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# Holistic Wellness Interventions for Canadian Learners in Health Professions: A Scoping Review

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4  
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## **Abstract**

### **Introduction**

Concerns exist about effect of medical education on learner well-being and it is unknown if existing medical schools' interventions incorporate holistic frameworks for learner wellness. The purpose of this scoping review was to explore the breadth and depth of wellness interventions for medical learners [in health professions] to address concerns about effect of medical education on learner well-being.

### **Methods**

The authors systematically searched MEDLINE, EMBASE, CINAHL and APA PsycINFO from database inception through March 11, 2020. Any studies that reported on outcomes of interventions implemented in Canadian medical schools to promote well-being among students in (non-medical) health sciences and medical education programs were included. Authors extracted information on learner demographics, study design, interventions and outcomes assessed.

### **Results**

From 1753 studies, 65 interventions were included (N=10202 learners). Roughly half the studies were conducted with medical students (n=34). Two studies included undergraduate non-medical, health sciences students; no study assessed wellness interventions on graduate students.

Intellectual wellness (n=51) was most commonly targeted, followed by occupational (n=32) and social wellneses (n=17). Of 50 studies that assessed statistical significance, 36 (72%) reported statistically significant positive effects. Overall, 58 of 65 studies (89%) reported positive outcomes among medical students and residents in Canadian academic medicine settings.

### **Discussion**

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The observed heterogeneity in wellness interventions suggests undergraduate and postgraduate medical education training programs in Canada are not consistently implementing wellness interventions for enhanced learning environments and improved learner well-being. These findings highlight need for innovative wellness tools that facilitate holistic learner wellness.

## Keywords

Medical Learners; Wellness; Interventions; Scoping Review

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3 Over the last century, medical education has shifted from informative education for  
4 trained expertise,<sup>1</sup> to formative education that fashioned professionals,<sup>2</sup> to transformative  
5 scholarship “about developing leadership attributes; its purpose to produce an enlightened change  
6 agent.”<sup>3</sup> Medical schools aim to cultivate competent, kind and professional physicians.<sup>4,5</sup>

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12 A key component of academic medicine settings is its effect on learner well-being.<sup>6</sup>  
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14 Reported well-being of matriculating medical trainees decreases during undergraduate medical  
15 education;<sup>7</sup> medical trainees are likely to experience reduced well-being and have increased  
16 prevalence of burnout into postgraduate medical education.<sup>8,9</sup> Concerns exist about the effect of  
17 medical education on learner well-being<sup>10-15</sup> and it is unknown if existing wellness interventions  
18 incorporate holistic frameworks for learner wellness (i.e., frameworks comprehensive of social,  
19 mental, physical, intellectual and occupational wellness domains).<sup>16</sup> Enhancing the positive  
20 impact of wellness interventions on the systems that influence wellness for all is likely just as  
21 important as targeting individuals that make up learning communities in medical school.<sup>17</sup>

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33 The Wellness Subcommittee of the Royal College of Physicians and Surgeons of  
34 Canada’s vision for improving medical education is to “review and formulate program support  
35 systems; address stress-related issues both proactively and reactively; and ensure wellness topics  
36 are included in the academic half-day curriculum.”<sup>18</sup> To provide evidence-based support for this  
37 vision, we conducted a scoping review of the literature with the aim to describe current wellness  
38 interventions, characterize how educators assess wellness interventions in their programs, collate  
39 domains of wellness with established evidence for successful wellness interventions, and identify  
40 opportunities for future research and training for holistic learner well-being. Our question of  
41 research was: To what extent do existing wellness interventions facilitate well-being across five  
42 recognized holistic domains of wellness (social, mental, physical, intellectual, occupational  
43 [hereafter, wellness domains]) considered at the individual, program and system levels, for  
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3 undergraduate non-medical students, graduate science students, undergraduate medical students  
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5 and resident physicians in Canadian academic medical settings? We provide our guiding  
6  
7 framework developed for this review in Supplemental Table 1.  
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## 10 **Methods**

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13 We conducted this scoping review as per the Arksey-O'Malley 5-stage scoping review  
14  
15 method<sup>19</sup> and the Joanna Briggs Institute Scoping Review Methods Manual.<sup>20</sup> We used the  
16  
17 Preferred Reporting Items for Systematic Reviews and Meta-analysis Protocols (PRISMA-P)  
18  
19 guideline to develop the protocol.<sup>21</sup> We adhered to the PRISMA-ScR Extension for Scoping  
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21 Reviews<sup>22</sup> to report findings (Supplemental Table 2).  
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### 24 **Populations, settings, and study designs**

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27 Our inclusion criteria were as follows: (1) primary quantitative or qualitative research; (2)  
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29 reporting on wellness interventions targets to at least one wellness domain; (3) conducted with  
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31 Canadian undergraduate medical students, resident physicians, undergraduate non-medical  
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33 students or graduate science students in a program housed within a medical school; and (4) in any  
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35 language or publication year. We excluded studies if they were not primary research (e.g.,  
36  
37 reviews or editorials), did not report on an intervention aimed to improve wellness of a Canadian  
38  
39 learner, or were not situated at a medical school. For the purposes of this review, we defined: (1)  
40  
41 a learner (i.e., undergraduate medical student, postgraduate medical student [resident physician]  
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43 undergraduate non-medical [health sciences] student, graduate science [MSc or PhD] student) as  
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45 an individual registered in an academic institution whose program pertains to research or  
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47 treatment of diseases and injuries and/or relating to medicine<sup>23</sup>; and (2) a Canadian medical  
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49 school as all medical schools in Canada, including those with Dentistry and other healthcare  
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51 professions within the medical school (e.g., Western Schulich School of Medicine and Dentistry).  
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## Data sources and searches

We conducted comprehensive literature searches in MEDLINE, EMBASE, APA PsycINFO, and CINAHL. Our search strategies for each database were developed with an experienced Medical Librarian (D.L.L.) and revised after reviewing preliminary search results. Our search strategies combined synonyms and subject headings from three concepts: (1) Canadian learner in an academic medicine setting; (2) wellness domains; and (3) wellness interventions. We also searched the Cochrane Database of Systematic Reviews to identify review articles related to the research question and we screened their reference lists to identify additional potential studies missed in the search. We searched all databases from inception to March 11, 2020 and updated the search on July 11, 2020. We then reviewed reference lists of included papers to identify potential studies missed in the search. We did not apply language or date limits. We provide the complete MEDLINE search strategy in Supplemental Table 2.

## Study selection

After a subset of the study team (S.C., K.W., M.A.) achieved 100% agreement on a pilot-test of 50 random studies, we reviewed all titles and abstracts independently in duplicate (S.C., K.W., M.A.). We progressed any study selected at this stage to full-text review. We then reviewed the full-text of all articles independently in duplicate (S.C., K.W., M.A.); we included articles in the final review if both reviewers at this stage agreed on inclusion. We resolved disagreements by the involvement of a fourth reviewer (A.K.).

## Data abstraction

Independently and in duplicate, we (S.C., K.A., M.A., A.K.) abstracted data for each included study using a data collection sheet developed and piloted by the review team. We resolved discrepancies through discussion. We collected information on document characteristics (e.g., year of publication, geographic location), study characteristics (e.g., medical school, time

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3 frame of data collection), learner group, wellness intervention domain (i.e., social, mental,  
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5 physical, intellectual, occupational), level of wellness intervention (i.e., individual, program or  
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7 system), outcomes of wellness interventions (e.g., measures, themes, theories), statistical  
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9 significance (e.g., significant, not significant, not assessed), limitations (as reported), and authors'  
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11 conclusions (as published). We documented studies that examined wellness as one component of  
12  
13 a multi-component intervention to assess outcomes related to wellness only (e.g., where  
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15 knowledge from a clinical education intervention contributed to satisfaction for intellectual  
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17 wellness, not just application of procedural or clinical skills).  
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### 21 **Data synthesis and analysis**

