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Web-based tools and mobile applications to mitigate burnout, depression and suicidality among healthcare students and professionals: a systematic review

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Abstract

Objective—Being a healthcare professional can be a uniquely rewarding calling. However, the demands of training and practice can lead to chronic distress and serious psychological, interpersonal and personal-health burdens. Although higher burnout, depression and suicide rates have been reported in healthcare professionals, only a minority receives treatment. Concerns regarding confidentiality, stigma, potential career implications, and cost and time constraints are cited as key barriers. Web-based and mobile applications have been shown to mitigate stress, burnout, depression, and suicidal ideation among several populations and may circumvent these barriers. Here, we reviewed published data on such resources and selected a small sample that readily can be used by healthcare providers.

Methods—We searched PubMed for articles evaluating stress, burnout, depression and suicide prevention or intervention for healthcare students or providers and identified 5 categories of programs with significant effectiveness: Cognitive Behavioral Therapy (online), meditation, mindfulness, breathing, and relaxation techniques. Using these categories, we searched for stress-, burnout-, depression-, and suicide prevention- web-based (through Google and beacon.anu.edu.au--a wellness resource website) and mobile applications (Apple and mobile.va.gov/appstore) and identified 36 resources to further evaluate based on relevance, applicability to healthcare providers (confidentiality, convenience and cost) and the strength of findings supporting their effectiveness.

Results—We selected 7 resources under 5 general categories designed to foster wellness and reduce burnout, depression, and suicide risk among healthcare workers: breathing (Breath2Relax), meditation (Headspace, guided meditation audios), web-based Cognitive Behavioral Therapy (MoodGYM, Stress Gym) and suicide prevention apps (Stay Alive, Virtual Hope Box).

Conclusions—This list serves as a starting point to enhance coping with stressors as a healthcare student or professional in order to help mitigate burnout, depression and suicidality.

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Next steps include adapting digital health strategies to specifically fit the needs of healthcare providers, with the ultimate goal of facilitating in-person care when warranted.

Keywords

Burnout; depression; suicide prevention; mobile applications; web applications

Being a healthcare professional can be an exhilarating and uniquely rewarding calling. However, healthcare training and practice can also be very stressful. For many, adequate coping skills and available support can help to manage the stress and facilitate personal growth, fulfillment, and professional engagement. For others, the challenges of persistent school or workplace stress can overwhelm personal resources, potentially resulting in chronic distress, role dissatisfaction, and burnout. These, in turn, can lead to serious psychological, interpersonal, social, and personal health burdens and even exacerbate suicidality [1, 2] (see Figure 1). Maslach and associates define burnout as a syndrome that develops in response to enduring work-related stress and is characterized by emotional exhaustion, depersonalization (i.e. treating patients as objects) and a low sense of personal accomplishment [3]. The adverse consequences of burnout predominantly manifest in the work environment and symptoms can be improved by getting away from work [3]. Risk factors for burnout include high workload, low sense of control and autonomy, seemingly endless and meaningless tasks, and work-life imbalance [4]—all common in the training and practice of medicine. Subsequently, 24–54% of healthcare students and professionals experience distressing, disruptive, and, at times, disabling symptoms of burnout [3, 5]. Burnout in healthcare professionals is associated with poor quality of care, patient dissatisfaction, increased medical errors, loss of empathy, absenteeism, quitting, and marital, family and health problems [1, 2].

The relationship between burnout and Major Depressive Disorder (MDD) is complex [4]. Not all burnout results in MDD and not all MDD is preceded by burnout, but burnout for some may be a consequence, a "*forme-fruste*", an early manifestation, or a precipitant of MDD [4]. In contrast to burnout, the negative thoughts, feelings, and behaviors associated with MDD are not limited to the workplace; rather, they are persistent, pervasive, and pathological. Whereas "getting away from work" helps mitigate burnout, it is of limited value for MDD, which has been shown to respond to several evidence-based psychological and pharmacological treatments [6]. Unfortunately, the majority of healthcare students and professionals, even those with substantial risk factors for suicide, do not avail themselves of such services [7, 8]. Risk factors for suicide, including untreated MDD, substance abuse, and active suicidal ideation [9], have been reported in medical students and physicians [7, 10]. In the United States alone, 300–400 physicians die by suicide annually and there are no data to suggest that the rates are decreasing [9]. Given the personal and professional consequences of untreated MDD, with suicide being the most dire, self-care is a professional imperative [9].

