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# Burnout in medical education: interventions from a co-creation process

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## Abstract

**Introduction** The high prevalence of burnout in medical education indicates an urgent need to develop and implement effective interventions at both the individual and organisational levels. Currently, there is a shortage of studies that include perspectives from multiple stakeholders, such as medical students, trainees and university staff. Our objective is to identify and discuss interventions from various stakeholders using a bottom-up approach to guide future implementation.

**Methods** A co-creation methodology was adopted, including workshops and a Delphi session, engaging 96 participants. The study included 12 workshops with medical students and trainees in Flanders (Belgium): first-year bachelor students ( $n = 12$ ), first-year master students ( $n = 13$ ), first-year General Practice (GP) trainees ( $n = 14$ ) and first-year specialist trainees ( $n = 39$ ). Additionally, one Delphi session was held with 18 other relevant stakeholders, including university staff. All workshops were transcribed verbatim and thematically analysed using NVivo.

**Results** Our results identified interventions to prevent and mitigate burnout among medical students and trainees. On the individual level, participants discussed personalized coaching, annual health assessments and training sessions. On the organisational level, a distinction was made between interventions intended for universities, and those for hospitals and GPs involved in medical training. Six interventions focused on preventing burnout in all contexts (i.e., onboarding programs); three were meant for universities only (i.e., pass-fail system), and six were tailored for hospitals and GPs (i.e., flexibility in scheduling).

**Conclusion** Through an iterative multistakeholder co-creation process, this study identified interventions to prevent and mitigate burnout within medical education. These interventions span individual and organisational levels, targeting universities, hospitals and GPs. While organisational interventions are increasingly recognized as crucial to address burnout, individual-focused interventions remain predominant in current research. There is a pressing need to further investigate organisational interventions and their combination with individual-focused strategies.

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## Introduction

Burnout is a complex and multifaceted phenomenon that results from prolonged periods of stress in combination with insufficient recuperation possibilities, manifesting in symptoms of emotional exhaustion, cynicism, and reduced professional efficacy [33]. Emotional exhaustion refers to feelings of being emotionally depleted. Cynicism, also referred to as depersonalization, involves developing negative feelings towards professional responsibilities. Reduced professional efficacy entails a decline in the sense of competence and effectiveness in performing tasks [33].

According to recent studies, medical students and trainees are at high risk of burnout [2, 17, 19, 40, 49]. Almutairi et al. [2] conducted a systematic review and meta-analysis, estimating a pooled burnout prevalence rate of 37.2% [CI 95%, 32.66–42.05%] for medical students. Among trainees, Rodrigues et al. [49] found an overall burnout prevalence of 35.7% [CI 95%, 26.8–43.5%], while Naji et al. [40] reported a prevalence rate of 47.3% [CI 95%, 43.1–51.5%]. Furthermore, Dyrbye et al. [14] noted a significantly higher burnout prevalence ( $p < 0.0001$ ) among medical students and trainees compared to the general population [14].

Burnout is usually investigated in a work context, and although not formally considered work, the activities that students conduct share similarities with those in a work context [1, 15, 28, 30, 56]. In this regard, student burnout represents a similar phenomenon of emotional exhaustion, cynicism and reduced efficacy in relation to one's education [28, 30]. Further, Robins et al. [48] reported that study exhaustion and study cynicism predict exhaustion and cynicism later at the workplace, which adds to the importance of addressing burnout in university settings [48].

Given the high prevalence of burnout among medical students and trainees, there is a pressing need to explore burnout interventions. Former studies have often categorized these interventions into two groups: individual and organisational interventions [59, 65]. Individual-level interventions are focused on addressing burnout at the personal level, typically involving strategies aimed at enhancing coping skills, resilience, and stress management capabilities [10, 12, 59, 65]. Organisational interventions, on the other hand, target burnout at the systemic level rather than focusing solely on individuals, including interventions such as mentorship programs or flexible work arrangements [10, 12, 59, 65].

Three research gaps persist in intervention studies that might prevent and mitigate burnout. First, there is a shortage of studies involving stakeholders in intervention development and implementation, which often resulted in less effective interventions that fail to meet end-users'

needs and are insufficiently tailored to specific regional contexts [6, 27, 52]. Second, current intervention studies tend to focus on the individual level rather than on the organisational level, despite the need for organisational interventions and a combined strategy [9, 12, 20, 39, 59, 65]. Third, there is a lack of rigorous research focusing on both medical students and trainees, considering their different contexts (i.e. university, hospital or GP), with a majority of former studies focusing on medical trainees [59].

