Article details: 2020-0236	
Title	Interventions to improve well-being in Canadian medical learners: a scoping review
Authors	Stephana J. Cherak MSc, Krista Wollny RN MN, Mungunzul Amarbayan MPP, Diane L. Lorenzetti PhD, Aliya Kassam PhD
Reviewer 1	Dr. Cintia Curioni
Institution	Nutrition Institute, Rio de Janeiro State University, Rio de Janeiro, Brazil.
General comments (author response in bold)	Overall, it is an interesting and well-written paper. The following objective and question were stated by the authors: Objective: to describe current wellness interventions, characterize how educators assess wellness interventions in their programs, collate domains of wellness with established evidence for successful wellness interventions, and identify opportunities for future research and training for holistic learner well-being. Question: To what extent do existing wellness interventions facilitate well-being across five recognized holistic domains of wellness (social, mental, physical, intellectual, occupational [hereafter, wellness domains]) considered at the individual, program and system levels, for undergraduate non-medical students, graduate science students, undergraduate medical students and resident physicians in Canadian academic medical settings? After reading the paper, I had some doubts regarding the design. Sometimes I identified issues that would be appropriate to be investigated by a scoping review and sometimes I identified issues better evaluated by a systematic review. In the objective and questions described above, I highlighted two issues better evaluated by systematic review. Scoping reviews describe existing literature and other sources of information and commonly include findings from a range of different study designs and methods. This “broad feature” is not appropriate for the evaluation of these highlighted issues. **Thank you very much for your time and energy in reviewing our paper. We appreciate your kind comments and hope that our findings will be important to many medical education programs during this challenging time.** The following objectives can be achieved by scoping reviews: to identify types of existing evidence in a given field or key characteristics related to a certain topic or knowledge gaps, to clarify key concepts or how research is conducted on a certain topic, to identifying, and identifying. It is important that the objective of the review align with the review’s indication or purpose. **Thank you for the suggestion to clarify the method that we used to conduct our review as it is important for the interpretation of our results. The revised manuscript includes a large number (long list to the Senior Editor, and to each of your concerns below) of changes to wording and data displays to justify and clarify our use of scoping methodology to ensure that our study is reported to standards.** Specific comments: 1. In the methods section, it is not necessary to include the checklist of PRISMA-ScR in the manuscript. **Thank you for bringing this to our attention. We have removed this mention and the reference that was included in the earlier version of our manuscript.** 2. In the methods section, it would be interesting if more details regarding the study design were included. Why reviews and editorials were excluded? A scoping

	review should map the evidence, including different study designs. An additional effort could be done to identify studies in grey literature. Any effort was done to find studies that have not been formally published? Mainly by the topic include programs done by schools/universities. **Thank you for your suggestion to broaden and strengthen the methods section of our paper. The authors agree that to achieve a comprehensive review, grey literature is an important element of large-scale syntheses and can be incorporated as included items in these reviews and as a means to identify relevant studies and publications for these projects. For reviews of intervention studies, failure to include grey literature may artificially amplify estimates of treatment effects, given the effects of publication bias.** **For our review, we conducted the search on March 11, 2020, which meant that searching the grey literature to identify well-being interventions that were implemented prior to the COVID-19 pandemic was not feasible for our group. It would have taken an extensive amount of time to contact all universities, programs, and departments, to obtain more information. Further, we chose not to include the grey literature since these sources usually do not go through a peer review process, and the quality can vary a great deal. This was important as we planned to not conduct a quality assessment of included studies given the diverse nature of our review. Though we did not conduct a systematic review, and did not report estimates of treatment effects, we acknowledge that excluding grey literature is a notable limitation of our paper. We have provided further description of the publication bias for our review on pg. 12 Limitations, which states: "First, the protocol for our review was not registered and we did not search grey literature, which may fill gaps we identified or report well-being interventions with negative outcomes."