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24 We synthesized findings descriptively to map different areas of the literature as outlined  
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26 in the research question. We categorized wellness interventions into five domains: social (e.g.,  
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28 equity, diversity), mental (e.g., mindfulness, emotions), physical (e.g., exercise, nutrition),  
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30 intellectual (e.g., learning tools, education) and occupational (e.g., research, resident rotation); we  
31  
32 provide full descriptions and additional examples for wellness domains in Supplemental Table 1.  
33  
34 If applicable, we recorded more than one wellness domain for a single study. We categorized the  
35  
36 level of intervention as individual (i.e., the individual learner), program (i.e., the program the  
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38 learner is enrolled in) or system (i.e., the academic institution or system the learner is housed  
39  
40 within) (Supplemental Table 1); we recorded only one level of intervention for each study. We  
41  
42 classified outcomes according to wellness domain targeted as stated in the study main objective.  
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44 We classified studies as “statistically significant” if  $p < 0.05$  and “not statistically significant” if  
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46  $p \geq 0.05$ . We classified studies as “not assessed” if significance was not assessed through statistical  
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48 equations. We calculated descriptive statistics using STATA IC 15 (StataCorp. Stata Statistical  
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50 Software: Release 15. College Station, TX: StataCorp LLC).  
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## Results

We screened 4320 unique abstracts, of these, 750 full-text articles were selected for review, 65 of which were included in our synthesis. Of the 685 full-text articles that were excluded, the most common reasons for exclusion were the study did not report on a wellness intervention (n=512/685) or did not include Canadian learners in an academic medicine setting (n=77/685). We achieved 93% agreement (n=4,036/4,320) on title and abstract screening and 98% agreement (n=736/750) on full-text screening. Figure 1 illustrates flow of study inclusion or exclusion and Table 1 provides characteristics for all 65 wellness intervention studies included in our review.

### **Wellness domains and level of intervention for learner populations in academic medicine settings**

The 65 included studies<sup>24-88</sup> were published between 1973 and 2020 and conducted frequently at the University of Toronto (n=16, 25%) or McGill University (n=8, 12%), and with undergraduate (n=34, 52%) or postgraduate medical education students (n=31, 48%). Two studies included both medical students and residents, another two studies targeted undergraduate health sciences students, and no studies included graduate students.

Among the 44 studies that reported implementation year the median was 2010 (range: 1971-2018). Median intervention duration reported from 47 studies was 3 months (range: 1 hour-48 months). Many studies (n=52, 80%) were uncontrolled trials of which half were conducted with undergraduate medical students (n=26). We included 16 qualitative studies and most (n=9) were conducted with undergraduate medical students. Residents were most commonly family medicine physicians (n=6) and pediatrics broadly (n=6)—which could include pediatric subspecialties (n=2) but the generalist practice was more broadly defined (n=4).

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3 Most studies examined wellness interventions targeted to intellectual (n=51, 78%) or  
4 occupational (n=32, 49%) wellness domains; twenty three of which (35%) targeted both domains  
5 within a single intervention. Among the 19 interventions implemented for individual learners, the  
6 majority (n=14) were for medical students, while interventions at the program level (n=27) were  
7 primarily for resident physicians (n=17). Medical students and residents were represented  
8 similarly among systems level interventions (undergraduate, n=9; postgraduate, n=10). We found  
9 that both (n=2) wellness interventions targeted to undergraduate health sciences students were  
10 implemented at the system level.  
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### 21 **Outcomes and measures for wellness domains**

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23 Among the 17 studies which aimed to improve social wellness, 10 studies assessed  
24 learner satisfaction with the intervention (Table 2). Other outcome measures for social wellness  
25 included learner agreement that the intervention addressed wellness (n=7) and learner perceptions  
26 (n=6). Four of the 6 mental wellness interventions assessed learner experiences through open-  
27 ended survey questions or semi-structured interviews. The single study which assessed mental  
28 health (i.e., anxiety) symptoms used the State-Trait Anxiety Inventory (STAI).<sup>89</sup> Compliance was  
29 assessed for the single intervention on physical wellness; specifically, compliance rates for  
30 immunizations. Twenty three intellectual wellness and 14 occupational wellness interventions  
31 assessed learner knowledge through standardized knowledge assessment tools (e.g., the Quality  
32 Improvement Knowledge Application Tool - Revised [QIKAT-R]<sup>90</sup>) with self-assessment tools  
33 specific to knowledge delivered (i.e., knowledge assessments tapped in to subjective wellness  
34 associated with knowledge gained). Other frequent outcomes among intellectual and occupational  
35 wellness interventions were agreement regarding that the intervention addressed wellness (n=12)  
36 and satisfaction (n=8).  
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### 56 **Qualitative wellness intervention studies**

We included sixteen studies that qualitatively explored wellness among learners through interventional trials, and most (n=12) focused particularly on promoting and understanding intellectual wellness in medical education. Summary of findings from qualitative studies are provided in Table 3. Though all qualitative studies reported favourable outcomes associated with the interventions, three studies concluded that more formal audit and additional research is needed,<sup>31,66,74</sup> while two studies uncovered shortcomings in medical education related to postgraduate education content<sup>81</sup> and undergraduate medical education leadership.<sup>30</sup> The key findings among qualitative studies were that aspects of wellness among learners form a multi-dimensional construct. This construct covered four key domains: 1) genuine sense of personal fulfillment and gratification in medical education; 2) grounded understanding of requirements for medical education programs; 3) enhanced peer cohesion and functionality; and 4) promoting cognitive flexibility to strengthen knowledge for diverse perspectives. Three conditions were identified as both predicting enhanced wellness and promoting better well-being. These were: 1) effective coping and emotional regulation through individual strategies; 2) individual and program affirmation of the role of being a learner in a medical school; and 3) systems that favor attributing meaning to being a learner. All qualitative studies included in our review provide insight into catalyzing the paradigm shift from reducing manifestations of learner distress to optimizing wellness interventions through proactively addressing underlying sources of learner distress and cultivating a holistic sense of well-being.

### **Evaluation of wellness interventions**

Statistical evaluation of wellness interventions was explored extensively (n=41, 63%)—namely, evaluating perceptions of wellness pre- and post-intervention, satisfaction with the intervention, and determining attitudes and agreement regarding use of interventions to enhance at least one wellness domain. In Table 4 we provide summarized findings on the statistical

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3 evaluation of wellness interventions regarding wellness domains about learner population and  
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5 level of intervention. Among the 17 interventions to improve social wellness, most studies (n=6)  
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7 with medical students showed statistically significant positive results, while some studies (n=3)  
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9 with resident physicians showed statistically significant positive results for social wellness.  
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11 Studies on mental wellness interventions (all six in resident physicians) showed mixed results;  
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13 half (n=3) of these studies did not assess for statistical significance. The single intervention on  
14  
15 enhancing physical wellness in resident physicians showed statistically significant positive  
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17 results. Among the 51 intellectual wellness interventions, most showed statistically significant  
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19 positive effects for both medical students (n=17) and resident physicians (n=13). While  
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21 statistically significant positive results for intellectual wellness were represented comparably  
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23 across intervention levels in undergraduate medical students (individual, n=6; program, n=6;  
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25 system, n=5), statistically improved intellectual wellness was primarily (n=11) at the program  
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27 level for resident physicians. Most of the 32 occupational wellness interventions showed  
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29 statistically significant positive results for medical students (n=12) and resident physicians (n=8)  
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31 implemented primarily at the individual level for medical students (n=6) and at the program level  
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33 for resident physicians (n=4).  
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## 40 **Discussion**

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43 We synthesized diverse literature to inform medical educators of key components for  
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45 rigorous, evidence-based wellness interventions to improve learner well-being. In sum, the results  
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47 of our review indicate that social, intellectual and occupational wellness interventions for  
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49 undergraduate medical education students improve wellness at the individual learner, medical  
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51 program or medical education system levels, while intellectual and occupational wellness  
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53 interventions for resident physicians improve wellness at the program level. Studies reporting  
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interventions targeting mental and physical wellness among learners in a Canadian medical school setting are scarce.

The observed heterogeneity in wellness interventions implies medical education systems and programs may not be consistently implementing wellness interventions for enhanced medical education learning environments or evaluating their impact on learner wellbeing. Only a small subset of studies contained empirically evaluated interventions, yet few used valid and reliable outcome measures. Despite these limitations in the evidence, below we propose a number of key findings from our review that may be relevant for Canadian medical schools and other medical schools more broadly. We suggest lines of inquiry for innovation of medical education for a holistic approach to learner well-being.