To address these research gaps, this study aims to identify and discuss multifaceted burnout prevention and mitigation strategies tailored to medical students and trainees across all five faculties of medicine in Flanders (Belgium). Using a co-creation approach involving diverse stakeholders via multiple (online) workshops, this study focuses on addressing specific needs while enhancing the impact and sustainability of interventions through continuous engagement [3, 13, 22, 27]. Co-creation, increasingly recognised as a rigorous qualitative scientific method, is expected to enhance stakeholder engagement and facilitate the effective and sustainable implementation of interventions [13, 22, 27]. This study also seeks to identify strategies addressing both individual- and organizational-level [59, 65].

## Materials and methods

### Study design

This study is part of the WeMeds research project ([www.wemeds.be](http://www.wemeds.be)), which investigates the evolution of burnout across medical education, assesses its main determinants, and collects interventions that aim to prevent and mitigate burnout. This study focuses on the qualitative part of the WeMeds study, namely the co-creation process with various online workshops and one Delphi session to collect perceptions on potential interventions from medical students, GP trainees, specialist trainees, and other relevant stakeholders (i.e. university staff, programme coordinators). Via interactive discussions, participants explored the problem of burnout in medical education and generated multiple intervention ideas. These interventions entailed both novel interventions not yet implemented in their respective universities, hospitals or GPs, as well as existing interventions considered effective by participants.

### Population and recruitment

Medical students, GP trainees, specialist trainees and other relevant stakeholders were invited from all five medical faculties in Flanders (Belgium): University of Leuven (KU Leuven), Free University of Brussels (VUB), University of Hasselt (UH), University of Ghent (UG), and University of Antwerp (UA). Inclusion criteria for

the co-creation workshops were being over 18 years old and registered as a first-year bachelor medical student (cohort 1), first-year master student (cohort 2), first-year GP trainee (cohort 3), or first-year specialist trainees (cohort 4) at one of the aforementioned universities. A first-year bachelor student in the Belgian educational system is similar to a first-year undergraduate medical student, while a first-year master student corresponds to a fourth-year medical student who already possesses more specialized knowledge. Furthermore, participants of the Delphi session included university staff, representatives of student and trainee organizations, professors, supervisors, and programme coordinators. All participants were recruited through both direct and indirect online communication channels, such as e-mail, the Wemeds website and multiple social media platforms. Interested individuals could register online immediately via the website or send an e-mail. Upon registration, they received an electronic Microsoft Teams (MS) invite link and an e-mail containing logistical details. Participants did not receive any remuneration for their participation.

#### Data collection

Qualitative data was gathered through a co-creation process, consisting of three online workshops per cohort between March and May 2022 (totalling 12 workshops) and a Delphi session conducted in December 2022. This timing provided an opportunity to inquire about participants' past experiences as well as their anticipations regarding future workload and potential challenges. All workshops were conducted in Dutch, and the collected data were translated to English for research purposes. The co-creation workshops had a duration of 150 min, while the Delphi sessions lasted 90 min. Microsoft Teams was selected as the online platform, and Miro ([www.miro.com](http://www.miro.com)) as an additional online tool to manage the interactive and creative component of the co-creation process [34, 35]. Boone et al. [4] provides more information on the format of the co-creation workshops in the WeMeds study [5].

The three co-creation workshops had a logical flow, each building upon the previous one and adding elaboration to the concepts discussed. Workshop one focused on the problem analysis, aiming to gain insights into the problem and generating some first quick ideas for interventions. Exercises included *stakeholder mapping* and *customer journey* [32, 38, 58]. Workshop two focused on the ideation of interventions through multiple brainstorm exercises, such as the development of *personas*, *brainwriting* and a *matrix analysis* [24, 32, 37]. Workshop three elaborated further on the ideas generated in

the former workshops, including co-creation exercises, such as *dot voting* and *prototyping* [32, 36, 57].

The Delphi session consisted of an iterative multistage process, aimed at integrating opinions and insights from a group of experts through consensus building [23]. Exercises included providing feedback on the different interventions, discussing the feasibility of implementing these interventions at the appropriate level, and outlining participants' roles in implementation and requirements from others. A brief description of the exercises can be found in Supplemental Material 1 (Table S.1), while Supplemental Material 2 (Figure S.1, S.2, S.3 and S.4.) presents the Miro boards for the three workshops and the Delphi session.

Medical students, GP trainees and specialist trainees were invited to attend all three workshops, with flexibility to choose attendance. To ensure continuity in the co-creation process, participants of workshop two, three and the Delphi session were provided with a three page report on the outcomes of the previous workshop(s). These reports were developed by two researchers (i.e. A.B. and a co-author). A first researcher developed the first draft of the report, while a second researcher checked for errors and provided feedback.

