 2 students unsurprisingly reported increased levels of stress during 2020/21. However, a striking observation was that year 1 and year 2 students reported academic studies being the major cause of stress at the beginning (T1) and end (T2) of the Autumn semester. This contrasted with 2019/20 cohorts who only reported academic-related issues causing stress during the start of the semester (T1). We speculate that the increased academic-related stress observed at both time points in 2020/21 for year 1 and year 2 students may correlate with their known unique academic position. Year 1 medical students did not carry out pre-entry examinations (e.g., A-level) before commencing their studies and therefore may have had concerns regarding their academic ability on entry. Additionally, year 2 students took a progression examination at the end of year 1, but in an unprecedented form of an open-book remote examination. Thus, they too may have felt uncertain of their academic capabilities. Other authors have commented on this phenomenon and commented on work considering the impact on students from differing socioeconomic backgrounds (Pownall et al., 2022). Appreciating the challenges faced as students

transition to university has been central to the proactive support wellbeing strategies at *[name deleted to maintain the integrity of the review process]*, which led to embedding initiatives mid-way through the Autumn semester (after T1). With academic stresses present in all cohorts at the semester's start, our supportive interventions have been moved to the beginning of the semester (during an extended three-week fresher's initiative) to further support transition.

A significant finding of this work was the enhanced positivity, ability to control anxiety with a maintained ability to manage stress and retained course satisfaction of the 2020/21 year 2 cohort – often differing not just to their past contemporaries, but also their fellow year 1 students. Potential reasons for this include the fact that these students retained the most in-person teaching with weekly anatomy classes maintained. With strict adherence to guidelines within the teaching session, students attended anatomy classes as small groups (~40 students) in bubbles of 4 – potentially achieving a more favourable pedagogical environment (Waheed et al., 2019). This human contact, alongside novel collaborative online-learning opportunities, may have provided a foundation for a more enjoyable learning experience (Hurst et al., 2013, Lockee, 2021, Nguyen et al., 2021). These students also experienced our enhanced wellbeing changes for a full academic year whilst present in their first year (2019/20). Additionally, these students were settled into their course and presumably had pre-established friendship/support networks, which are important evidence-based, psychology-informed considerations, that educators should be attentive to (Pownall et al., 2022). Furthermore, these students understood expected difficulties, and were exempt from the academic challenges that new/late students encountered during a natural educational transition. Therefore, the authors hypothesised the implemented wellbeing strategies were “fit-for-purpose” as methods of support for year 2 students during the pandemic. In comparison, these methods may have been less impactful on incoming 2020/21 year 1 students. These students were unable to integrate into student life with reduced opportunities to make friends – hence limiting their support network. Therefore, their higher education transition was more stressful (and lonelier) than expected. As year 2 students did not face these challenges, the older students' robust confidence is explained and the feelings of being over-burdened or reduced satisfaction in other year groups is similarly clarified.

A strength of this study is that the surveys feature questions whose answers reinforce the interpretation of other answers. For example, questions investigating poor mood and levels of depression naturally allow more robust conclusions when results are considered in unison. Unfortunately, the data suggests the pandemic significantly impacted upon the mental health of our year 1 students, and that as the academic year progressed the toll appeared to grow greater – a trend observed in other studies of this nature (Tinsley, 2020). This may indicate that previously adopted approaches to enhancing wellbeing were less efficacious within a blended-learning environment, and hence due enquiry/consolidation is needed as blended learning study continues into the new academic year (*[citation deleted to maintain the integrity of the review process]*).

Data gathered in this study will direct the future of proactive interventions. For example, *[name deleted to maintain the integrity of the review process]* medical students find accommodation and relationships consistent stressors during their course. Although we cannot prevent these life challenges/dynamics, understanding their impact will permit a strong open dialogue and allow timely support. This highlights the importance of establishing and maintaining observations of student wellbeing needs by institutions as demonstrated in this and our previous study (*[citation deleted to maintain the integrity of the review process]*). Furthermore, during 2020/21, financial concerns escalated to previously unseen levels. The pandemic's economic impact was evident within the student cohort, so raising awareness of university support provision was essential for formulating proactive approaches alongside other reactive support. This study also highlights the importance of in-person teaching and its sustainability against challenges. To reduce anxiety during transitional or challenging educational periods our university will adopt better channels for communication. Already, new approaches include announcing welfare resources at weekly lectures. Enhancement of welfare provision has been further enhanced by recruiting new academic staff to the Senior Tutor team – thereby increasing points of contact for students facing adversity.