** 3. On page 8, lines 26-27, the authors declare: "We did not apply language or date limits". It was not true, in the supplemental table 3 (not 2 as described in the text), line "24. limit 23 to english language". Additionally, a search strategy is very important to systematic/scoping reviews. I had some doubts about the terms used to retrieve wellness interventions. Why terms related to intervention were not included? **Thank you very much for bringing this to our attention, and we appreciate your diligence in reviewing our strategy. We have removed "we did not apply language or date limits" from our manuscript to clarify. Please see our responses to the Senior Editor (pg. 4-5) in which we clarify our search strategy that was reviewed by a Health Sciences Librarian, co-author D.L.L.** 4. The data extraction process in a scoping review is called data charting and involves the use of a data charting form to extract the relevant information from the reviewed literature. **Thank you for bringing this to our attention. Please see our detailed responses to the Senior Editor, in which we describe the numerous changes that have been made to ensure our paper is reporting according to scoping review standards. We appreciate your comment to strengthen our report.** 5. The bias assessment is optional, but it is also desirable in scoping reviews. **Thank you for this wonderful insight. We agree that scoping reviews don't**

	typically include a risk of bias assessment. We agree that a key difference between scoping reviews and systematic reviews is that the former are generally conducted to provide an overview of the existing evidence regardless of methodological quality or risk of bias (unless there is a specific requirement due to the nature of the scoping review aim). As we did not intend to provide a clinically meaningful answer to our research question, an assessment of methodological limitations or risk of bias of the evidence included within our scoping review was not performed 6. On page 8, lines 47-54, "We classified studies as "statistically significant" if $p<0.05$ and "not statistically significant" if $p<0.05$. We classified studies as "not assessed" if significance was not assessed through statistical equations." A Scoping review has a different purpose, and for me makes no sense to use it. Statistically non-significant results are interpreted as indicating 'no difference' or 'no effect', and it is usually not always true. **Thanks very much for this excellent advice and insight, and after reviewing our paper the authors agree that reporting on statistically non-significant results has not purpose for a scoping review. To address your concerns, we have made several revisions which are listed below:** • **Results, fifth paragraph (pg. 7) "Outcomes assessed quantitatively are reported in Supplemental Table 3. Statistical evaluation of well-being interventions was explored extensively (n=41, 63%)—namely, evaluating perceptions of well-being pre- and post-intervention, satisfaction with the intervention, and determining attitudes and agreement regarding use of interventions. Figure 4 illustrates number of studies reporting significantly positive effect of interventions by well-being domain and level of intervention, by learner group. Summaries of assessment tools and statistical findings are presented in Supplemental Results."** • **Summary of statistical findings (subheading revised as per your comment below), has been moved to supplemental results and has been completely revised to reflect your suggestions. This new section reads as follows: "Among 17 interventions to improve social well-being, most studies (n=6) with medical students showed statistically significant positive results, while some studies (n=3) with resident physicians showed statistically significant positive results. One study (of six) on mental well-being interventions (all six in resident physicians) showed statistically significant positive results. The single intervention on physical well-being in resident physicians showed statistically significant positive results. Most (n=17/51) intellectual well-being interventions showed statistically significant positive results in medical students (n=17) and resident physicians (n=13). Statistically significant positive results for intellectual well-being were represented comparably across intervention levels in undergraduate medical students (individual, n=6; program, n=6; system, n=5); statistically improved intellectual well-being was primarily (n=11) at the program level for resident physicians. Most of 32 occupational well-being interventions had statistically significant positive results in medical students (n=12, primarily individual) and resident physicians (n=8, primarily program)."** • **Figure 4, which was previously presented as a table (Table 4), is a new figure that illustrates the number of studies that reported significantly positive effects of well-being interventions by well-being domain and level of**