These alarming rates of burnout, depression, and suicidality among healthcare professionals [9,10] have spurred the implementation of programs to enhance wellness and facilitate mental health referral [11, 17]. The American Medical Association [18], Association of

American Medical Colleges [19], Accreditation Council for Graduate Medical Education [20], American Association of Colleges of Osteopathic Medicine [21] and American Foundation for Suicide Prevention (AFSP) [22] have taken notice. Some medical centers have begun to assess suicide risk among students and healthcare professionals and offer treatments [11, 15, 17, 23–25]. Most burnt-out trainees and healthcare professionals, including those with suicidal ideation, however, do not take advantage of treatment options or resources [9, 26, 27]. Reported roadblocks to treatment include lack of time, cost, and concerns regarding confidentiality, stigma, potential career implications and exposure to unwanted interventions [7]. An ideal intervention for a healthcare trainee or professional would therefore be effective – especially when combined with direct person-to-person-interventions – as well as convenient, accessible, affordable, and confidential. Digital health resources (e.g., websites and mobile applications [apps]) could fulfill these criteria [28–30].

With so many options available [31–35], how do healthcare organizations go about selecting the best web-based burnout and suicide prevention programs for their constituents? The purpose of this paper is to address that question by reviewing and curating the available web-based and mobile resources. In this manuscript, we 1) review a broad array of published interventions that may help mitigate stress, burnout, depression and suicidality, and 2) select a list of electronic resources that satisfy the mental health needs of healthcare students and professionals. Our ultimate goal is to provide transportable resources to medical programs with the potential to improve well-being, quality of life, job satisfaction, and mental health. These resources might also complement and facilitate other interventions, when indicated.

Methods

We first conducted a peer-reviewed literature search of PubMed for articles evaluating stress, burnout, depression, and suicide prevention or intervention programs for healthcare providers using the keywords “burnout prevention”, “burnout intervention”, “depression prevention”, “depression intervention”, and “suicide prevention” with each of the following terms: “healthcare provider”, “healthcare worker”, “health professional”, “healthcare student”, “physician”, “doctor”, “resident”, “medical student”, “nurse”, “nursing student”, “pharmacist”, “pharmacy student”, “physician assistant”, “medical assistant”, and “social worker”. With the exception of MoodGYM, the interventions used in these studies were neither web-based nor mobile applications. Nonetheless, our search identified six treatment approaches that are commonly applied to healthcare professionals to effectively reduce burnout: (1) web-based Cognitive Behavioral Therapy (CBT), (2) meditation, (3) breathing, (4) relaxation techniques, (5) mindfulness training and (6) suicide prevention apps.

Next, we searched Google and the wellness resources website beacon.anu.edu.au for online tools to prevent burnout, depression and suicide. Mobile applications specifically aimed at health professionals were queried using Apple App Store, Google Play Store, and US Department of Veterans Affairs App Store (mobile.va.gov/appstore). However, this general online search also yielded no healthcare worker-specific wellness resources. We subsequently searched for online tools and mobile applications in the aforementioned 5 categories of interventions used for healthcare professionals (web-based CBT, meditation, breathing mindfulness and relaxation techniques) in order to identify those with proven

efficacy for other populations that also satisfy the criteria specific to healthcare providers. For the US Department of Veterans Affairs App Store, we excluded wellness apps that are catered towards a specific patient population, such as PTSD Coach, Fam Coach, CPT Coach, and PE Coach for PTSD; Vet Change for alcohol abuse; Concussion Coach for Traumatic Brain Injury; CBT-I for insomnia; Stay Quit Coach for smoking cessation; and Parenting to Go for parents. All searches were conducted between November 1, 2016 and December 31, 2016.

Applying a strategy similar to the American Psychiatric Association "app evaluation framework" [36], the results of these searches were summarized to describe the content, format, duration, cost, effectiveness, confidentiality or privacy, and convenience (i.e., easy access anywhere and anytime) (see Table 1). A diverse group of healthcare professionals at one west coast public university [12, 14] reviewed this summary and selected 1 to 2 well-developed resources to recommend for each category along the spectrum of stress, burnout, MDD and suicidality. The selection criteria included the strength of significant findings supporting resource effectiveness and the potential to circumvent the aforementioned key barriers to treatment (i.e., by being convenient, accessible, affordable, and confidential). For each category, the final 1 to 2 resources were largely determined by the research findings that support their effectiveness.