All workshops were moderated by the first author (A.B.) to ensure consistency. This moderator was assisted by a second researcher, who was trained on the content and technical logistics. This researcher also served as a backup moderator if the main moderator would have technical issues. In addition, an interdisciplinary research team was set-up to discuss methodological considerations of the workshops and to validate results. Further, by including the opinions of these different researchers, these meetings have the potential to reduce the likelihood of results being unintentionally influenced by the personal beliefs and expectations of any researcher.

#### Data analysis

The collected qualitative data included video and audio recordings, Miro board exports and notes from the interdisciplinary research team. The first author (A.B.) and four co-authors (A.Bi., S.V.A, S.B., and C.V.) transcribed all workshops and sessions verbatim. Researchers used *Express Scribe Transcription Software* [42] to aid in the initial transcription of each recording. First, one researcher would conduct the first transcription, while another researcher would listen again to the recordings and check the transcriptions. Second, a thematic analysis was conducted using NVivo [45] and following the Braun and Clarke (2006) guidelines [7]. The researchers decided to focus their analysis on two predetermined categories of interventions, individual-level and organisational-level

interventions [65]. Regarding thematic data saturation, researchers adopted an inductive approach and concluded that data saturation had been achieved, as no new themes were identified, thus indicating that no new information was being observed [50].

**Ethics**

The *WeMeds* study was approved by the Ethics Committee Research UZ/KU Leuven in April 2021 (S64150), and this approval includes the current qualitative study. All participants provided written informed consent before participation. In addition, all participants were made aware beforehand and at the beginning of the workshop that the session would be recorded for research purposes only. Further, this study was carried out according to the ethical principles for medical research involving human subjects of the Declaration of Helsinki.

**Results**

**Description of the participants**

The co-creation workshops were attended by 78 students and trainees, including 12 first-year bachelor students, 13 first-year master students, 14 first-year GP trainees, and 39 first-year specialist trainees. Among these participants, the majority were female ( $n = 59, 75.6\%$ ). Most participants attended one workshop. Two bachelor students, two master students, two GP trainees and two specialist trainees attended two workshops; and one GP trainee attended all three workshops. Participants who attended multiple workshops were counted as double or triple, accordingly. Additionally, the Delphi session engaged 18 other relevant stakeholders from the included universities (i.e., programme coordinators, staff). Among these, the majority were female ( $n = 10, 56\%$ ). Consequently, the study included a total of 96 participants, comprising 78 medical students and trainees, and 18 other relevant stakeholders. Table 1 shows the characteristics of the participants per workshop or session.

**Thematic analysis**

This section presents the results of the thematic analysis, categorized in two pre-determined themes: individual-level and organisational-level interventions [10, 59, 65]. On the organisational level, a distinction was made between interventions intended for implementation within universities only, interventions for hospitals and GPs involved in medical training, and interventions that could be beneficial in all contexts (i.e. universities, hospitals and GPs). In addition, some of the interventions listed below are novel and have not yet been implemented, while others are existing interventions that participants consider effective. Figure 1 provides an overview of the thematic analysis.

**Individual-level interventions (for universities, hospitals and GPs)**

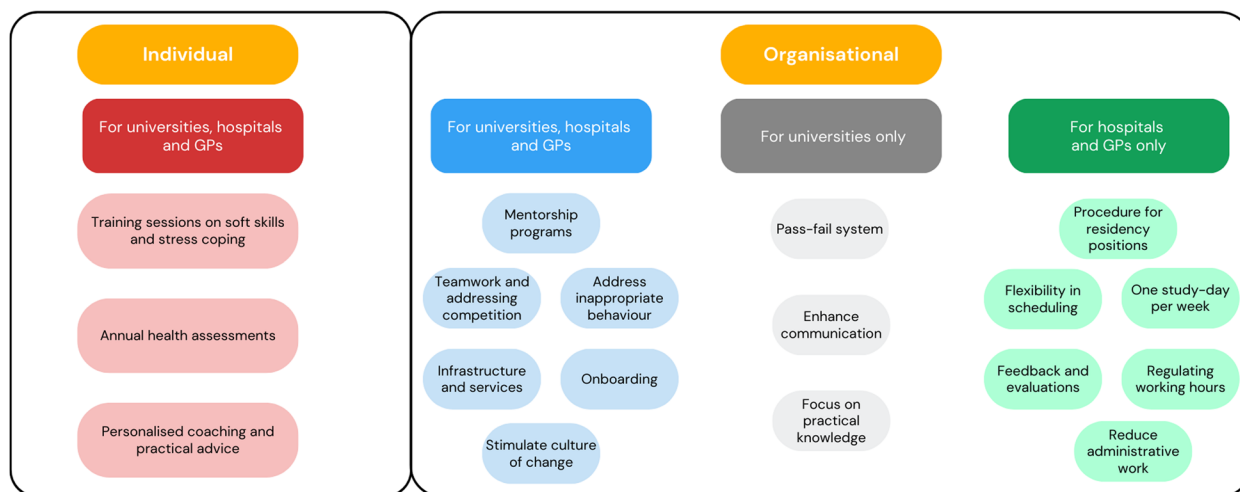
Interventions that focused on the individual-level were cited across all workshops, targeting universities, hospitals and GPs. The first intervention was the ‘provision of tailored personalized coaching and practical advice to address individual needs.’ This intervention encompasses psychological support, career coaching, study assistance and practical advice on housing, finances, or other aspects.