	intervention. 7. In the results, page 10, lines 10-13, the exclusion reasons are not related to the opposite of the inclusion criteria. The search strategy was not well planned for wellness interventions. **Thank you for this insight and we appreciate that you have shared your concerns. To address your point, we have revised the second paragraph in Identifying relevant studies (pg. 4-5) to clarifying our inclusion and exclusion reasons. This new section reads as follows: "Our inclusion criteria were as follows: (1) primary research that reported quantitative or qualitative findings; (2) reported outcomes from well-being interventions; (3) in Canadian medical learners; (4) in any publication year. Studies were excluded if they were not primary research (e.g., reviews or editorials) or did not report any outcome from an intervention aimed to improve well-being of a Canadian medical learner. We defined: (1) a medical learner (i.e., undergraduate medical student, postgraduate medical student [resident physician], undergraduate non-medical [health sciences] student, graduate science [MSc or PhD] student) as an individual registered in an academic institution whose program is housed in a Canadian medical school and pertains to research or treatment of diseases and injuries and/or relating to medicine15; (2) a Canadian medical institution as all medical schools in Canada, including those with Dentistry and other healthcare professions within the medical school (e.g., Western Schulich School of Medicine and Dentistry); and (3) a well-being intervention as any randomized or non-randomized experimental study with the aim to improve well-being. Studies were included if well-being was reported as one component of a multi-component intervention (e.g., education intervention to address intellectual well-being, not just clinical skills)."** **Regarding your comment to our search strategy, we apologize that we did not define interventions in our earlier version of our manuscript, as we think this is where confusion is within. "Interventions" in medical education are an abstract concept, which added complexity to our search strategy and general review process. Our search strategy included words such as surveys, interviews, and training courses, because we wanted to capture any literature with reported feedback from medical learners, regarding initiatives, programs, courses, or perhaps formal interventions. For this reason, we used broad outcomes-based words in our search strategy to capture as much of the literature as possible. To clarify our definition for interventions, on pg. 5 in Identifying relevant studies, we have included the following definition: "…and (3) a well-being intervention as any randomized or non-randomized experimental study with the aim to improve well-being." (as stated above)** 8. Tables must be thoughtfully put together - considering the knowledge needs and how to best communicate key findings. It is a scoping review and not a systematic review, which aims to summarizes results. Visual reporting could increase the impact on readers. Table 4 is very interesting and could be presented graphically. The information regarding statistical significance is confusing, especially with the results=0. **Thank you very much for this insight and recommendations to improve the**

	presenting of the results from our review. On page 6 of this response letting (in response to the Senior Editor) we provide a detailed list of the extensive revisions we have undertaken to consider the knowledge needs of our readers, and how best to communicate key findings. We sincerely appreciate your recommendation to present our previously Table 4 as a figure., in order to present results graphically. Thank you. 9. Page 11, "Evaluation of wellness interventions" – As described above, focusing on statistical significance is not the better way to describe results, especially in scoping reviews. **Thank you for this comment. As described above, we have revised this subheading to read as "Summary of statistical findings" and have revised this section to report on statistically positive findings from the reviews. Additionally, Figure 4 (previously Table 4) has been revised to incorporate your suggestions.** 10. Discussion on scoping reviews are a challenge. In the first paragraph, the following sentence is stated: "We synthesized diverse literature to inform medical educators of key components for rigorous, evidence-based wellness interventions to improve learner well-being". I consider that authors mixed the aim of scoping review and systematic reviews. Rigorous assume that evidence comes from unbiased studies, and the quality was not even evaluated. Following lines 45-55: "In sum, the results of our review indicate that social, intellectual and occupational wellness interventions for undergraduate medical education students improve wellness at the individual learner, medical program or medical education system levels, while intellectual and occupational wellness interventions for resident physicians improve wellness at the program level." The same here, the evidence to improve or not should be based on studies with a low risk of bias… **Thank you kindly for your detailed response and insightful comments on how to revise the discussion of our scoping review to best incorporate our findings within the broader context of literature. As described above, to your other suggestions and to the Senior Editor, we have revised our review to following scoping review conducting and reporting standards.