Results

The general online search generated 14 web-based tools and 22 mobile applications. The content, format, duration, advantages, and disadvantages of each tool are summarized in Table 1. From the 36 resources, based on the significant research findings that support their effectiveness, the workgroup of reviewers selected a total of 7 web-based tools or mobile applications applicable to each category of distress: 1 for stress (Breath2Relax), 2 for burnout (Headspace, UC San Diego meditation audios), 2 for depression (MoodGYM, Stress Gym) and 2 for suicide prevention (Virtual Hope Box, Stay Alive). Breath2Relax is a mobile app that provides various guided breathing video and audio tutorials [37]. Headspace is a meditation mobile app shown to reduce depressive symptoms and improve positive affect among smartphone owners [28]. Although many sites and institutions provide guided meditation audios, not every source includes mindfulness-based stress reduction (MBSR) (e.g., health.uscd.edu/specialties/mindfulness/programs/mbsr/Pages/audio.aspx), which has been shown to decrease burnout and improve mental well-being [39]. Through its five weekly modules, MoodGYM, a web-based Cognitive Behavioral Therapy (CBT) program developed by Australian National University, has been shown to decrease suicidal ideation in medical interns [29]. Stress Gym, on the other hand, offers eight self-paced CBT modules and step-by-step stress management guides, with success in reducing stress among Navy officers [40]. Virtual Hope Box is a suicide prevention app that improves users' ability to cope with unpleasant thoughts and emotions [30]. Finally, Stay Alive, a suicide prevention app developed by the Grassroots Suicide Prevention, provides a customized safety plan, breathing and grounding exercise tutorials, online discussion forum, and links to other suicide prevention resources.

Discussion

Only recently have burnout, depression and suicidality been recognized nationally as significant challenges faced by healthcare students and professionals. Applying a strategy similar to the “app evaluation framework” [36], we searched for digital health resources aimed at mitigating burnout, depression and suicidal thoughts and behaviors. Such resources designed for the general population are rapidly emerging [32, 33]. To help healthcare programs navigate these evolving resources, we compiled a list of 7 web-based tools and mobile applications designed to foster wellness and mitigate burnout, depression, and suicide risk that have features that could satisfy the unique needs of healthcare workers. Of note, of all those reviewed, only MoodGym is evidence-based, only a minority (10) show any evidence of efficacy, and none specifically target healthcare professionals. Even so, they represent resources with the potential to reach a broad range of healthcare providers and surmount some of the obstacles preventing so many healthcare students and professionals from pursuing the help that they need. As such, they could also serve as a catalyst for some to pursue more established treatments, such as formalized psychotherapy, when indicated. Future efforts could (1) evaluate whether such tools are effective in healthcare professionals and (2) apply user-centered design to optimize these resources for healthcare providers and thus improve their relevance and efficacy.

The recommendations herein should be considered in the context of several limitations. First, the list of recommended resources was not generated from an exhaustive search process and may therefore have failed to identify other web- or app-based tools that satisfy our a priori defined criteria for inclusion. For instance, only included articles written in English were evaluated. Likewise, our search also relied upon PubMed or general searches and may have failed to identify valuable resources that did not appear in these venues. Additionally, since we did both literature and consumer product searches, our searches may especially be limited by terminology. Second, our criteria in selecting the final 7 resources within 5 categories focused on efficacy and our assessment of their potential to overcome healthcare professionals’ commonly cited barriers to pursuing treatment. The choice of categories and this assessment was based on the literature and the collective judgment of the diverse workgroup of healthcare students and professionals; it was not objective nor was it subjected to validation by a test group. Also, while we favored digital resources that claimed confidentiality, we nonetheless recognize the limits of internet-based resources – even those that are designed to be confidential – which may not fully protect a person’s anonymity in all instances. Users may be rightfully concerned about Internet monitoring, particularly while they are at work, which may be the most vulnerable time to use these digital resources. Concerns about data breaches and the sale of personal information are also valid and warrant careful consideration. Lastly, in this review, only tools that were publicly available at the time of the search were queried. Given the rapid development of mobile and web-based technology and the growing spotlight on wellness research over the past few years, it is likely that new tools have emerged as of January 1st, 2017. Hence, to support our recommendations and keep the pace with this rapidly evolving trend, our findings remain to be further refined, validated, and updated through research.