Whilst our findings provide local contextual evidence when considering medical students, COVID-19's impact on the mental health of students goes beyond the experiences of our medical students. In adopting a 'wider' approach we have speculatively reflected on the experiences of other healthcare students (such as pharmacy and nursing). For both these degree programmes, COVID-19 related concerns would have been a contributing stressor impacting mental health/wellbeing. The literature does support this view with pharmacy students encountering negative impacts on mental health including isolation (Nagy et al., 2021, Strawbridge et al., 2022). Anecdotally, as authors, we saw a similar impact on year 1 pharmacy students at *[name deleted to maintain the integrity of the review process]* who were similarly exposed to online learning and lockdown restrictions. This is further reflected in the global literature when considering nursing degree students, where the rapid transition to remote education increased anxiety (Fitzgerald and Konrad, 2021, Barrett, 2022, Head et al., 2022). Studies noted that student concerns included not spending time with classmates and course leaders, hence corroborating our general hypothesis (Head et al., 2022). However, a UK nursing qualification is approximately 3 years in duration, which

may point to a differing stressor for nurses compared to our medical students e.g. the proximity to frontline duty and increased potential for illness, as reported in the literature (Gómez-Ibáñez et al., 2020, Kaveh et al., 2022).

Unsurprisingly, the medical student experience presents with similarities when exploring the impact of COVID-19 globally. In America, a study reported significantly higher stress levels (assessed by perceived stress score) when students (n = 3826) from 22 medical schools were surveyed in summer 2020 (Alkureishi et al., 2022). Similarly in Morocco (Essangri et al., 2021), Japan (Arima et al., 2020) and Ireland (Komer, 2020), increased stress and psychological distress in medical students were also noted – analogous to levels reported in this study. With potential global experiential commonality across the various degree programmes, an opportunity exists for knowledge dissemination when formulating supportive proactive interventions for students. That is why new support needs to be devised to address the levels of anxiety and stress found within cohorts. The widely publicised positive impact of physical health on wellbeing may be an angle to pursue as part of enhancing the comprehensive wellbeing provisions offered by *[name deleted to maintain the integrity of the review process]* (Herbert, 2022, Kim and McKenzie, 2014).

Within many of the studies considered here, changes in educational approach driven by the pandemic were evident as most content (all year 1) moved online. Therefore, we question whether content delivery was inclusive/accessible to our medical students, specifically whether the move from traditional teaching to online platforms narrowed or widened the accessibility gap? Advantages of web-based applications have been alluded to in the literature, however, can all our student's access this instantly/away from campus? It is important that, going forward, we review whether a technological demand could isolate some learners further, cause a socio-economic impact, and by doing so create new unexpected welfare support challenges that we should answer.

LIMITATIONS OF THE STUDY

Although a range of conclusions have been drawn, study limitations are acknowledged. Non-mandatory questionnaires ask for student goodwill. The respondents tend to be motivated and as the year progresses, participation drops. Therefore, the data is from a self-selecting population, which may bias interpretations, and may not therefore be representative of the larger population of students. However, the high levels of stress, feelings of depression and reduced ability to cope are nevertheless significant findings. A further complication was the necessary switch from the paper-based to online questionnaire. Although permitting more detailed answers, this approach requires more facilities (and time), than a paper-based survey that can be filled-in by pen within a small time slot at the beginning of a teaching session. Additionally, Likert-style question limitations are well known (Bishop and Herron, 2015). These include the alternate interpretation of a question's scale by different respondents, as well as perceived interval malleability on those scales. Nevertheless, such surveys are a readily applicable method of surveying cohorts and, can act as the foundation for meaningful course change. The *[name deleted to maintain the integrity of the review process]* will build on the findings of this study to ensure a more equitable, and enjoyable, experience for our students. Finally, the study identifies levels and predictors of stress, it does however, not identify in what ways the pandemic impacted on individual students, and how they coped with these challenges faced. This would require more in-depth qualitative research and we recommend this to enhance and complement future surveys.