### **Wellness of Canadian learners in academic medicine settings**

#### *Social wellness*

Mentorship is an interactive process to encourage learning and development grounded in social learning principles.<sup>91,92</sup> While mentorship has been used extensively in the setting of United States academic medical schools,<sup>6</sup> our review indicates that formal faculty advisor/mentor programs as a method to promote social wellness may be understudied (reported by two studies only) and underutilized in Canadian academic medical schools. Formal mentorship programs based in small groups and linked with curricular and/or professional content can be used to offer academic career guidance to graduate science researchers,<sup>93,94</sup> or to develop clinical skills among medical students<sup>95</sup> and resident physicians.<sup>96</sup> Mentorship programs to facilitate social wellness often report high satisfaction,<sup>97,98</sup> career promotion,<sup>99</sup> improved clinical performance<sup>100</sup> and patient safety.<sup>101,102</sup> While mentorship is ubiquitous in medical education, our review shows that academic medical schools do not explicitly incorporate mentorship in their wellness programs. We encourage Canadian medical schools to conduct high-quality research on mentorship

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3 interventions for improved social wellness of learners. We suggest such evidence will enable the  
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5 greatest exploitation of knowledge to promote the transfer of mentorship programs from medical  
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7 schools, one program, one individual, to the next. Exceptional academic mentors are critical to  
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9 demonstrate the importance of inclusion, diversity and professionalism—key components of  
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11 social wellness—in medical education.<sup>103</sup>  
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#### 14 *Mental wellness*

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17 Barriers to learners' mental health treatment are common<sup>104,105</sup> and must be considered for  
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19 effective mental wellness interventions.<sup>106,107</sup> Increasing access to and reducing the stigma of  
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21 mental health interventions for learners was not frequently considered among our included  
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23 studies. Learners with mental health illnesses and disorders can go undiagnosed and  
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25 undertreated.<sup>108</sup> In 2019, Wilkes and colleagues surveyed 69 undergraduate medical students and  
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27 reported that while 83% of students considered medical education a source of stress and 70% met  
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29 criterium for exhaustion, only 36% of students reported seeing a mental health professional to  
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31 address mental health concerns.<sup>109</sup> These findings, in line with our review, highlight a need for  
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33 formal programs focused on mental wellness, inclusive of increasing awareness, reducing stigma  
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35 and improving access to mental health services at programmatic and systemic levels. Although  
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37 this approach has been associated with lower depression and suicidal ideation rates in the United  
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39 States, the effectiveness of this approach in Canadian medical schools is as yet unknown.<sup>110</sup>  
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45 While the studies included in our review evaluated a diverse set of mental wellness  
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47 outcomes, none explored positive adaptations to potential mental health consequences of medical  
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49 education. Positive psychological outcomes are as important as negative outcomes<sup>111</sup> given that  
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51 positive psychological adaptations evolve to demands of stressful experiences, encapsulated  
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53 within psychological resilience.<sup>112,113</sup> Though highly resilient individuals are known to  
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55 proactively cultivate positive adaptations,<sup>114,115</sup> it is unknown whether positive psychological  
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adaptations are simply by-products of wellness interventions or whether they can also improve coping behaviors. Future interventions for improved mental wellness should consider mental wellness, as the aggregate of negative and positive mental wellness outcomes.

### *Physical wellness*

Not all wellness domains were equally well represented in the included studies. In contrast to other wellness domains long recognized as integral elements of a physician's well-being (i.e., intellectual and occupational wellness), physical wellness does not have comparable widespread acceptance as an aspect of physician well-being.<sup>116,117</sup> Comprehensive adherence to various dimensions of physical wellness is low among undergraduate medical education students.<sup>118</sup> Holtz and colleagues demonstrated through an online cross-sectional survey of fourth-year University of British Columbia medical students that individuals who perceived exercise counseling to be highly important to clinical practice participated in significant physical activity themselves.<sup>119</sup> In our review, we found a scarcity of physical wellness interventions, suggesting a possible need for the inclusion of physical wellness components in future wellness programs.<sup>120</sup> While it may be hubristic to suggest learner wellness interventions will improve patient outcomes,<sup>121</sup> we contend encouraging physical wellness in medical education should be considered an important part component in the development of competent and professional future physicians.<sup>122</sup>

### *Intellectual wellness*

Overall, we found that wellness interventions identified through this review were designed to promote collectives of individual learners, to encourage a collaborative state of mind rather than peer-to-peer competition. Our finding aligns with the fact that all but two Canadian medical schools have adopted a pass/fail grading system for all years of medical education.<sup>123</sup> A pass/fail system has been demonstrated to improve intellectual well-being,<sup>124</sup> enhancing

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3 teamwork among learners<sup>125</sup> without negative impact on academic performance.<sup>126</sup> In light of our  
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5 findings and in line with seminal studies on this topic,<sup>127,128</sup> we recommend a pass/fail system  
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7 with demarcated standards to guide medical education and build the intellectual achievement of  
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9 an individual learner independent of the underachievement of another. Pass/fail grading systems  
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11 complemented by standards-based evaluations is a vital step along the continuum to recognizing  
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13 learners' as professionals, enhancing intellectual wellness, and preparing medical students for life  
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15 as enduring learners.  
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19 With respect to assessment strategies for intellectual wellness interventions, we  
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21 commonly found assessments of learner satisfaction, learner self-assessment of [knowledge]  
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23 outcomes achievement, and assessments of learner agreement with and perception of the  
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25 intervention as impactful to their intellectual well-being. We suggest the most appropriate  
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27 outcome measures for a given intellectual wellness intervention should depend on the goals and  
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29 objectives of the medical educators. The majority of studies on intellectual wellness, including 4  
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31 RCTs, indicated intellectual wellness interventions have higher learner satisfaction and greater  
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33 achievement of knowledge-related outcomes when skills are taught in condensed workshops,  
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35 ranging from 2 hours<sup>56</sup> to 5 days<sup>38</sup> to 2 weeks.<sup>48</sup> Based on our findings we recommend medical  
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37 schools and programs balance benefit from intellectual wellness interventions with learner time  
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39 investments to enable adequate learner maintenance for intellectual wellness interventions to  
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41 maximize intellectual well-being.  
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#### 46 *Occupational wellness*

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49 Our review indicates that occupational wellness is an increasingly well-researched area of  
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51 learner well-being at Canadian medical schools. We found that occupational wellness is  
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53 important for all learners, particularly resident trainees.<sup>129</sup> Research presented at the 2018  
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55 International Conference on Physician Health in Toronto showed that in comparison to Canadian  
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3 physicians, Canadian residents have 48% increased risk of burnout, 95% increased risk of  
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5 depression and 72% increased risk of suicidal thoughts.<sup>130</sup> The view that the residency program  
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7 environment plays a predominant role in the occupational wellness of residents is gaining traction  
8  
9 in Canada; at this same physician health conference, medical leaders stressed the need for  
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11 universities to make occupational wellness a core competency of medicine through medical  
12  
13 learning redesign.<sup>131</sup> While it may be premature to estimate full effects of this call, in our review  
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15 we found many occupational wellness interventions that targeted program and system factors to  
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17 address culture, learning and work environments. Our findings highlight the need for more high-  
18  
19 quality occupational wellness interventions, to ensure efficacious interventions are effectively  
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21 implemented in a contextually adaptive manner that can respond to the needs of each learner.  
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### 26 **Lines of inquiry for redesign of holistic learner well-being**