To our knowledge, with the exception of MoodGYM, which demonstrated promising results among medical interns, most of these resources have not yet been tested among healthcare providers. Future research evaluating the effectiveness of these resources among healthcare workers is needed. We do offer a few caveats for programs planning to recommend such resources. First, none of the resources identified in this report is considered a suitable replacement for face-to-face interventions for suicide prevention or the treatment of MDD. Rather, they can be used to bridge the obstacles to intervention and, in doing so, hopefully serve as a catalyst for individuals to seek direct support. These resources may also help individuals during periods of "watchful waiting" in primary care or as an adjunct to more traditional therapy. We also see these interventions as niched more for managing stress, burnout and relatively mild depressive symptoms, where professional help may not yet be indicated. Second, we recommend that programs consider implementing "guided" internet-based interventions for suicide prevention or the treatment of moderate to severe MDD that directly facilitate prompt referrals to in-person care [44]; we are aware that the evidence showing that self-guided interventions are less effective than clinician-guided interventions is not conclusive [32, 45]. Third, we recommend that programs find innovative ways to monitor the use of these resources and solicit ongoing feedback on their utility to guide real-time improvement. Since healthcare professionals may be motivated to choose digital resources out of a concern about their privacy, finding ways to monitor their use without the real or perceived compromise of confidentiality represents a challenge moving forward.

By intervening with technology-based resources at the burnout stages, near the base of the pyramid of distress (see Figure 1), we hope to enhance healthcare students' or professionals' coping with the customary stresses and strains of their everyday life, and thus create upstream effects of preventing burnout, reducing depressive symptoms, and even attenuating suicide risk. Future efforts could test the effectiveness of this approach in large scale, multi-site, longitudinal studies, with the goal of improving the wellness of healthcare students and providers.

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Fig. 1.

Spectrum of healthcare student and professional distress. We conceptualize a spectrum of workplace stress in healthcare students and professionals. To the left is school and workplace stress, which are pervasive in healthcare. Without the proper support to facilitate coping skills, chronic workplace stress can lead to burnout, which can be distressing in its mildest form and debilitating when severe. In susceptible individuals, chronic workplace stressors can trigger or exacerbate Major Depressive Disorder (MDD) or even intensify suicidal ideations.

Table 1

Summaries of web-based tools and mobile applications organized within 6 categories: relaxation, breathing, mindfulness, meditation, online CBT, and suicide prevention

Resource	Description	Evidence for the General Population	Evidence for Healthcare Providers	Privacy	Ease of use	Free to use	Other features
Relaxation							
Dartmouth	23 guided relaxation audios (various techniques) and soothing music (2–30 minutes). https://www.dartmouth.edu/~healthed/relax/downloads.html			n/a	+ Downloadable	x	
Breathing							
Dr. Weil	3 breathing technique videos (1–3 minutes) http://www.drweil.com/health-wellness/body-mind-spirit/stress-anxiety/breathing-three-exercises/			n/a	+ Short duration + Bullet-point instructions	x	+ Created by a physician
Breathe2 Relax[a,b]	Various guided breathing audio and video tutorials	298,000 app users by July 2013 (2.5 years since its release) [37]		"For statistical purposes, T2 collects anonymous usage data and sends it to a data provider. This feature can be disabled through settings screen at any time."		x	+ Tracking
Breathe Deep	Various guided breathing techniques with timer and visual illustrations			Not provided in the App Store		x	+ Timer + Reminders + Customizable breathing rate
MyCalmBeat	Guided breathing with timer			https://www.mybrainsolutions.com/Pages/PrivacyPolicysIframe.aspx	− May slow phone down (app disclaimer)	x	+ Tracking + Customizable breathing rate
Tactical Breather,[b]	A timer to slow breathing rate	Visualized breathing apps resulted in better perceived effectiveness [38]		"For statistical purposes, T2 collects anonymous usage data and sends it to a data provider. This feature can be disabled through settings screen at any time."	+ Easy to use	x	
Mindfulness Meditation							
UCSD[a]	37 guided meditation audios (6–45 minutes) of various MBSR types https://health.ucsd.edu/specialties/mindfulness/programs/mbsr/Pages/audio.aspx		MBSR: + Reduced burnout and improved mental well-being [39]	n/a		x	

