

# BMJ Open Digital health interventions for the management of mental health in people with chronic diseases: a rapid review

Maxime Sasseville ,<sup>1,2,3</sup> Annie LeBlanc ,<sup>3,4</sup> Mylène Boucher,<sup>3</sup> Michèle Dugas,<sup>3</sup> Gisele Mbemba,<sup>3</sup> Jack Tchunte,<sup>3</sup> Maud-Christine Chouinard,<sup>5</sup> Marianne Beaulieu,<sup>2,3</sup> Nicolas Beudet,<sup>6,7</sup> Becky Skidmore,<sup>8</sup> Pascale Cholette,<sup>9</sup> Christine Aspiros,<sup>10</sup> Alain Larouche,<sup>11</sup> Guylaine Chabot,<sup>11</sup> Marie-Pierre Gagnon <sup>2,3</sup>

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For numbered affiliations see end of article.

## Correspondence to

Dr Maxime Sasseville;  
[maxime1\\_sasseville@uqac.ca](mailto:maxime1_sasseville@uqac.ca)

## ABSTRACT

**Objective** Determine the effectiveness of digital mental health interventions for individuals with a concomitant chronic disease.

**Design** We conducted a rapid review of systematic reviews. Two reviewers independently conducted study selection and risk of bias evaluation. A standardised extraction form was used. Data are reported narratively.

**Interventions** We included systematic reviews of digital health interventions aiming to prevent, detect or manage mental health problems in individuals with a pre-existing chronic disease, including chronic mental health illnesses, published in 2010 or after.

**Main outcome measure** Reports on mental health outcomes (eg, anxiety symptoms and depression symptoms).

**Results** We included 35 reviews, totalling 702 primary studies with a total sample of 50 692 participants. We structured the results in four population clusters: (1) chronic diseases, (2) cancer, (3) mental health and (4) children and youth. For populations presenting a chronic disease or cancer, health provider directed digital interventions (eg, web-based consultation, internet cognitive-behavioural therapy) are effective and safe. Further analyses are required in order to provide stronger recommendations regarding relevance for specific population (such as children and youth). Web-based interventions and email were the modes of administration that had the most reports of improvement. Virtual reality, smartphone applications and patient portal had limited reports of improvement.

**Conclusions** Digital technologies could be used to prevent and manage mental health problems in people living with chronic conditions, with consideration for the age group and type of technology used.

## INTRODUCTION

Chronic diseases are the main burden on healthcare systems in developed countries and account for almost 70% of deaths worldwide.<sup>1</sup> An individual with a chronic condition is two to three times more likely to present a concomitant mental health

## Strengths and limitations of this study

- We conducted a rapid review of systematic reviews published in the last 10 years, including a large body of evidence in four clusters of population.
- A panel of knowledge users were involved in each step of the review, from conceptualisation to publication to ensure relevance in clinical context and policy making.
- Study selection and bias evaluation were completed by two independent reviewers and data extraction used a standardised form.
- We limited the search to the most relevant databases and the last 10 years.
- The overlapping of primary studies was not evaluated.

problem than the general population.<sup>2</sup> As the number of physical chronic conditions increase in a population, so do the mental health ones. The co-occurrence of chronic and mental health conditions leads to an increase in total healthcare costs and services utilisation, as well as poorer quality of life and health outcomes for these individuals.<sup>3 4</sup>

The psychosocial consequences of the current COVID-19 pandemic are alarming and will persist long after the pandemic is over.<sup>5</sup> In the current COVID-19 pandemic context, efforts have been invested to rapidly produce scientific evidence in mental health for adapting the clinical setting and supporting policy making (eg, confinement measures). Adapting to telehealth, when in-person consultation is not recommended, requires efficient and relevant digital mental health interventions for the population with concomitant chronic diseases and mental health issues. While a large number of interventions using digital technologies have been

evaluated for the management of depression or anxiety,<sup>6,7</sup> the relevance of these interventions for people living with chronic diseases remains to be defined.

This rapid review of systematic reviews aimed to determine effectiveness of digital mental health interventions aiming to prevent, detect or manage mental health problems in individuals with a pre-existing chronic condition.