** **Regarding the first paragraph of our discussion, we have completely revised this paragraph to better interpret the main findings of our review as per the goals of a scoping review. This new paragraph (pg. 8) reads as follows: "We synthesized literature to provide a bibliography of published interventions conducted in Canadian medical schools to improve well-being in Canadian medical learners. Our review indicates that many Canadian medical schools address intellectual, occupational, and social well-being through interventions targeted to individual medical learners, their respective programs, within the medical education system . The well-being of graduate students in health sciences programs has not been addressed through targeted well-being interventions. Across all Canadian medical learners, mental and physical well-being is an important area that requires further exploration. We recommend lines of inquiry for future research to add literature in these research gaps."** **Further, the rest of our discussion has been revised to be direct, clearer and**

	concise, we have revised our discussion (described in our response to the Senior Editor on pg. 7 of this letter) with an explanation of main findings, comparison to the literature, knowledge gaps, Limitations and Conclusion. This revision brought the word count of our review down to an appropriate word count. think that shortening this would bring the word count down to an appropriate number. **In regard to our conclusions (as per changes in the discussion), the abstract conclusion now reads as follows: "Many Canadian medical schools have addressed intellectual, occupational, and social well-being through interventions targeted to individual medical learners, their medical learning programs, or respective systems. Well-being of graduate students in health sciences programs has not been addressed through targeted interventions. Across all Canadian medical learners, mental and physical well-being is an important area for further exploration. Comprehensive and inclusive well-being interventions for Canadian medical learners are needed."** **The conclusion at the end of our manuscript has been revised to read as the follow, "Well-being interventions in Canadian medical schools vary. Many Canadian medical schools have addressed intellectual, occupational, and social well-being through interventions targeted to individual medical learners, their medical learning programs, or medical education systems. Well-being of graduate students in health sciences programs has not been addressed through targeted interventions. Across all Canadian medical learners, mental and physical well-being is an important area for further exploration. Comprehensive and inclusive well-being interventions for Canadian medical learners are needed."**
Reviewer 2	Dr. Julie Maggi
Institution	University of Toronto Temerty Faculty of Medicine, Toronto, Ont.
General comments (author response in bold)	Dear Authors - Thank you for the tremendous effort you have put into this study. This is much needed work in this topic area, and will be very useful to Canadian medical schools who are engaging in supporting wellbeing of their trainees. My overall impression is that some revisions are needed to support the final conclusions, but I sincerely hope that you will consider doing those to be able to publish this work, as it would be extremely helpful in our current context. **Thank you very much for your time and effort in reviewing our paper. In our responses to the Senior Editor and Reviewer 1 (above), we have detailed revisions taken to report our review according to scoping review standards. As such, we have considerably revised our discussion and overall interpretation of our findings, so that our results support the final conclusions. We thank you for your kind words regarding the usefulness of our paper, and we hope our findings will be of interest to medical education programs during the our current challenging times.** The following is some specific feedback for your consideration. Thank you for examining Canadian data. Given the differences between nations in medical schools it is useful to have data specific to Canada to guide us. **Thank you, we agree, and have justified this further in the first paragraph of our introduction section that reads as follows: "Despite that literature on medical learner well-being grows as universities implement well-being services, earlier reviews on this topic have excluded Canadian medical learners."**

	I noted that you did not include all the dimensions of wellness; this is reasonable but I would suggest noting that there are other dimensions and indicate why you selected the ones you did for this review. (This is mentioned briefly in the limitations but should appear in the introduction to set the stage.) **Thank you very much for this comment, to indicate that well-being is a multidimensional concept, and our review covered but five of many well-being dimensions. To address your concerns, we have revised the first paragraph of our introduction section to introduce the five dimensions that we researched in our review, while indicated there are several dimensions to well-being. This new section reads as follows:** **"Concerns exist about effect of medical education on learner well-being.