Resource	Description	Evidence for the General Population	Evidence for Healthcare Providers	Privacy	Ease of use	Free to use	Other features
Palouse	8 weekly MBSR modules (50 hours), videos, reading, daily practice (30 minutes), and supplemental materials of various meditation types. http://www.palousemindfulness.com/index.html		MBSR: + Reduced burnout and improved mental well-being [39]	n/a	− Time commitment for daily practices	x	+ Interactive (online community)
Audio Dharma	6 beginner-level and 8-intermediate level meditation modules (1.5-hour) with homework http://www.audiodharma.org/series/1/talk/1762/			n/a	+ Downloadable	x	+ Transcripts
Free Mindfulness	30 guided meditation audios (3–45 minutes) of various meditation types http://www.freemindfulness.org/download			n/a	+ Downloadable	x	
UCLA	8 guided meditation audios (3–19 minutes) http://marc.ucla.edu/body.cfm?id=22			n/a	+ Short duration	x	+ Transcripts
Frantic World	7 guided meditation audios (3–30 minutes) of various meditation types http://franticworld.com/free-meditations-from-mindfulness/			n/a		x	
Headspace[a,b]	10-minute guided meditation audios for various categories (SOS, sleep, work, etc.)	Reduced job strain and depression [28] + Increase positive affect and mental well-being [28]		https://www.headspace.com/privacy-policy	+ Short duration	− Fee to unlock more programs	
Insight Timer	3,683 guided meditations, music tracks and courses, which are frequently updated.			https://www.insighttimer.com/privacypolicy	− Requires registration	x	+ Tracking + Reminders + Timer + Interactive (user network)
ACT Coach	6 ACT-based mindfulness exercises and tools			https://www.ptsd.va.gov/PTSD/public/materials/apps/	+ Easy to use + Practical	x	+ Tracking + Bookmark function + Interactive
3 Minute Mindfulness	3 three-minute guided meditation sessions, 2 seven-day programs (mindfulness, stress management), and various breathing techniques.			http://www.threeminutemindfulness.com/privacy-policy/	+ Short duration	x	
Stop, Breathe & Think	8 categories of guided meditations (3–10 sessions each) with visual illustrations			https://www.stopbreathethink.com/privacy-policy/	− Requires registration	x	+ Tracking

Resource	Description	Evidence for the General Population	Evidence for Healthcare Providers	Privacy	Ease of use	Free to use	Other features
Mindfulness Coach	9 modules (mindful breathing, walking, eating, listening and looking). Originally created for those with PTSD. However, may be still relevant to other groups.			https://www.ptsd.va.gov/PTSD/public/materials/apps/		x	+ Transcripts + Tracking + Reminders
Smiling Mind	Guided meditation app with a focus on classroom and workplace usage			https://www.ptsd.va.gov/PTSD/public/materials/apps/	− Requires registration	− Fee to unlock more programs	+ Tracking
Calm	A guided and unguided meditation app that can be accessed in both the app- and website-format			http://www.calm.com/privacy	+ Many 7-day programs − Requires registration	− Fee to unlock more programs	
Breethe – Guided Meditation	21 single- and 78 serial-guided meditation sessions			https://breethe.com/more/privacy-policy	+ Daily randomized sessions − Requires registration	− Fee to unlock more programs	+ Family sessions + Interactive (user network)
Online CBT							
MoodGYM[a,b,c]	5 CBT modules (30 minutes weekly), quizzes and exercises with visual aids and detailed feedback. Content: thoughts, mood and how to change it, problem-solving and coping methods. https://moodgym.anu.edu.au/welcome		+ Decreased suicidal ideation in medical interns (RR 0.4) [29] + Reduced dysfunctional thinking [41], depression and anxiety at 6 months [42] + Increased self-esteem [42]	https://moodgym.com.au/info/privacy	− Requires registration	x	+ Detailed feedback on pre-assessment + Interactive (sample characters, daily scenarios) − Australia-based resources
*Stress Gym[a,b]	8 CBT modules. Content: stress awareness and management, problem solving, and various wellness topics (coping at work, exercise, nutrition, etc.). http://www.depressiontoolkit.org/stressgym/	+ Decreased stress in Navy officers [40]		http://www.uofmhealth.org/patient-visitor-guide/protecting-your-privacy-hipaa	+ Concise + Self-paced + Downloadable	x	− USA-based resources
BluePages[b]	Informative pages with visual aids and quizzes http://www.bluepages.anu.edu.au	+ Decreased personal stigma and depression at 12 months [41]		https://bluepages.anu.edu.au/index.php?id=privacy&lang=en	+ Easy to use	x	+ Interactive (forum) + Search function − Only encompassed informative pages − Australia-based resources