*It [coaching] can assist you in your study career. Even when facing difficulties, you can always fall back on this support. It can definitely be a valuable resource provided by the university.*  
 – First-year bachelor student 3, workshop 2

A second individual-focused intervention was the ‘implementation of annual health assessments conducted by an occupational physician and psychologist.’ The majority of students and trainees supported making these visits mandatory to reduce barriers to attendance. The main advantage would be its focus on prevention of burnout. However, concerns were raised about affordability. In addition, it was suggested to integrate these

**Table 1** Characteristics of the participants

	Workshop 1				Workshop 2				Workshop 3				Delphi Session				Total
	Total		Female		Total		Female		Total		Female		Total		Female		
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	
First-year bachelor students	4	33	1	25	5	42	4	80	3	25	2	67	-	-	-	-	12
First-year master students	5	38	4	80	3	23	3	100	5	39	5	100	-	-	-	-	13
First-year GP trainees	4	28	4	100	5	36	5	100	5	36	5	100	-	-	-	-	14
First-year specialist trainees	7	18	4	57	13	33	8	62	19	49	14	74	-	-	-	-	39
Other stakeholders	-	-	-	-	-	-	-	-	-	-	-	-	18	100	10	56	18
<b>Total</b>	20	100	13	65	26	100	20	77	32	100	26	81	18	100	10	56	96



**Fig. 1** Overview of the thematic analysis

visits into the curriculum once or twice a year, ideally at the beginning of the academic year or semester.

*‘We are healthcare workers who care for others, but it’s also important that care is provided for us.’*  
 – GP trainee 5, workshop 2

A third intervention was the ‘organization of group training sessions focusing on soft skills and stress coping techniques’. Across all workshops, there was consensus on the potential benefits of integrating these sessions into the curriculum, given that physicians will inevitably work in highly stressful environments at some point. However, a GP trainee representative in the Delphi session noted:

*‘You can’t fight a toxic work environment with yoga or mindfulness. I think we need to acknowledge that, we can provide soft skills training, but let’s not make students feel responsible for their burnout.’*  
 – Participant 18 (GP trainee representative), Delphi session

**Organisational-level interventions**

Participants highlighted the need to complement individual-level interventions with organisational interventions. While implementing individual-level interventions may initially seem easier, quicker, and more cost-effective, organisational interventions address systematic factors contributing to burnout. Below, a distinction is made between organisational interventions that can be beneficial in all contexts (i.e. universities, hospitals and GPs), interventions intended for implementation within universities only, and interventions for hospitals and GPs only.

*Universities, hospitals and GPs* One intervention that was discussed that could be implemented in all contexts (i.e. universities, hospitals and GPs) was the implementation of onboarding programs. Onboarding programs were considered necessary to acquaint new students and trainees with their student peers or colleagues, while also providing information on customs and facilitating orientation. By stimulating a sense of community and providing clear expectations, onboarding programs might help reduce stress and uncertainty that contribute to burnout.

*‘Currently, you’re kind of thrown into the cold water. It would be better to have a metaphorical stepping stone in the cold water, a longer introduction period.’*  
 – Specialist trainee 5, workshop 1

A second intervention involved mentorship programs in group or individually. Ideally, the group sessions should be scheduled in advance and integrated into the curriculum. Each session, moderated by a senior physician, psychologist, or coach, ideally involves a maximum of 10 students or trainees, and occurs once every two months for about two hours. Topics, such as mental health and burnout, can be selected by participants. This type of intervention can contribute to creating a supportive study and work culture, while also increasing support for students and trainees individually. This type of intervention could also address intergenerational conflicts by facilitating improved understanding between new and senior physicians. During the Delphi session, a programme coordinator expressed strong support for mentorship programs:

*‘I strongly believe in mentorship programs. We have implemented it in the bachelor training since last*

*year, and I think that with groups of about ten students per mentor, we can really address and mitigate a lot of issues.'*

– Participant 10 (programme coordinator), Delphi session

The third intervention comprised a set of interventions aimed at stimulating teamwork and reducing competition. In hospitals and GPs, discussed interventions included regular debriefings, teambuilding activities, and celebrating small successes. In universities, this might involve peer support groups, stimulating studying together (e.g., in libraries), and facilitating group projects. In addition, a bachelor student explained that currently universities stimulate competition through ranking, however, according to these students, this approach results in higher stress levels, creates rivalry among peers, and incites unnecessary competition.