[1-4] Medical education programs commonly address intellectual and occupational well-being;[5,6] however, well-being is multidimensional. Social, mental, and physical well-being decrease during undergraduate medical education,[7] with increased prevalence of burnout into residency.[8,9] Well-being problems are faced by other medial learners (e.g., health sciences students).[10] Despite that literature on medical learner well-being grows as universities implement well-being services, earlier reviews on this topic have excluded Canadian medical learners.[11]"** **We have also revised this statement in our limitation sections (pg. 11) to be clearer, which reads as follows: "Second, we categorized studies based on five domains of well-being; there are many well-being domains related to medical learning (e.g., spirituality).[132]"** I appreciated the thorough methodology and transparency of describing the methods. This is a strength that allows the reader to be clear on how the review was conducted. Indeed it would be reproducible which is the goal of describing methods, so this is excellent. **We appreciate your kind comment regarding the methods of our review. We have undertaken additional significant revisions (described to the Senior Editor and Reviewer 1 above) to further strengthen our reporting of our review method, in order to ensure reproducibility.** My main critiques are in the description of interventions and the synthesis of the data acquired. (i) While it is understandable that interventions from all the studies can not be described, I would advise including a few examples in strategic locations to help the reader develop an understanding of what some of the interventions look like. Unlike a review that is looking at the evidence for a single intervention, this is looking at all different interventions and so without a sense of what those interventions look like, it leaves the reader with a large information gap at the end of reading the paper. **Thank you for the suggestion to provide concrete examples of interventions in our review. In the results section (pg. 7) we have included the following additional paragraph, "Most interventions targeted intellectual (n=51, 78% [e.g., clinical skills modules38]) or occupational (n=32, 49% [e.g., resident rotation bundle[39]) well-being; twenty-three (35%) targeted both domains (e.g., specialty exploration and discovery programs[84]). Among 19 interventions for**

	individuals, majority (n=14) were for medical students. Program interventions (n=27) were primarily for resident physicians (n=17). Medical students and residents were represented similarly in system interventions (undergraduate, n=9; postgraduate, n=10). Two system interventions were for undergraduate health sciences students." **Further, we have included the following statement in the qualitative results section (pg. 7), that reads as follows: "Qualitative studies reported favorable outcomes; three studies concluded formal audit is needed[26,61,69] and two studies uncovered shortcomings related to postgraduate education content [intellectual, occupational well-being][76] and undergraduate medical education leadership [social, intellectual well-being].[25]"** (ii) I had a lot of difficulty understanding the synthesis of the data. The data presentation was very good, but it wasn't clear how the data was then synthesized to be presented the discussion. The discussion read like a random selection of pieces of information from the articles but it wasn't clear how one arrived at those selections. **Thank you for your comment and we apologize that the earlier version of our review was not easy to understand.** **We undertook a mixed-methods model to our review that enabled us to integrate quantitative results from well-being interventions, with more qualitative understanding from the medical learners themselves. This integration helped us to determine not only the effects of well-being interventions, but also their appropriateness. This concept is similar to that of social validity and informed our discussion and subsequent recommendations. We hope that including diverse forms of evidence will increase the relevance of our systematic review to decision makers.** **This is now clarified on pg. 6 of our revised paper (in Collating, summarizing, and reporting results), which reads as follows: "We (S.C., K.W., M.A., A.K.) synthesized results reported from included qualitative studies using thematic synthesis for reviews on health research.[16] We developed discrete themes that represented the findings reported in primary studies and considered these themes to generate new interpretive constructs, explanations, or hypotheses.[17] We then integrated our qualitative and quantitative findings by using qualitative results to interrogate quantitative results, to identify research gaps and synthesize lines of inquiry, which can be interpreted broadly as recommendations.[18]"**
Reviewer 3	Dr. Monique Auger
Institution	University of Victoria, Camosun College, Victoria, BC