Resource	Description	Evidence for the General Population	Evidence for Healthcare Providers	Privacy	Ease of use	Free to use	Other features
		+ Decreased alcohol use and depression at 12 months (combined with MoodGYM) [41]					
e-couch[b]	5 CBT/IPT programs with visual aids, quizzes and workbook. Content: depression, anxiety, social anxiety, separation, bereavement. Included information on physical activity and relaxation http://www.ecouch.anu.edu.au	+ Decreased depression directly, 6 and 12 months after intervention (combined with internet support group) [43]		https://ecouch.anu.edu.au/ecouch/info/privacy	− Requires registration	x	+ Interactive (sample characters) − Australia-based statistics
Depression Center	18 CBT modules, workbook and quizzes with feedback http://www.depressioncenter.net/			http://www.depressioncenter.net/Content/CMStaticPage.aspx?pageid=privacypolicy		x	+ Mood tracking + Interactive (online support group, message board, blog, personal goals) + Health educators − The multitude of options may be initially overwhelming
myRay	6 CBT modules, pre-assessment quiz (28 questions), video tutorials http://www.myray.com/content/en/index.cfm			http://www.myray.com/content/en/index.cfm		x	+ Detailed feedback on pre-assessment (coping strategies, recommendations, benefits, proposed timeline for CBT) + Glossary + Interactive − Limited visual aids
MoodTools	Depression assessment, information, and CBT-oriented thought diary. Included links to meditation, relaxation and TED Talks videos.			Not provided in the App Store		x	+ Mood tracking during different activities + Customized safety plan + Validated measure (PHQ-9)
Moving Forward	7 problem-solving tools, assessments, exercises and workbook. Various psycho-educational content.			https://www.ptsd.va.gov/PTSD/public/materials/apps/	+ Easy to use + Practical materials	x	+ Service locators + Interactive

Resource	Description	Evidence for the General Population	Evidence for Healthcare Providers	Privacy	Ease of use	Free to use	Other features
T2 Mood Tracker	Mood tracker app. 6 different areas: general well-being, stress and post-traumatic stress, depression, anxiety and head injury			"For statistical purposes, T2 collects anonymous usage data and sends it to a data provider. This feature can be disabled through settings screen at any time."		x	+ Progress tracking + Reminders + Users can type notes
LifeArmor	Problem-solving tools, video testimonies, and self-assessments. Included various wellness topics (stress, tobacco, resilience, depression, etc.).			"For statistical purposes, T2 collects anonymous usage data and sends it to a data provider. This feature can be disabled through settings screen at any time."	+ Easy to use + Practical materials	x	
Pacifica	CBT-based stress management tools			https://www.thinkpacifica.com/privacy/	− Requires registration − The multitude of options may be initially overwhelming	x	+ Journal entry with daily tracking (sleep, exercise, daily habits, etc.) + Reminders + Customizable + Interactive (user network to share quotes, goals, mindfulness tips, etc.)
CBT Thought Record Diary	CBT-oriented diary where users can record and associate their thoughts with situations, types of cognitive distortion, challenges and outcome.			https://medium.com/@moodtools/thought-diary-privacy-policy-bc37d95c988b	− Limited function (only journal entry)	x	
Suicide Prevention							
Virtual Hope Box[a,b]	Digital alternative to traditional, physical hope box. Included breathing and grounding exercises and information on bereavement, other relevant apps, etc.	+ Improved coping ability with unpleasant thoughts and emotions at 3 and 12 weeks [30]		Not provided in the App Store.		x	+ Interactive and customized (users can upload photos, videos, quotes, and contacts)
Stay Alive[a]	Suicide- and bereavement-related information			Not provided in the App Store.		x	+ A list of UK national support helplines and local services + Interactive and customized (users can upload photos, safety plan, online forum) − UK-based resources
Suicide Safe	A treatment locator app by Substance Abuse and Mental Health Services Administration (USA). Included training resources and case studies. However, might be more suitable for those who want to help a loved one in distress.			https://www.samhsa.gov/privacy.aspx		x	+ Treatment locator

[a] Included in our recommended resource list

[b] Demonstrated significant results in published studies

[c] MoodGym had shown significant decrease in suicidal ideations among medical interns

[+] indicates advantage

[–] indicates disadvantage

Abbreviations: UCSD: University of California San Diego, MBSR: Mindfulness-Based Stress Reduction, CBT: Cognitive Behavioral Therapy, RR: Relative Risk, ACT: Acceptance and Commitment Therapy, IPT: Interpersonal Therapy.