*'Currently our university ranks students on an online study progress dashboard, so that you can see whether you're doing well relative to your peers.'*

– First-year bachelor student 1, workshop 2.

Another intervention comprised a set of awareness raising initiatives to promote cross-generational collaborations and stimulate a culture of change. The above-mentioned mentorship programs could foster cross-generational teamwork. In addition, there is a need to challenge generational stereotypes and remarks from senior physicians such as *'I had to do this too'* or *'I used to work 100 hours per week'*. These type of interventions might prevent burnout by enhancing mutual understanding and respect across generations, reducing feelings of frustration, and promoting a more supportive work culture.

*'We need a bit more awareness raising and change the culture. Well, yes, this is how it always was, but perhaps it could be different in the future. Just because it's been this way for so many years doesn't mean it cannot change.'*

– First-year master student 2, workshop 3.

A fifth intervention was the provision of adequate infrastructure and services to promote optimal work conditions and a healthy work-life balance. The direct work and study environment is important, along with the availability of sport facilities, green spaces, childcare services, parking facilities, or amenities such as a small grocery shop, which have the potential to enhance work-life balance and overall well-being in universities, hospitals and GPs.

*'Our campus is located outside the city, and there isn't much to do besides studying in the library, which is kind of boring and uninspiring.'*

– First-year bachelor student 2, workshop 1.

A sixth intervention was the development and implementation of measures to address inappropriate behaviour. Participants in the workshop reported incidents ranging from verbal aggression to sexist or homophobic remarks. A programme coordinator acknowledged the importance of such policies and measures to create a safe and respectful work environment, thereby reducing stress caused by inappropriate behaviour.

*'We've actually just recently developed this within the faculty, on a relatively short-term basis, uh, there's also a new reporting point set up, and there has been extensive communication to the students about it.'*

– Participant 9 (programme coordinator), Delphi session.

*Universities only* A first intervention mainly for universities encompassed a unified platform or guideline consolidating all deadlines, mandatory classes, and expectations. This intervention aims to improve and align internal communication channels effectively. Additionally, the involvement of year representatives plays an important role in the accurate dissemination of information. A master's student added an interesting existing intervention in this regard, namely *'date your doctor'*, which encompasses some sort of speed dating with a specialist to gain practical information. These interventions might address burnout by reducing confusion and information overload, making it easier for students to manage their workload, stay organized, and have correct expectations.

*'There is a lot of fake news going around about selection criteria for certain specialisations. And it would have been nice if the university had just informed me clearly on the criteria.'*

– First-year master student 3, workshop 1

Another intervention highlighted among students was to reduce the emphasis on detailed theoretical knowledge and increase focus on practical knowledge. First-year master's students feel ill-prepared for their upcoming internships, as the transition from their theoretical bubble to the work floor feels too abrupt. This type of intervention might ease the transition from theory to practice, helping students feel more prepared and reduce stress about upcoming internships.

*'We learn a lot of theory and see little practice, and have little connection with patients, how they would look. Sometimes I really feel like we're bookworms focusing on the smallest unnecessary details.'*

– First-year master student 4, workshop 1

The final intervention for universities was the implementation of a pass-fail system. During the Delphi session, the president of a student organisation suggested a pass-fail system as an effective intervention to reduce stress. However, concerns about its feasibility across the curriculum and the loss of student differentiation suggest a combination approach might be preferable, with pass-fail for certain courses (e.g., internships) and traditional grading with feedback for others (e.g., theory).

*'I do think it would be feasible for the internship, for example, but then there would of course be less differentiation between students who excel and those who are just on the brink of being good enough.'*

– Participant 6 (medical student representative), Delphi session

**Hospitals and GPs only** A first intervention for trainees focused on flexible scheduling, including self-scheduling, longer career breaks (e.g., international internships), and part-time residency options. These interventions might give trainees more control over their schedules, allowing for better work-life balance and reducing stress.