CONCLUSION

In 2021, we as authors commented on the importance of establishing a robust mechanism to monitor medical student wellbeing thereby allowing the development of an adaptive support framework. Little did we know that global events would provide unique and unanticipated stressors that only served to make our challenges more acute. Having previously embedded reactive and proactive support interventions within *[name deleted to maintain the integrity of the review process]*'s medical curriculum, we observed how the pandemic put our previously instigated supporting measures under strain. This was most noticeable in students transitioning into university during COVID-19 restrictions who showed an increased level of stress, feelings of depression and reduced ability to cope. However, many of those students who commenced their studies before the pandemic felt more supported and confident in their ability to handle personal problems during the period of educational flux. This study highlights the presumed importance of face-to-face teaching and regular assessment of wellbeing to reveal new stressors as they develop within cohorts, permitting continued refinement of support frameworks to help those at the stress "chokepoints" of their course. Continuous review of our support offering will take place, with a focus on supporting transition and building communities within our cohorts. Future studies will consider welfare provisions for students of different socio-economic backgrounds.

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DECLARATION OF INTEREST STATEMENT:

- Funding details - No funding of any kind was utilised in this study.
- Competing interests - The authors report there are no competing interests to declare.
- Ethics approval and consent to participate - The study received ethical approval from the [name deleted to maintain the integrity of the review process] School of Life Sciences Ethics Committee (Reference No. B021019YM) throughout its duration. Written consent was obtained from study participants.
- Availability of data and materials - The data that support the findings of this study are available from the corresponding author, [[name deleted to maintain the integrity of the review process]], upon reasonable request.

REFERENCES

- Agarwal, G., Mosquera, M., Ring, M. & Victorson, d. 2020. Work engagement in medical students: An exploratory analysis of the relationship between engagement, burnout, perceived stress, lifestyle factors, and medical student attitudes. *Med Teach*, 42, 299-305.
- Alkureishi, M. L., Jaishankar, D., Dave, S., Tatineni, S., Zhu, M., Chretien, K. C., Woodruff, J. N., Pincavage, A. & Lee, W. W. 2022. Impact of the Early Phase of the COVID-19 Pandemic on Medical Student Well-Being: a Multisite Survey. *J Gen Intern Med*, 37, 2156-2164.
- Andreou, E., Alexopoulos, E. C., Lionis, C., Varvogli, L., Gnardellis, C., Chrousos, G. P. & Darviri, C. 2011. Perceived stress scale: reliability and validity study in Greece. *International journal of environmental research and public health*, 8, 3287-3298.
- Arima, M., Takamiya, Y., Furuta, A., Siriratsivawong, K., Tsuchiya, S. & Izumi, M. 2020. Factors associated with the mental health status of medical students during the COVID-19 pandemic: a cross-sectional study in Japan. *BMJ Open*, 10, e043728.
- Barrett, D. 2022. Impact of COVID-19 on nursing students: what does the evidence tell us? *Evidence Based Nursing*, 25, 37-38.
- Bishop, P. A. & Herron, R. L. 2015. Use and misuse of the Likert item responses and other ordinal measures. *International journal of exercise science*, 8, 297.
- Bramness, J., Fixdal, T. & Vaglum, P. 1991. Effect of medical school stress on the mental health of medical students in early and late clinical curriculum. *Acta Psychiatrica Scandinavica*, 84, 340-345.
- Chandratre, S. 2020. Medical students and COVID-19: challenges and supportive strategies. *Journal of medical education and curricular development*, 7, 2382120520935059.
- Cuttilan, A. N., Sayampanathan, A. A. & HO, R. C. 2016. Mental health issues amongst medical students in Asia: a systematic review [2000-2015]. *Ann Transl Med*, 4, 72.
- Dye, J. F., Schatz, I. M., Rosenberg, B. A. & Coleman, S. T. 2000. Constant Comparison Method: A Kaleidoscope of Data. *The Qualitative Report*, 4, 1-10.
- Dyrbye, L. & Shanafelt, T. 2016. A narrative review on burnout experienced by medical students and residents. *Medical education*, 50, 132-149.
- Essangri, H., Sabir, M., Benkabbou, A., Majbar, M. A., Amrani, L., Ghannam, A., Lekehal, B., Mohsine, R. & Souadka, A. 2021. Predictive Factors for Impaired Mental Health among Medical Students during the Early Stage of the COVID-19 Pandemic in Morocco. *Am J Trop Med Hyg*, 104, 95-102.
- Farrell, S. M., Kadhum, M., Lewis, T., Singh, G., Penzenstadler, L. & Molodynski, A. 2019. Wellbeing and burnout amongst medical students in England. *International Review of Psychiatry*, 31, 579-583.
- Fitzgerald, A. & Konrad, S. 2021. Transition in learning during COVID-19: Student nurse anxiety, stress, and resource support. *Nurs Forum*, 56, 298-304.
- Folkman, S., Lazarus, R. S., Dunkel-schetter, C., Delongis, A. & Gruen, R. J. 1986. Dynamics of a stressful encounter: cognitive appraisal, coping, and encounter outcomes. *Journal of personality and social psychology*, 50, 992.
- General Medical Council, 2013. Supporting medical students with mental health conditions. Retrieved 10.12.2021. Available at: [Supporting medical students with mental health conditions \(gmc-uk.org\)](https://www.gmc-uk.org/supporting-medical-students-with-mental-health-conditions)
- General Medical Council, 2018. Outcome for graduates: 2018. Retrived 26.01.23. Available at: [Outcomes for graduates \(gmc-uk.org\)](https://www.gmc-uk.org/outcomes-for-graduates)