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28 This scoping review provides an overview of the breadth and nature of wellness  
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30 interventions in Canadian medical education. Our review examined a broad scope of learner  
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32 wellness domains, which can be of use to program directors, educators and administrators  
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34 working to develop holistic wellness interventions.  
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38 Despite our comprehensive search and broad inclusion criteria we found no study that  
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40 reported on wellness interventions for graduate science education students. Scientific research is  
41  
42 an important element in graduate science education programs and learners conducting scientific  
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44 research as a core element of their training program may face unique wellness challenges.<sup>132,133</sup> In  
45  
46 Canada, the integrative MD-PhD program is a popular approach for training physician-  
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48 scientists<sup>134</sup> and represents a substantial investment of institutional, federal and societal  
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50 resources.<sup>135</sup> As such, we recommend medical schools consider wellness interventions for all  
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52 learners conducting scientific medical research to augment their success as future investigators.  
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3 Our review suggests that the holistic redesign of wellness supports, tools and programs  
4 offered to learners is likely to incorporate many wellness domains. We found that few studies  
5 included process evaluations to assess implementation of interventions (i.e., fidelity, dose or  
6 reach of the intervention) and outcome assessments (i.e., use of wrong or incomplete  
7 measurement tool) over time. Though most studies reported positive improvements in wellness, it  
8 is possible interventions were not reliably delivered as intended or consistently adhered to as  
9 required.<sup>136</sup> Along with others,<sup>6</sup> we suggest future evaluation of wellness interventions study  
10 sequential phases of implementation to determine synergies among wellness domains associated  
11 with improvements in learner well-being.  
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24 We found that few studies reported using theories of wellness change (e.g., Nussbaum's  
25 human capabilities approach [freedom to attain well-being is partial to people's capabilities—real  
26 opportunities to do and be what they have reason to value]<sup>137</sup>), to inform the selection of  
27 interventions and outcomes. We suggest the wellness trajectories of learners may require  
28 different wellness domains to be targeted by different interventions at different time points. What  
29 works at one stage of medical education may not be helpful at the next stage of training.<sup>138</sup>  
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38 We acknowledge that from our review it is unclear whether wellness outcomes with  
39 overlapping “symptoms” have differential responses to interventions, or whether the smaller  
40 number of trials examining social, mental and physical wellness explain our observations. It is  
41 also possible that some neutral or negative outcomes represent unaccounted for illnesses in the  
42 learner that may not be responsive to interventions. For these learners, wellness interventions  
43 may have important adverse effects that need to be carefully weighed against any potential  
44 benefit.<sup>139</sup> We assert there is no magic bullet to improve learner well-being however a holistic  
45 approach targeting interventions at the levels of individual learners, programs and the overall  
46 system may help to cultivate an enduring culture of wellness in academic medicine.  
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## Limitations

The results of this review need to be interpreted within the context of its limitations. Primarily, we did not search the grey literature, including ongoing clinical trial registries. The inclusion of conference abstracts and other forms of grey literature may have uncovered additional evidence of relevance to this review. Second, the scope of our review was restricted to studies evaluating the effect of wellness interventions on five medical learner wellness domains, although there are other domains of the learning environment that deserve attention in a holistic redesign of wellness support, tools and programs offered to learners such as spirituality.<sup>140</sup> Third, we found that authors nearly exclusively reported successes of their wellness interventions—and few failures—which suggests a possible publication bias in favour of positive studies. Fourth, given our inclusive wellness framework and the multifaceted nature of wellness interventions, it was not possible to determine the specific components of individual wellness interventions associated with more favourable learner well-being. Fifth, lack of a universal definition of learner wellness added complexity to the study selection process. However, our broad inclusion criteria allowed us to produce a more comprehensive summary of literature on this topic. Finally, we restricted our review to Canadian medical schools, however different countries with different medical education systems may have differing cultural values such as child caregiving responsibilities and social support networks which may influence the learner experience.<sup>141</sup>

## Conclusions

High-quality medical training can ultimately translate to high-quality care.<sup>142,143</sup> Wellness interventions in academic medicine settings are highly variable, which implies medical education systems and programs may not consistently be implementing wellness interventions to enhance medical education learning environments and improve learner well-being. The findings from this

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3 review highlight that medical education research on learner wellness will benefit from studies  
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5 with rigorous design, appropriate comparators, and objective data collection. High-quality  
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7 medical education research on wellness innovation across the spectrum of health sciences and  
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9 health professions training is needed to ensure and sustain holistic learner well-being.  
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Cherak et al., (2020) Tables and Figures

**Table 1.** Characteristics of included studies<sup>1</sup>

Undergraduate Non-Medical Students							
Author, Year	Timeframe	Respondents	Program	Design <sup>2</sup>	Wellness Domain <sup>3</sup>	Level <sup>4</sup>	Effects, significance <sup>5</sup>
Dumont et al., 2010 <sup>1</sup>	N/S	215	Health Sciences	Uncontrolled	Intellectual, Occupational	System	Positive, significant
Roach et al., 2012 <sup>2</sup>	N/S	43	Health Sciences	RCT	Intellectual, Occupational	System	Positive, not significant
Undergraduate Medical Students							
Author, Year	Timeframe	Respondents	Program	Design <sup>2</sup>	Wellness Domain <sup>3</sup>	Level <sup>4</sup>	Effects, significance <sup>5</sup>
Ali et al., 2003 <sup>3</sup>	N/S	29	N/A	RCT	Intellectual	Individual	Positive, significant
Bland et al., 2001 <sup>4</sup>	2001	84	N/A	Uncontrolled	Intellectual	Program	Positive, significant
Brown et al., 2018 <sup>5</sup>	2016	123	N/A	Uncontrolled	Intellectual, Occupational	Individual	Positive, significant
Burbridge et al., 2015 <sup>6</sup>	2013-2015	135	N/A	Quasi-experimental	Intellectual, Occupational	System	Positive, significant
Byszewski et al., 2017 <sup>7</sup>	2014	93	N/A	Uncontrolled	Intellectual, Occupational	Individual	Positive, significant
Cadieux et al., 2017 <sup>8</sup>	N/S	62	N/A	Uncontrolled	Intellectual, Occupational	System	Negative, not assessed
Cassidy-Smith et al., 2011 <sup>9</sup>	2005	26	N/A	Uncontrolled	Intellectual, Occupational	Program	Positive, significant
Chew et al., 2012 <sup>10</sup>	2008-2009	18	N/A	Uncontrolled	Intellectual, Occupational	Individual	Positive, significant
Cleave-Hogg et al., 2002 <sup>11</sup>	N/S	145	N/A	Uncontrolled	Intellectual, Occupational	Program	Positive, not assessed
D'Urzo et al., 2019 <sup>12</sup>	N/S	27	N/A	Uncontrolled	Social, Intellectual	Program	Positive, not significant
Duque et al., 2003 <sup>13</sup>	1999-2000	182	N/A	Uncontrolled	Intellectual	Program	Positive, significant
Elharram et al., 2017 <sup>14</sup>	2015	7	N/A	Uncontrolled	Social, Intellectual	System	Positive, significant
Ellaway et al., 2014 <sup>15</sup>	2010-2012	101	N/A	Uncontrolled	Social, Intellectual	System	Positive, not significant
Fairchild et al., 2012 <sup>16</sup>	N/S	8	N/A	Uncontrolled	Social, Intellectual	System	Positive, not assessed
Garg et al., 1997 <sup>17</sup>	1987	359	N/A	Uncontrolled	Social, Intellectual	Program	Positive, significant
Gawad et al., 2013 <sup>18</sup>	N/S	21	N/A	Uncontrolled	Intellectual, Occupational	System	Positive, significant
Greene et al., 2015 <sup>19</sup>	2015	18	N/A	Uncontrolled	Intellectual, Occupational	Program	Positive, significant
Harding, et al., 2001 <sup>20</sup>	N/S	N/S	N/A	Uncontrolled	Social, Intellectual	Program	Positive, significant
Haupt et al., 2019 <sup>21</sup>	2018	37	N/A	Uncontrolled	Occupational	Individual	Positive, significant
Ibrahim et al., 2014 <sup>22</sup>	2014	143	N/A	Uncontrolled	Social, Intellectual	System	Positive, significant
Jamniczky et al., 2017 <sup>23</sup>	2014	161	N/A	Quasi-experimental	Intellectual	Individual	Indeterminate, significant <sup>6</sup>
Law et al., 2019 <sup>24</sup>	2017	17	N/A	Uncontrolled	Intellectual, Occupational	Individual	Positive, not assessed
Livingston et al., 1973 <sup>25</sup>	1973	6	N/A	Uncontrolled	Occupational	Individual	Positive, not assessed
Lynch et al., 2014 <sup>26</sup>	N/S	4	N/A	Uncontrolled	Social, Intellectual	Individual	Positive, not assessed
Morgan et al., 2000 <sup>27</sup>	1998-1999	145	N/A	Uncontrolled	Intellectual	Program	Positive, not assessed