*'An option could be to work 3/4 or 4/5 contracts, to promote a healthy work-life balance. Additionally, we recommend considering a flexible work schedule that suits your needs, as we believe having more autonomy in decision-making is beneficial for your health.'*

– GP trainee 2, workshop 3

A second intervention focused on regulating and limiting working hours by ensuring accurate tracking through an independent institute, addressing understaffing, and preventing trainees from being a quick fix for staffing shortages. Additionally, there were discussions about Belgium's 'opting out system', which allows specialist trainees to exceed the regulatory maximum 48-hour workweek by up to 12 additional hours for on-call duties. Many specialist trainees report feeling pressured to sign this document, resulting in workweeks often exceeding 60–70h. These interventions might help protect trainees' well-being, encourage a healthier work-life balance, and prevent burnout.

*'There really needs to be an end to those 60–70 hour weeks; I think that's the essence if we truly want to reduce burnout.'*

– Specialist trainee 10, workshop 2

A third intervention focused on cultivating a feedback culture with regular evaluations (i.e. 360° feedback system: gathering feedback from multiple sources), which might promote professional growth, reduce stress, and boost motivation. Specialist trainees emphasize that they would prefer to establish their learning goals at the start of their residency and regularly discuss them in pre-scheduled evaluations with their supervisors. Although these evaluations are often theoretically planned, they hardly take place, and they often lack preparation and depth. In addition, it is crucial to consider who conducts these evaluations, their hierarchical position towards the trainee, whether they are also responsible for grading the trainee, and whether the relationship between both parties is safe enough to communicate openly.

*'I also find it important that these moments are not only about us and how we perform, but also about how we perceive the work environment, how the team is, how the training is going.'*

– Specialist trainee 9, workshop 2

A fourth highlighted intervention among specialist trainees was the allocation of one day per week specifically for study purposes during their residency, which already exists for GP trainees. A specialist trainee emphasized the necessity of this to ensure days off to recharge during the weekend, or have a break in the evening. Sometimes specialist trainees cannot even attend their courses, because of their work schedule. One study day per week could be utilized for (online) courses, scientific work or group work. In terms of frequency, while the ideal situation would be one day per week, even half a day per week or two days per month would be beneficial.

*'Even on Saturdays, there are often (online) lessons or groupwork, which is the one weekend you're not on call, so you still have to work.'*

– Specialist trainee 2, workshop 2

A fifth intervention among GP and specialist trainees was the reduction of administrative tasks. The first step involved distinguishing between essential and non-essential administrative tasks. For instance, a participant recognised the advantages of consultation letters, as it can stimulate reflection on certain cases. Despite recognizing the importance of consultation letters, trainees expressed their concern over the high volume. They also

criticized the requirement of writing consultation letters for patients of their supervisors. Strategies to address this issue were discussed, included utilizing templates, minimizing lay-out efforts, and providing support from medical secretaries or others. Furthermore, certain administrative tasks were considered less meaningful, such as short-term sick certificates. An interesting intervention involved the 'blue crocodile' project, in which physicians stamped unnecessary sick (or other) certificates with a blue crocodile to raise awareness.

*'We will never eliminate all administrative tasks, and it's also about what you personally gain from them.[...] This aspect might be something for a soft skill training, namely focusing on optimizing the personal benefits of admin work.'*

– Participant 18 (GP trainee representative), Delphi session

The sixth intervention was the establishment of an effective procedure for securing residency positions in hospitals or GPs. A GP trainee suggested to organise speed dates between trainees and supervisors. This intervention might enable both trainees and future supervisors to meet each other more profoundly, reflect on their options, and make well-considered decisions with regard to their internship and residency location.

*'We could organize a speed dating event with senior GPs, which allows to quickly meet a lot of people. [...] Additionally, implementing at least one week dedicated to interviews only, with no contracts being signed, would provide the opportunity to visit multiple places.'*

– GP trainee 1, workshop 3

## Discussion

To address the high prevalence of burnout among medical students, GP trainees and specialist trainees, we conducted a qualitative study to identify interventions that might prevent and mitigate burnout in medical education. We employed a co-creation approach to ensure that the interventions were not developed in a top-down manner, but were directly aligned with the practical knowledge and needs of all stakeholders involved. By actively involving medical students, GP trainees and specialist trainees in the first three workshops, we ensured that the interventions proposed were grounded in their experiences and needs. Subsequently, including other stakeholders in the Delphi session allowed for validation of the proposed interventions, ensuring alignment with strategic goals. This iterative approach is particularly

valuable because it moves beyond traditional data collection methods by increasing stakeholder engagement, facilitating future implementation of proposed interventions, and enabling the development of tailored solutions that align with specific regional contexts [22, 27].