- Gómez-ibáñez, R., Watson, C., Leyva-Moral, J. M., Aguayo-González, M. & Granel, N. 2020. Final-year nursing students called to work: Experiences of a rushed labour insertion during the COVID-19 pandemic. *Nurse Education in Practice*, 49, 102920.
- Head, M. L., Acosta, S., Bickford, E. G. & Leatherland, M. A. 2022. Impact of COVID-19 on Undergraduate Nursing Education: Student Perspectives. *Acad Med*, 97, S49-s54.
- Herbert, C. 2022. Enhancing Mental Health, Well-Being and Active Lifestyles of University Students by Means of Physical Activity and Exercise Research Programs. *Front Public Health*, 10, 849093.
- Hurst, B., Wallace, R. & Nixon, S. B. 2013. The Impact of Social Interaction on Student Learning. *Reading Horizons: A Journal of Literacy and Language Arts*, 52, 375-398.
- Kaveh, O., Charati, F. G., Kamali, M. & Mojarrad, F. A. 2022. Clinical nursing education during the COVID-19 pandemic: perspectives of students and clinical educators. *BMC Nursing*, 21, 286.
- Keller, E. J. 2014. Philosophy in medical education: a means of protecting mental health. *Acad Psychiatry*, 38, 409-13.
- Kim, J.-H. & Mckenzie, L. 2014. The Impacts of Physical Exercise on Stress Coping and Well-Being in University Students in the Context of Leisure. *Health*, 06, 2570-2580.
- Komer, L. 2020. COVID-19 amongst the Pandemic of Medical Student Mental Health. *International Journal of Medical Students*, 8, 56-57.
- Lockee, B. 2021. Online education in the post-COVID era. *Nature Electronics*, 4, 5-6.
- LYONS, Z., WILCOX, H., LEUNG, L. & DEARSLEY, O. 2020. COVID-19 and the mental well-being of Australian medical students: impact, concerns and coping strategies used. *Australasian Psychiatry*, 28, 649-652.
- Martins, J. M. S., Ferreira, E. A. L., Valete, C. O. S. & Gramasco, H. H. F. 2022. Fantastic Lifestyle Questionnaire applied to undergraduate medical students during the COVID-19 pandemic: a factor analysis. *Rev Assoc Med Bras (1992)*, 68, 658-663.
- Mcgrady, A., Brennan, J., Lynch, D. & Whearty, K. 2012. A wellness program for first year medical students. *Applied psychophysiology and biofeedback*, 37, 253-260.
- [citation deleted to maintain the integrity of the review process]
- Moberly, T. 2018. Number of women entering medical school rises after decade of decline. *BMJ*, 360, k254.
- Moffat, K. J., Mcconnachie, A., Ross, S. & Morrison, J. M. 2004. First year medical student stress and coping in a problem-based learning medical curriculum. *Medical education*, 38, 482-491.
- Nagy, D. K., Hall, J. J. & Charrois, T. L. 2021. The impact of the COVID-19 pandemic on pharmacy students' personal and professional learning. *Curr Pharm Teach Learn*, 13, 1312-1318.
- Nechita, F., Nechita, D., Pîrlog, M. C. & Rogoveanu, I. 2014. Stress in medical students. *Romanian journal of morphology and embryology= Revue roumaine de morphologie et embryologie*, 55, 1263-1266.
- Nguyen, T., Netto, C. L. M., Wilkins, J. F., Bröker, P., Vargas, E. E., Sealfon, C. D., Puthipiroj, P., LI, K. S., Bowler, J. E., Hinson, H. R., Pujar, M. & Stein, G. M. 2021. Insights Into Students' Experiences and Perceptions of Remote Learning Methods: From the COVID-19 Pandemic to Best Practice for the Future. *Frontiers in Education*, 6.
- Pownall, M., Harris, R. & Blundell-Birtill, P. 2022. Supporting students during the transition to university in COVID-19: Five key considerations and recommendations for educators. *Psychology Learning & Teaching*, 21, 3-18.
- Puthran, R., Zhang, M. W., Tam, W. W. & Ho, R. C. 2016. Prevalence of depression amongst medical students: A meta-analysis. *Medical education*, 50, 456-468.
- Rahimi, B., Baetz, M., Bowen, R. & Balbuena, L. 2014. Resilience, stress, and coping among Canadian medical students. *Canadian medical education journal*, 5, e5.
- Ruhomaulu, Z., Haffeez, A. & Karponis, D. 2020. Addressing the mental health crisis in medical schools in England and the Republic of Ireland: a student collaborative. *Lancet Psychiatry*, 7, 307-308.
- Sani, I., Hamza, Y., Chedid, Y., Amalendran, J. & Hamza, N. 2020. Understanding the consequence of COVID-19 on undergraduate medical education: Medical students' perspective. *Annals of medicine and surgery*, 58, 117-119.
- Schiller, J. H., Stansfield, R. B., Belmonte, D. C., Purkiss, J. A., Reddy, R. M., House, J. B. & Santen, S. A. 2018. Medical students' use of different coping strategies and relationship with academic performance in preclinical and clinical years. *Teaching and learning in medicine*, 30, 15-21.
- Slavin, S. J., Schindler, D. L. & Chibnall, J. T. 2014. Medical student mental health 3.0: improving student wellness through curricular changes. *Academic Medicine*, 89, 573.
- Strawbridge, J., Hayden, J. C., Robson, T., Flood, M., Cullinan, S., Lynch, M., Morgan, A. T., O'brien, F., Reynolds, R., Kerrigan, S. W., Cavalleri, G., Kirby, B. P., Tighe, O., Maher, A. & Barlow, J. W. 2022. Educating pharmacy students through a pandemic: Reflecting on our COVID-19 experience. *Res Social Adm Pharm*, 18, 3204-3209.