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Shapiro et al., 2009 <sup>28</sup>	1996-2000	38	N/A	Quasi-experimental	Social	Individual	Indeterminate, significant <sup>7</sup>
Sheppard et al., 2020 <sup>29</sup>	N/S	37	N/A	Uncontrolled	Occupational	Individual	Positive, significant
Skoll et al., 2006 <sup>30</sup>	2003-2004	92	N/A	Uncontrolled	Occupational	Program	Positive, significant
Smyth et al., 2019 <sup>31</sup>	2018	37	N/A	Uncontrolled [qualitative]	Occupational	Individual	Positive, significant
Turner et al., 2012 <sup>32</sup>	2009-2010	63	N/A	Quasi-experimental	Intellectual, Occupational	System	Positive, significant
Welsher et al., 2018 <sup>33</sup>	N/S	23	N/A	Quasi-experimental	Intellectual	Individual	Positive, not significant
Yeung et al., 2017 <sup>34</sup>	2014	20	N/A	Uncontrolled	Social, Intellectual	Individual	Positive, significant
Postgraduate Medical Students							
Author, Year	Timeframe	Respondents	Program	Design <sup>2</sup>	Wellness Domain <sup>3</sup>	Level <sup>4</sup>	Effects, significance <sup>5</sup>
Baird et al., 2016 <sup>35</sup>	2016	10	Pediatric Surgery	Uncontrolled	Social, Intellectual, Occupational	Program	Positive, significant <sup>8</sup>
Campagna-Vaillancourt et al., 2014 <sup>36</sup>	2011-2013	45	Otolaryngology–Head and Neck Surgery	Uncontrolled	Social	Program	Positive, not assessed
Crutcher et al., 2004 <sup>37</sup>	N/S	56	Family	Quasi-experimental	Intellectual, Occupational	System	Positive, significant
Dore et al., 2010 <sup>38</sup>	2008-2010	484	Obstetrics–Gynecology, Pediatrics, Internal	Uncontrolled	Social	Program	Positive, significant
Downar et al., 2010 <sup>39</sup>	N/S	25	Psychiatry	Uncontrolled	Intellectual, Occupational	Individual	Positive, significant
Ens et al., 2017 <sup>40</sup>	2013	97	Pediatrics	RCT	Intellectual, Occupational	Program	Positive, significant
Fabreau et al., 2013 <sup>41</sup>	2010	63	Internal	Uncontrolled	Social, Mental	Program	Indeterminate, not significant <sup>9</sup>
Finley et al., 2001 <sup>42</sup>	1998	93	Pediatric Cardiology	Uncontrolled	Intellectual	Program	Positive, not assessed
Gibson et al., 2015 <sup>43</sup>	2009-2013	32	Psychiatry	Uncontrolled	Intellectual	Program	Positive, significant
Gilic et al., 2015 <sup>44</sup>	2012	40	Family	Quasi-experimental	Intellectual, Occupational	Program	Positive, significant
Grabovac et al., 2008 <sup>45</sup>	2005	22	Psychiatry	Uncontrolled	Intellectual	Program	Positive, significant
Hanna et al., 2012 <sup>46</sup>	N/S	43	Surgical subspecialties	Uncontrolled	Occupational	System	Positive, significant
James et al., 2006 <sup>47</sup>	N/S	46	Internal	Uncontrolled	Social, Intellectual	Program	Positive, significant
Jefferies et al., 2011 <sup>48</sup>	2009	20	Neonatal Intensive Care	Uncontrolled	Intellectual, Occupational	System	Positive, not significant
Kanagasabai et al., 2007 <sup>49</sup>	2003-2005	5917	Any	Uncontrolled	Physical, Occupational	System	Positive, significant
Law et al., 2016 <sup>50</sup>	2012-2013	29	Geriatric Psychiatry	Uncontrolled	Intellectual	Individual	Positive, not significant

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Malhotra et al., 2008 <sup>51</sup>	2005	12	Internal	Uncontrolled	Mental, Intellectual	Program	Positive, N/A
McKendy et al., 2016 <sup>52</sup>	N/S	24	Surgical subspecialties	Uncontrolled	Intellectual	Program	Indeterminate, significant <sup>10</sup>
McMillan et al., 2016 <sup>53</sup>	2014	16	Pediatrics	Uncontrolled	Mental, Intellectual	Individual	Positive, not significant
Meterissian et al., 2007 <sup>54</sup>	2006-2007	40	General Surgery	Uncontrolled	Intellectual	Program	Positive, significant
Myden et al., 2012 <sup>55</sup>	N/S	6	Orthopedics	Quasi-experimental	Intellectual, Occupational	Program	Positive, significant
Sachedina et al., 2019 <sup>56</sup>	N/S	17	Cardiac Critical Care	Uncontrolled	Occupational	Individual	Positive, N/A
Sternszus et al., 2018 <sup>57</sup>	2015-2016	25	N/S	Uncontrolled	Social, Intellectual	System	Positive, not assessed
Sukhera et al., 2018 <sup>58</sup>	2017	10	Psychiatry	Uncontrolled	Mental	System	Positive, N/A
Tait et al., 2013 <sup>59</sup>	N/S	7	Family Medicine, Psychiatry	Uncontrolled	Mental, Intellectual, Occupational	Individual	Positive, N/A
Tan et al., 2013 <sup>60</sup>	2010-2011	130	Family Medicine	Uncontrolled	Social, Occupational	Program	Positive, not significant
Telner et al., 2010 <sup>61</sup>	N/S	3	Family	RCT	Intellectual	System	Positive, not significant
Willett et al., 2011 <sup>62</sup>	2009	37	Family Medicine	Uncontrolled	Intellectual	Program	Positive, significant
Zahrai et al., 2011 <sup>63</sup>	2009	16	Orthopedic Surgery	Quasi-experimental	Mental, Intellectual	Program	Negative, significant
Undergraduate Medical & Postgraduate Medical Students							
Author, Year	Timeframe	Respondents	Program	Design <sup>2</sup>	Wellness Domain <sup>3</sup>	Level <sup>4</sup>	Effects, significance <sup>5</sup>
Posluns et al., 1990 <sup>64</sup>	1990	N/S	Any	Uncontrolled	Intellectual	System	N/S
Laidlaw et al., 2002 <sup>65</sup>	1997-1998	318	Any	Uncontrolled	Intellectual, Occupational	System	Positive, significant

<sup>1</sup>Categorized by medical learner population then alphabetically by author

<sup>2</sup>RCT, randomized controlled trial; Quasi-experimental, non-randomized controlled trial; Uncontrolled, non-randomized uncontrolled trial

<sup>3</sup>Social, mental, physical, intellectual and/or occupational wellness [Supplemental Table 3]

<sup>4</sup>Individual, program or system level [Supplemental Table 3]

<sup>5</sup>For main effects of wellness intervention

<sup>6</sup>Intervention did not improve learner knowledge but compliance was high and perceived impactful to intellectual wellness

<sup>7</sup>Intervention improved learner communication skills but not learner confidence and perceptions of engaging communications; both social wellness

<sup>8</sup>Learners agreed the intervention improved intellectual and occupational wellness and logistical challenges negatively impacted social wellness

<sup>9</sup>Learners felt social and mental wellness were relatively unaffected by the intervention

<sup>10</sup>Intervention failed to improve learner knowledge but satisfaction with curriculum was significantly higher, both related to intellectual wellness

N/A, not applicable; N/S, not stated

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**Table 2.** Quantitative outcomes measured for wellness domains<sup>1,2</sup>