In our findings, participants have mainly focused on preventive interventions at the organisational level, with some consideration given to the individual level. This was supported by former studies that demonstrated mixed effects of individual-focused interventions, such as training in soft skills or stress management [10, 43, 53, 59, 60]. For instance, a study by Panagioti et al. [43] showed that the effects of organisational interventions were significantly larger than the effects of individual interventions (Cohen  $Q=4.15$ ,  $P=0.04$ ) [43]. Panagioti et al. [43] found that individual-focused interventions were associated with small but significant reductions in burnout prevalence (SMD =  $-0.18$ ; 95%CI,  $-0.32$  to  $-0.03$ ), while organisational interventions were linked to moderate and significant reductions in burnout (SMD =  $-0.45$ ; 95%CI,  $-0.62$  to  $-0.28$ ). This issue was also highlighted by one participant in this study, who emphasized that a toxic environment cannot be addressed with yoga or mindfulness (i.e. individual-level intervention), instead, the underlying root causes (i.e. organisational intervention) must be addressed.

Nevertheless, various systematic reviews reported a disbalance in research focus, with more studies conducted on individual-level interventions compared to organisational interventions [10, 43, 59, 60]. For example, Walsh et al. [59] reviewed 14 studies, of which 9 examined individual-level interventions and only 5 organisational interventions. Similarly, West et al. [60] assessed interventions among physicians and trainees, reporting that among the 15 identified RCTs, 12 involved individual interventions and only 3 focused on organisational interventions. Consequently, there is a need for further research on organisational interventions, in addition to individual interventions. Based on our findings, we believe a comprehensive approach is necessary, underscoring the importance of individual and organisational (i.e., universities, hospitals and GPs), while also looking at the possible interconnectedness between the different levels and their mutual influence [10, 43, 51, 59, 60, 65].

For instance, in our study, the organisational interventions of mentoring and onboarding programs were positively assessed across all cohorts. This was confirmed by former studies stating that mentoring programs reduce stress levels, contribute to the development of key professional competencies and help in developing coping mechanisms [25, 44, 62]. Furthermore, studies have also confirmed the effectiveness of these programs on burnout, job retention and cost savings [63, 64]. For example,



the introduction of a formal mentorship program in a surgical residency program revealed that participants had lower scores on emotional exhaustion (14.9,  $p < 0.0001$ ), depersonalization (20.1,  $p < 0.0001$ ), and higher personal achievement (42.5,  $p < 0.0001$ ) at 12 months [64].

The transition from medical school to internship and residency is known as a stressful period, as medical students are faced with new responsibilities and requirements that can increase stress, anxiety and mental health issues [11, 31, 54, 55]. Former studies confirm our results that medical students feel unprepared to make this transition, mainly due to a lack of exposure to clinical situations [31, 54]. A study by Teagle et al. [54] piloted a 'preparation for practice' course of three days and consisting of four simulated stations: ward round, prescribing, and handover; with positive results [54]. Together with 'on-the-job' shadowing or 'date your doctor', these programs can increase students' knowledge of the profession, which may ensure better preparation for the job in the near future [54].

Stimulating teamwork and reducing competition were also regularly referenced by participants as interventions that might (partly) address burnout. The growing complexity of patient care and the surge in comorbidities demands a collaborative approach, starting from medical education [6]. Prioritizing teamwork across all learning phases (i.e. from admission to residency) and all domains (i.e., interdisciplinarity) is essential to prepare future physicians [4]. In addition, implementing a pass-fail system, or a combination of numerical grading with pass-fail, were suggested to be beneficial in reducing competition, increasing well-being, enhancing group cohesion, and mitigating burnout [46, 47, 61].

Other interventions that were discussed involved introducing flexibility and autonomy in scheduling, and regulating work hours. Former studies have demonstrated that (online) self-scheduling programs resulted in an increased sense of autonomy, reduced occurrences of staff being called in for last-minute shifts, and contributed to a healthier work-life balance [26, 29]. Furthermore, allowing individuals to start the workday earlier/later or to work longer hours on certain days of the week and shorter hours on others may allow them to meet personal responsibilities [26, 51]. In addition to self-scheduling and flexible work schedules, participants discussed work hour limitations as a possible effective intervention. The efficacy of this type of interventions was confirmed by earlier studies, that reported positive and significant results on the effects of work hour limitations on burnout among trainees [9, 59].

Further, awareness raising initiatives to promote cross-generational collaborations and stimulate a culture of change were discussed among participants. These

interventions are closely associated with the long-standing top-down hierarchical structure in healthcare provision and medical education [18]. Although a certain level of hierarchy is beneficial in healthcare for decision making and clear role-divisions, steep hierarchical gradients often have a negative impact on the learning climate, affect speaking up possibilities, hinder an open feedback culture, and reduce the overall job satisfaction [18, 21]. The above-mentioned mentorship programs represent a possible intervention that might soften hierarchical structures and stimulate cross-generational collaborations. However, to have long-term effects, cultivating a culture rich in collaboration and empathy might be required to truly support the well-being of medical students and trainees [62].