- Sullivan, G. M. & Artino Jr, A. R. 2013. Analyzing and interpreting data from Likert-type scales. *Journal of graduate medical education*, 5, 541-542.
- Syeda Rubaba, A. 2020. Mental Distress among Medical Students. In: Vladimir, V. K. A. C. H. A. S. M. (ed.) *Anxiety Disorders*. Rijeka: IntechOpen.
- Thompson, G., McBride, R. B., Hosford, C. C. & Halaas, G. 2016. Resilience among medical students: the role of coping style and social support. *Teaching and learning in medicine*, 28, 174-182.
- Tinsley, B. 2020. Coronavirus and the impact on students in higher education in England: September to December 2020. In: (ONS), O. F. N. S. (ed.). ONS Website: Office for National Statistics, UK Government.
- Velez, C., Gupta, N. & Gendreau, P. 2019. The development and implementation of a longitudinal wellness curriculum for mcgill university's undergraduate medical program. *The International Journal of Whole Person Care*, 6, 6-21.
- Waheed, N., Waheed, Q., Bibi, Y., Siddiqi, H., Hassa, B. & Wahid, I. 2019. Impact of small group interactive sessions on students learning of Anatomy. *Internation Journal of Current REsearch in Biology and Medicine*, 4, 12-16.
- Wilhelm, K., Handley, T. & Reddy, P. 2016. Exploring the validity of the Fantastic Lifestyle Checklist in an inner city population of people presenting with suicidal behaviours. *Australian & New Zealand Journal of Psychiatry*, 50, 128-134.
- Wilson, D. M., Nielsen, E. & Ciliska, D. 1984. Lifestyle assessment: testing the FANTASTIC instrument. *Canadian Family Physician*, 30, 1863.
- Wolf, T. 1994. Stress, coping and health: enhancing well-being during medical school. *Medical education*, 28, 8-17.