Social Wellness N=17 (26%)		Mental Wellness N=6 (9%)		Physical Wellness N=1 (2%)		Intellectual Wellness N=51 (78%)		Occupational Wellness N=32 (49%)	
Outcome	N (%) <sup>3</sup>	Outcome	N (%) <sup>3</sup>	Outcome	N (%) <sup>3</sup>	Outcome	N (%) <sup>3</sup>	Outcome	N (%) <sup>3</sup>
Agreement	7 (41%)	Anxiety symptoms	1 (17%)	Compliance	1 (100%)	Anxiety symptoms	1 (2%)	Agreement	5 (16%)
Behavior	1 (6%)	Experience	4 (57%)			Attitudes	12 (23%)	Attitudes	3 (9%)
Competence	1 (6%)	Implicit association	1 (17%)			Compliance	8 (16%)	Compliance	3 (9%)
Confidence	3 (18%)	Quality of life	1 (17%)			Confidence	4 (8%)	Competence	2 (6%)
Content	1 (6%)	Satisfaction	2 (33%)			Competence	4 (8%)	Confidence	2 (6%)
Experience	3 (18%)	Skills	1 (17%)			Content	6 (12%)	Duties	1 (3%)
Knowledge	3 (18%)	Stressors	1 (17%)			Duties	3 (6%)	Experience	8 (25%)
Learning	1 (6%)					Goals	1 (2%)	Goals	1 (3%)
Perceptions	6 (35%)					Interest	10 (20%)	Interest	2 (6%)
Preparedness	1 (6%)					Experience	1 (2%)	Knowledge	14 (44%)
Reaction	1 (6%)					Goals	12 (23%)	Perceptions	7 (22%)
Satisfaction	10 (59%)					Interest	23 (45%)	Performance	2 (6%)
Skills	2 (12%)					Knowledge	12 (23%)	Preparedness	2 (6%)
Willingness	1 (6%)					Perceptions	1 (2%)	Satisfaction	8 (25%)
						Performance	1 (2%)	Skills	3 (9%)
						Preparedness	1 (2%)	Usefulness	1 (3%)
						Quality of intervention	1 (2%)		
						Quality of life	1 (2%)		
						Satisfaction	16 (31%)		
						Skills	5 (10%)		
						Usefulness	1 (2%)		
						Willingness	1 (2%)		

<sup>1</sup>Social, mental, physical, intellectual and/or occupational wellness [Supplemental Table 3]<sup>2</sup>More than one outcome measure was often reported in a single study for each wellness domain<sup>3</sup>N, number of studies that reported each outcome; %, N as a proportion of studies for that domain

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**Table 3.** Summary of findings from qualitative studies<sup>1,2</sup>

Undergraduate Medical Students					
Author, Year	Wellness Domain <sup>3</sup>	Intervention Level <sup>4</sup>	Analysis	Themes or Theory	Authors' Conclusions
Brown et al., 2018	Intellectual, Occupational	Individual	Thematic	Continuous support; Genuine interest in improving medical education; Team-based learning and problem solving; Regular project feedback; Access to QI education resources	Medical education is an appropriate context to teach pre-clerkship medical students about quality improvement, which might lead to an increase in knowledge of and comfort with quality improvement principles.
Byszewski et al., 2017	Intellectual, Occupational	Individual	Thematic	Students found the podcast a creative method to present a specialty and suggested creating podcasts for other medical fields; Students provided suggestions for including patient testimonials and "A day in the life of..."	A creative podcast is useful to raise awareness of geriatric medicine as a potential career choice among medical students and can be used as a novel multimedia approach for a variety of career options for medical students when considering residency programs.
Cadieux et al., 2017	Intellectual, Occupational	System	Thematic	Understanding change; Effective teamwork; Leading in patient safety; Leadership in action	Leadership in medical education should be grounded in a healthcare context applicable to the learner's stage of training. Engagement among medical students may be better supported if leadership is framed as a competency throughout their career.
Chew et al., 2012	Intellectual, Occupational	Individual	Thematic	Enthusiasm for small group sessions; Clinical observer-ships; Community agency placements; Diversity of topics covered	Student-run initiatives can supplement medical curriculum content and promote student leadership and interest, community partnerships, and faculty mentorship.
Ellaway et al., 2014	Social, Intellectual	System	Grounded Theory	Learners use their devices differently, depending on affordances and context; Mobile devices augment but are not replacements for laptop computers; Learners use only some device features and desire more control over device selection; There are learner concerns about the hidden curriculum of mobile device use in medical education; Mobile devices in medical education are perceived as a tool and source of support.	Medical learners use electronic devices as a support tool in medical education depending on the learning culture and contexts of their specific medical programs and education ecologies.
Law et al., 2019	Intellectual, Occupational	Individual	Thematic	Value of the course; Potential application of learning	There are linkages between computer science and medicine that would benefit from enhanced two-way communication

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					between the disciplines when developing technology for use in medicine.
Lynch et al., 2018	Social, Intellectual	Individual	Thematic	Peer Connection; Trust in Data Veracity; Aid to Clinical Learning Process	It is feasible to link students from separate continents in a community of peer-to-peer learning to encourage peer cooperation with potential to disseminate key clinical learning experiences widely.
Welsher et al., 2018	Intellectual	Individual	Thematic	Ease of use; Technical knowledge; Versatile and accessible; Observational tools beneficial to learning; Desire for more networked observational learning activity	Video-based observational learning, facilitated by internet-mediated platforms, is a viable way to support simulation-based clinical skills learning in a distributed group of health professional trainees.
Yeung et al., 2017	Social, Intellectual	Individual	Thematic	A longitudinal SAT program increased perceived knowledge of educational theory and provided students with opportunities to practice teaching; A longitudinal SAT program allowed students to provide and receive feedback, and gave students opportunities to reflect on their practice; A longitudinal SAT program equipped students with improved learning strategies	Early exposure to medical education theories gives students opportunities to apply theories practically through ongoing teaching and feedback sessions, and reflective exercises.
<b>Postgraduate Medical Students</b>					
<b>Author, Year</b>	<b>Wellness Domain<sup>3</sup></b>	<b>Intervention Level<sup>4</sup></b>	<b>Analysis</b>	<b>Themes or Theory</b>	<b>Authors' Conclusions</b>
Campagna-Vaillancourt et al., 2014	Social	Program	Thematic	Meet more staff; Less stressful; Multiple first impressions; Different aspects of personality; Objective and fair; Team assessment	Using the MMI for admission to a residency program has good acceptability among stakeholders, good reliability, and is feasible. Predictive validity should be assessed regarding future performance.
Malhotra et al., 2008	Mental, Intellectual	Program	Phenomenological	Education; Assessment; Exam preparation	The mini-Clinical Evaluation Exercise may be anxiety provoking during initial assessment, but over time, may provide insight into clinical competence. Participants believed the mini-Clinical Evaluation Exercise experience would benefit them in preparation and successful completion of their national specialty exam.
Myden et al., 2012	Intellectual, Occupational	Program	Thematic	Confidence; Awareness; Deepening knowledge; Changed perspectives	High-impact educational interventions promoting cognitive flexibility would benefit trainees through increased confidence, changed awareness, and deepening knowledge, as well as changed perspectives.

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Sachedina et al., 2019	Occupational	Individual	Thematic	Skills of code blue learners; Residents feel unprepared to serve as CBLs before the CCU rotation; The CBSP is a useful tool to help prepare residents to serve as CBLs; The authenticity of the CBP cases was useful; Real codes have higher stakes, higher anxiety, and more chaos than simulated codes	The code blue simulation program enhanced resident preparedness to serve as code blue leaders; however, differences remain between simulated and real codes that should be addressed to enhance the fidelity of future simulations.
Sukhera et al., 2018	Mental	System	Grounded Theory	Vulnerability provoked tension between personal and professional identities reconciled through striving for ideal while acknowledging the actual.	Addressing implicit bias among health professionals is influence by the process of recognizing and managing biases. A self-improvement approach that accepts individual shortcomings may be a useful approach.
Tait et al., 2013	Mental, Intellectual, Occupational	Individual	Thematic	Experience of the interview; Patient as teacher; Residents reflecting on their own lives; Resident reflections on palliative/end-of-life care education; Physician role in conflict	Conversations with dying patients and soliciting a patient’s story are poorly taught and modeled in medical education.
Tan et al., 2013	Social, Occupational	Program	Thematic	Useful content; Beneficial teaching modality; Realism of case; Awkward navigation; Worried about missing key points in the case	The online virtual patient case in palliative care is a teaching tool helpful to address the need for increased formal palliative care experience in medical education.