Interventions that stimulate a feedback culture with regular evaluations (i.e. 360° feedback system) and encourage professional goal setting were often mentioned by participants, and might be interesting tools for increasing well-being [8, 16, 41]. However, this process is complex and influenced by numerous factors. Natesan et al. [41] offered multiple strategies to cultivate a culture of feedback in medical education, emphasizing that feedback should be clear, specific, timely and actionable. The authors also stress the significance of the work environment, the provision of opportunities to build long-lasting trust-based relationships, and shifting the focus from performance-oriented to learner-oriented feedback [41].

Importantly, participants regularly mentioned the need to integrate interventions into the current curriculum to prevent further burdening their work. This was also mentioned by Busireddy et al. [9], who noted that when interventions were added to medical students' and trainees' workload, they might be perceived as less effective. The authors suggested that there may be more benefits from interventions integrated in the curriculum or interventions removing certain tasks, particularly those unrelated to clinical or educational purposes [9]. This is in line with participants mentioning the need to reduce their administrative tasks, such as the high volume of consultation letters, or allocating one day per week for study activities.

### Strengths and limitations

A key strength of our study is the use of a co-creation approach, including 12 workshops and a Delphi session conducted across all five Flemish medical faculties and learning stages, while also involving other relevant stakeholders. This research provided a collection of novel and already existing interventions aimed to prevent or mitigate burnout throughout medical education, and connecting it with literature. However, we should also note several limitations and how we addressed them. First, recruiting medical students and trainees for workshops

proved challenging, mainly due to their heavy workload and busy schedules. Nonetheless, we were able to collect relevant information from many participants while achieving thematic saturation. Second, we should consider a potential researcher bias, whereby researchers unintentionally might influence results with personal beliefs and expectations. To counter this, we discussed the results during regular team meetings with an inter-professional research team consisting of the co-authors. Third, respondents participated voluntarily in this study, resulting in a potential selection bias. It is plausible that those who entered the study share some characteristics (e.g., experience with or interest in mental health). Fourth, while our study offers valuable insights into the Flemish medical education system, its findings may not be directly transferable to other contexts. Future cross-country research is needed to determine whether similar interventions emerge in different settings and to broaden the applicability of our findings. Lastly, our study did not investigate interventions' effectiveness, but instead collected ideas and perceptions from students, trainees and other stakeholders. Although this is a crucial first step to ensure sustainability of implemented interventions, future research should assess the effectiveness of these interventions through rigorous intervention studies.

## Conclusion

Through this iterative, multistakeholder and bottom-up co-creation process, this study identified a number of interventions that hold promise in preventing burnout within medical education, spanning individual and organisational levels; and including universities, hospitals and GPs that provide training. This approach enhances the impact and sustainability of the interventions, and facilitates future implementation of the interventions. While organisational interventions are increasingly recognized as crucial to address burnout, individual-focused interventions remain predominant in current research. Therefore, there is a pressing need to further investigate organisational interventions, while also investigating the combination of individual and organisational interventions.

## Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s12909-025-06833-4>.

Supplementary Material 1.

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## Authors' contributions

A.B., L.B., N.M., K.V.B., H.K., A.R., M.C.L., S.V., A.Bi., S.V.A., S.B., C.V., D.D., and L.G. all meet the ICMJE criteria. A.B., S.V. and L.G. conceptualised the design and implementation of the data collection and developed the content of the workshops. A.B., L.B., N.M., K.V.B., H.K., A.R., M.C.L., S.V., A.Bi., S.V.A., S.B., C.V., D.D., and L.G. were all part of the interdisciplinary research team that discussed all findings and provided feedback on the manuscript. L.G. supervised the overall WeMeds study. All authors contributed to the article and approved the submitted version.

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## Data availability

The raw data supporting the conclusions of this article will be made available by the authors upon request, without undue reservation.

## Declarations

### Ethics approval and consent to participate

The *WeMeds* study was approved by the Ethics Committee Research UZ/ KU Leuven in April 2021 (S64150), and this approval includes the current qualitative study. All participants provided written informed consent before participation. Due to the online nature of the workshops, the researchers had to email the consent form to the participant, who then returned their signed consent through email. In addition, all participants were made aware beforehand and at the beginning of the workshop that the session would be recorded for research purposes only. Further, this study was carried out according to the ethical principles for medical research involving human subjects of the Declaration of Helsinki.

### Consent for publication

Not applicable.

### Competing interests

The authors declare no competing interests.

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