General comments (author response in bold)	This is a well-written, comprehensive paper on an important topic. The methods are well thought-out and the tables are incredibly well organized. Thank you for the opportunity to review your article. **Thank you very much for your time and energy in reviewing our paper. We appreciate your kind comments and hope that our findings will be important to many medical education programs during this challenging time.** Page 7: The choice of looking at holistic frameworks for learner wellness is important. I am curious why holistic wellness in this context is limited to the defined domains, where spiritual and emotional wellness are clearly missing. It would be helpful if the authors could explain why they chose these domains and perhaps

	could also note that holistic (or wholistic, a spelling that many prefer) programming and interventions in other fields include additional domains. If spiritual and emotional wellness are clearly missing within medical school wellness interventions, this may lead to interesting findings. I note that this is very briefly described in the limitations, but should be addressed at the beginning. **Thank you for your comment to substantiate that well-being is a multidimensional concept, and that our review covers only five of these dimensions. Please see our repose to Reviewer 2 (pg, 13 of this response letter) where we detail revisions that have been made to address your concerns. Further, to address your point regarding wholistic versus holistic, we have revised any mention of this word to "wholistic" as per your suggestions. Finally, we have revised our manuscript to refer to well-being dimensions, rather than wellness dimensions, in order to keep consistent with previous literature and research. We hope that these revisions help to clarify the domains we have chosen, and how these domains were incorporated throughout our review.** Page 8: I recommend that the authors provide a self-location statement, indicating who they are, why they are doing this research (motivations), etc. This practice of positionality, which is becoming increasingly common across disciplines, aids the readers in understanding the lenses through which these findings are interpreted. **Thank you for this wonderful idea. On pg. 13 of our paper, we have provided a self-location statement for Dr. Aliya Kassam, the senior author on this publication. "Aliya Kassam is the Research Lead within the Office of Postgraduate Medical Education at the Cumming School of Medicine. Her study population of interest is that of resident physicians. She is interested in the areas of transitions from medical school to residency and residency into practice, and in the teaching and assessment of intrinsic CanMEDS roles, professionalism and ethical issues in residency as well as resident wellness. She is also interested in how medical education intersects with health services research, especially how resident physicians interact with patients and deliver patient-centered care. Other areas of interest include patient safety and quality improvement in health care."** The results are succinct and clear, with the strength being the excellent tables prepared for this manuscript. **Thank you very much. To further strengthen our results and reporting of findings, we have undertaken many revisions. Kindly refer to our response to the Senior Editor, Reviewer 1, and Reviewer 2 (all above), where we provided a list of revisions in the manuscript and for data displays in our newly submitted version of our paper.** The discussion provides valuable learnings from the studies reviewed, synthesized into lines of inquiry, which can be interpreted broadly as recommendations. **Thanks for this kind comment. To further strengthen our discussion section, we revised as per the comment from the Senior Editor, which can be reference on page 7 of this response letter. We have also provided additional information in our methods section, to detail how we incorporated findings from the studies in our review, to support our interpretation and overall conclusions. These revisions are detailed on pg. 5 of this response letter in**

	response to a comment from the Senior Editor. Page 15: Edits needed to the sentence: “Future interventions for improved mental wellness should consider mental wellness, as the aggregate of negative and positive mental wellness outcomes.” **Thank you for catching this for the authors, we appreciate your diligence in reading our manuscript. In revising our paper to report according to scoping review standards—ensuring that conclusions are supported by result—this sentence has been removed from the revised manuscript.** Page 17: Did any of the studies assessed look specifically at sub-populations of medical students? I am specifically curious about supports provided to Indigenous medical students and was surprised that this was a gap in the works reviewed. **Thank you for your comment as this is an incredibly important point to make in our paper. After going back to the included studies, we did not find any studies that assessed sub-populations of medical learners. As this is an important area for future development, we have included a statement in our discussion (pg. 11) that reads as follows: “Finally, included studies did not report on sub-populations of learner (e.g., Indigenous, international students). We were unable to comment on different ethno-cultural factors influencing the learning experience.133” Hope that future studies will take note, and provide information on these sub-population in literature.**