<sup>1</sup>Adapted from the Summary of Qualitative Findings Table structure proposed by Lewin et al., 2018

<sup>2</sup>Categorized by medical learner population then alphabetically by author

<sup>3</sup>Social, mental, physical, intellectual and/or occupational wellness [Supplemental Table 3]

<sup>4</sup>Individual, program or system level [Supplemental Table 3]

**Table 4.** Summarized findings on wellness domains with regard to medical learner population and level of intervention

Medical Learner Population <i>Level of Intervention</i> <sup>2</sup>		Wellness Domains <sup>1</sup>				
		Social	Mental	Physical	Intellectual	Occupational
		N=17 (26%) <sup>3</sup>	N=6 (9%) <sup>3</sup>	N=1 (2%) <sup>3</sup>	N=51 (78%) <sup>3</sup>	N=32 (49%) <sup>3</sup>
<b>Undergraduate Non-Medical</b>	<b>N=2</b> <b>(3%)<sup>3</sup></b>	0	0	0	2	2
<i>Individual</i>		↑ 0 ↓ 0 ‡ 0	↑ 0 ↓ 0 ‡ 0	↑ 0 ↓ 0 ‡ 0	↑ 0 ↓ 0 ‡ 0	↑ 0 ↓ 0 ‡ 0
<i>Program</i>		↑ 0 ↓ 0 ‡ 0	↑ 0 ↓ 0 ‡ 0	↑ 0 ↓ 0 ‡ 0	↑ 0 ↓ 0 ‡ 0	↑ 0 ↓ 0 ‡ 0
<i>System</i>		↑ 0 ↓ 0 ‡ 0	↑ 0 ↓ 0 ‡ 0	↑ 0 ↓ 0 ‡ 0	↑ 1 ↓ 1 ‡ 0	↑ 1 ↓ 1 ‡ 0
<b>Undergraduate Medical</b>	<b>N=32</b> <b>(49%)<sup>3</sup></b>	10	0	0	26	17
<i>Individual</i>		↑ 2 ↓ 0 ‡ 1	↑ 0 ↓ 0 ‡ 0	↑ 0 ↓ 0 ‡ 0	↑ 6 ↓ 1 ‡ 2	↑ 6 ↓ 0 ‡ 2
<i>Program</i>		↑ 2 ↓ 1 ‡ 0	↑ 0 ↓ 0 ‡ 0	↑ 0 ↓ 0 ‡ 0	↑ 6 ↓ 1 ‡ 2	↑ 3 ↓ 0 ‡ 1
<i>System</i>		↑ 2 ↓ 1 ‡ 1	↑ 0 ↓ 0 ‡ 0	↑ 0 ↓ 0 ‡ 0	↑ 5 ↓ 1 ‡ 2	↑ 3 ↓ 0 ‡ 1
<b>Postgraduate Medical</b>	<b>N=29</b> <b>(45%)<sup>3</sup></b>	7	6	1	21	12
<i>Individual</i>		↑ 0 ↓ 0 ‡ 0	↑ 0 ↓ 1 ‡ 1	↑ 0 ↓ 0 ‡ 0	↑ 1 ↓ 2 ‡ 1	↑ 1 ↓ 0 ‡ 2
<i>Program</i>		↑ 3 ↓ 2 ‡ 1	↑ 1 ↓ 1 ‡ 1	↑ 0 ↓ 0 ‡ 0	↑ 11 ↓ 0 ‡ 2	↑ 4 ↓ 1 ‡ 0
<i>System</i>		↑ 0 ↓ 0 ‡ 1	↑ 0 ↓ 0 ‡ 1	↑ 1 ↓ 0 ‡ 0	↑ 1 ↓ 2 ‡ 1	↑ 3 ↓ 1 ‡ 0
<b>Undergraduate Medical &amp; Postgraduate Medical</b>	<b>N=2</b> <b>(3%)<sup>3</sup></b>	0	0	0	2	1
<i>Individual</i>		↑ 0 ↓ 0 ‡ 0	↑ 0 ↓ 0 ‡ 0	↑ 0 ↓ 0 ‡ 0	↑ 0 ↓ 0 ‡ 0	↑ 0 ↓ 0 ‡ 0
<i>Program</i>		↑ 0 ↓ 0 ‡ 0	↑ 0 ↓ 0 ‡ 0	↑ 0 ↓ 0 ‡ 0	↑ 0 ↓ 0 ‡ 0	↑ 0 ↓ 0 ‡ 0
<i>System</i>		↑ 0 ↓ 0 ‡ 0	↑ 0 ↓ 0 ‡ 0	↑ 0 ↓ 0 ‡ 0	↑ 1 ↓ 0 ‡ 1	↑ 1 ↓ 0 ‡ 0

<sup>1</sup>More than one wellness domain could be recorded from a single study

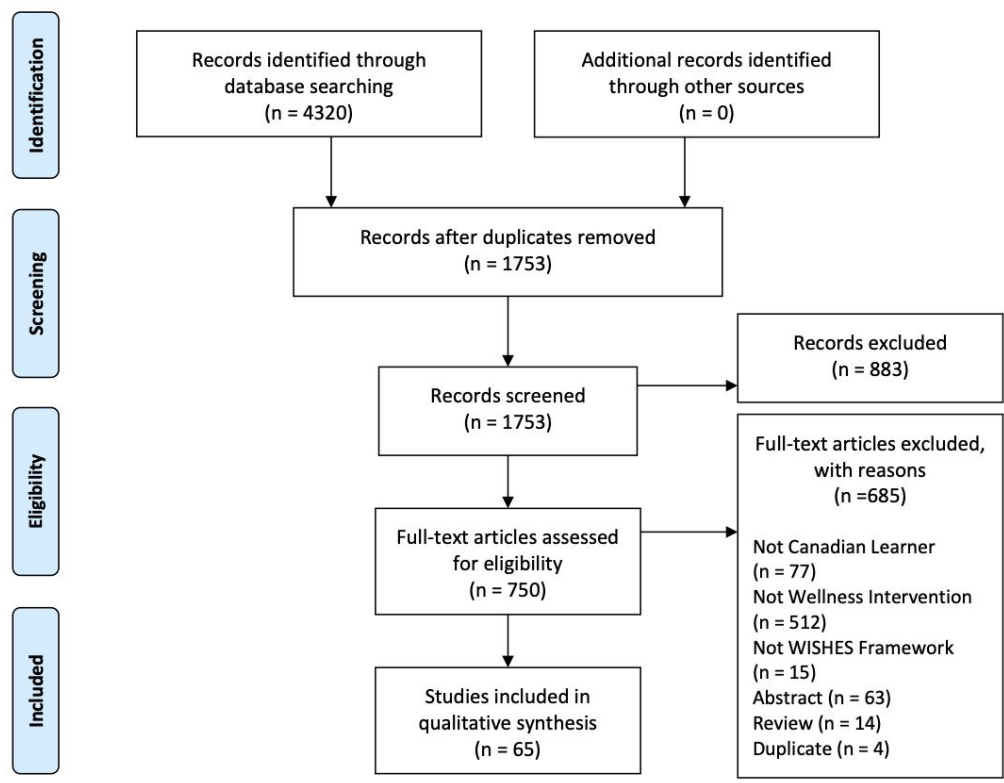
<sup>2</sup>One level of intervention was recorded from each included study

<sup>3</sup>N, number of studies that reported each objective or outcome category; %, N as a proportion of total included studies

↑, statistically significant; ↓, not statistically significant; ‡, statistical significance not assessed; Shading indicates majority statistically significant  
Studies with qualitative outcomes only findings included under statistical significance not assessed

Indeterminate studies with statistically significant results showed statistically significant positive results and indeterminate results not significant

Figure 1. PRISMA diagram





**Supplemental Table 1.** Categorization of wellness domains and intervention levels

Wellness Domain <sup>1</sup>	Description	Examples
Social	State of well-being in which individuals and communities feel they understand, are a part of, and are accepted by their social environment, and are comfortable expressing their feelings, needs, identities and opinions <i>Including processes [methods] and outcomes [experiences] of social wellness</i>	Isolation, equity, diversity, discrimination, race, religion, ethnicity, family support
Mental	State of well-being in which every individual realizes his or her own potential, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to her or his community	Mindfulness, mental health, mental illness or disorder, anger, sadness, emotions
Physical	Perception and expectation of well-being of an individuals' body, including the active and continuous effort to maintain optimum levels of physical activity and focus on nutrition, as well as self-care and maintenance of a healthy lifestyle <i>Acknowledging physical health and limitations can co-exist in a healthy environment</i>	Exercise, physical activity, physical health, nutrition, symptoms of burnout
Intellectual	State of well-being in which individuals are enabled to pursue creative, mentally-stimulating activities that expand their knowledge, develop skills, and foster life-long learning and teaching, towards a goal of self-actualization <i>Including processes [how] and outcomes [deliverables] of intellectual wellness</i>	Learning, tools, outcomes, teaching, goals, learning needs
Occupational	Protection and promotion of workers/learners by preventing and controlling occupational diseases and accidents, and by elimination of conditions hazardous to health and safety at work/school, and the development and promotion of healthy and safe work/learning, work learning environments and organizations <i>Including processes [responsibilities] and outcomes [trajectories] of occupational wellness</i>	Work, (resident) rotation, job, lab, research (assistantship or similar)
Impactful factor <sup>2</sup>	Description	Examples
Individual	The individual learner or group of individual learners undefined by program	Persons
Program	The type of program the learner is enrolled in	Undergraduate Medical or Health Sciences, Graduate Medical or Post-Graduate Medical Education
System	The academic institution or system the learner is housed within	University, Medical School, Royal College of Physicians and Surgeons of Canada

<sup>1</sup>Domains of wellness described within an overall feeling of well-being (i.e., feeling balanced or good generally)

**Supplemental Table 2.** Preferred Reporting Items for Systematic review and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR)

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	PAGE #
<b>TITLE</b>			
Title	1	Identify the report as a scoping review.	1
<b>ABSTRACT</b>			
Structured summary	2	Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.	3
<b>INTRODUCTION</b>			
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach.	5
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions and/or objectives.	5
<b>METHODS</b>			
Protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a Web address); and if available, provide registration information, including the registration number.	6
Eligibility criteria	6	Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status), and provide a rationale.	6
Information sources*	7	Describe all information sources in the search (e.g., databases with dates of coverage and contact with authors to identify additional sources), as well as the date the most recent search was executed.	7
Search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	S. Table 2
Selection of sources of evidence†	9	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.	7
Data charting process‡	10	Describe the methods of charting data from the included sources of evidence (e.g., calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and any processes for obtaining and confirming data from investigators.	7
Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.	8
Critical appraisal of individual sources of evidence§	12	If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe the methods used and how this information was used in any data synthesis (if appropriate).	N/A

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SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	PAGE #
Synthesis of results	13	Describe the methods of handling and summarizing the data that were charted.	8
<b>RESULTS</b>			
Selection of sources of evidence	14	Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.	9 Figure 1
Characteristics of sources of evidence	15	For each source of evidence, present characteristics for which data were charted and provide the citations.	9 Table 1
Critical appraisal within sources of evidence	16	If done, present data on critical appraisal of included sources of evidence (see item 12).	N/A
Results of individual sources of evidence	17	For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives.	10 Table 2 Table 3
Synthesis of results	18	Summarize and/or present the charting results as they relate to the review questions and objectives.	11 Table 4
<b>DISCUSSION</b>			
Summary of evidence	19	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.	12-18
Limitations	20	Discuss the limitations of the scoping review process.	19
Conclusions	21	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications and/or next steps.	19
<b>FUNDING</b>			
Funding	22	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.	20

JBIG = Joanna Briggs Institute; PRISMA-ScR = Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews.

\* Where *sources of evidence* (see second footnote) are compiled from, such as bibliographic databases, social media platforms, and Web sites.

† A more inclusive/heterogeneous term used to account for the different types of evidence or data sources (e.g., quantitative and/or qualitative research, expert opinion, and policy documents) that may be eligible in a scoping review as opposed to only studies. This is not to be confused with *information sources* (see first footnote).

‡ The frameworks by Arksey and O'Malley (6) and Levac and colleagues (7) and the JBI guidance (4, 5) refer to the process of data extraction in a scoping review as data charting.

§ The process of systematically examining research evidence to assess its validity, results, and relevance before using it to inform a decision. This term is used for items 12 and 19 instead of "risk of bias" (which is more applicable to systematic reviews of interventions) to include and acknowledge the various sources of evidence that may be used in a scoping review (e.g., quantitative and/or qualitative research, expert opinion, and policy document).

From: Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMA-ScR): Checklist and Explanation. *Ann Intern Med.* ;169:467–473. doi: 10.7326/M18-0850

**Supplemental Table 3.** OVID Medline search strategy

Population	Outcomes	Interventions	Combination and Limiters <sup>3</sup>
<i>Canadian Medical Learner<sup>1</sup></i>	<i>Wellness Domains<sup>2</sup></i>	<i>Wellness Interventions</i>	
1. exp Education, Medical/ or exp School, Medical/ or exp Faculty, Medical/	5. (mental or physical or social or intellectual or occupational or mental health or mental disorder or physical health or physical disorder or occupational health or occupational disorder or social health or social disorder or intellectual health or intellectual disorder or health or quality of life or health related quality of life or health-related quality of life).tw.	15. exp "Surveys and Questionnaires"/	20. or/1-4
2. exp Education, Medical, Undergraduate/ or exp "Internship or Residency"/	6. exp Emotions/ or exp Stress, Psychological/	16. interview/ or interviews/	21. or/5-14
3. exp Education, Medical, Graduate/	7. (emotion or affect or mood or anxiety or anxious or fear or frustration or happiness or happy or sad or lonely or loneliness or pleasure or hate or anger or guilt or shame or hope or hostility or jealousy or satisfaction or cope).tw.	17. Interview, Psychological/	22. or/15-19
4. (medical adj (student\$ or undergrad\$ or resident\$)).tw.	8. culture.mp. or culture.tw. or cultural.tw. or individual.tw. or individuals.tw. or system.tw. or systems.tw. or systematic.tw. or program.tw. or programs.tw. or programmatic.tw.	18. feedback/ or response/ or responses/	23. and/20-22
	9. (burnout or distress or stress or stressed or wellness or well-being or wellbeing or depressed or depression or suicide).tw.	19. ((program or training or course or curriculum or initiative) adj2 (evaluate or feedback or view or opinion)).tw.	24. limit 23 to english language
	10. (abuse or mistreat or harassment or harass or professional or unprofessional or support or unsupport or humiliation or disparage or ignore or unsafe or safe or harm or personal service or appropriate or inappropriate or respect or disrespect).tw.		25. exp Canada/
	11. empathy/		26. (canada or canadian).tw.
	12. (empathy or compassion or collegial or resilient or resilience or cooperation or collaboration or kind or kindness or integrity).tw.		27. 25 or 26
	13. exp prejudice/		28. 24 and 27
	14. (discriminate or discrimination or sexism or sexist or sexual or racism or race or ethnic or bias).tw.		29. (Canada* or Canadi* or Alberta* or Calgary* or Edmonton* or "British Columbia*" or Vancouver* or Victoria* or Manitoba* or Winnipeg* or "New Brunswick*" or Fredericton* or Moncton* or Newfoundland* or "New Foundland*" or Labrador* or "St John*" or "Saint John*" or "Northwest Territor*" or Yellowknife* or "Nova Scotia*" or Halifax* or Dalhousie* or Nunavut* or Igaluit* or Ontario* or Ontarian* or Toronto* or Ottawa* or Hamilton or Queen's or McMaster* or Kingston* or Sudbury* or "Prince Edward Island*" or Charlottetown* or Quebec* or Montreal* or McGill* or Laval* or Sherbrooke* or Nunavik* or Kuujuaq* or Inukjuak* or Puvirnituk* or Saskatchewan* or Saskatoon* or Yukon* or Whitehorse*).ti,ab. or exp Canada/
			30. 28 and 29

<sup>1</sup>A medical learner defined as a learner (i.e., undergraduate non-medical [health sciences or similar] student, graduate science [MSc or PhD] student, undergraduate medical student or postgraduate medical student [resident physician]) registered in an institution whose program pertains to research or treatment of diseases and injuries relating to medicine

<sup>2</sup>Social, mental, physical, intellectual and/or occupational wellness

<sup>3</sup>Population, outcomes and intervention terms were combined within-group with the Boolean operator OR and then population terms yield was combined between-group with the intervention, and outcome terms yields using the Boolean operator AND

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