## METHODS

We conducted a rapid review following the guidance from the Cochrane Rapid Reviews Methods Group.<sup>8</sup> We report our results based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Statement.<sup>9</sup> The protocol for this rapid review was registered in the National Collaborating Centre for Methods and Tools COVID-19 Rapid Evidence Service (ID 75).

### Knowledge users engagement

We engaged a panel of knowledge users (patients, clinicians and decision makers), content experts, review methodologists and researchers throughout the review process, from question development, literature search, data extraction and analysis, interpretation and writing of results, and dissemination of findings.

### Eligibility criteria

We followed the PICO Framework in establishing eligibility criteria<sup>10</sup> (table 1). We considered any review that included digital health interventions aiming to prevent, detect or manage mental health problems in individuals with a pre-existing chronic disease, including chronic mental health diseases, published in 2010 or after. There was no language restriction.

### Literature search

An experienced medical information specialist developed and tested the search strategies through an iterative process in consultation with the review team and knowledge users. Using the OVID platform, we searched Ovid MEDLINE, including Epub Ahead of Print and In-Process & Other Non-Indexed Citations, Embase Classic+Embase, Cochrane Database of Systematic Reviews, Database of Abstracts of Reviews of Effects and the Health Technology Assessment Database. We also searched CINAHL (EBSCO) and Web of Science. All searches were performed on 11 June 2020. We used a combination of controlled vocabulary (eg, “Chronic Disease”, “Mood Disorders” and “Internet”) and keywords (eg, “cancer”, “anxiety” and “telehealth”) and adjusted vocabulary and syntax across the databases. We applied a systematic review filter to all searches except for the Cochrane databases, where it is not required. Specific details regarding the strategies appear in online supplemental file 1).

### Study selection, data extraction and synthesis

Six reviewers individually performed screening for titles, abstracts and then full text using a standardised form pilot-tested by all reviewers on 25 citations. All citations

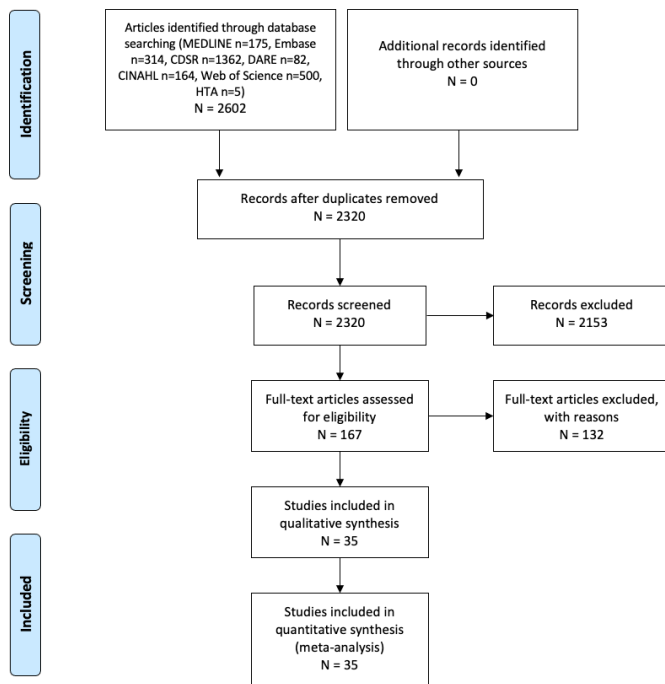
**Table 1** PICO eligibility criteria

Population (P)	Adults with any chronic disease (eg, diabetes, ischaemic heart diseases, cerebrovascular diseases, chronic obstructive pulmonary disease, asthma, hypertension, dyslipidaemia, arthritis/rheumatoid arthritis, chronic pain, cancer, chronic renal disease, inflammatory bowel diseases, mood disorders and attention deficit disorders). We will rely in the authors' definition of chronic disease and presenting, or at risk of presenting, a concomitant mental health problem (eg, mood disorders, depression, anxiety, obsessive compulsive disorder, panic disorder and post-traumatic stress disorder).
Intervention (I)	Digital health technologies, including but not limited to: telemedicine/teleconsultation, patient portal, electronic health record, web-based/internet intervention or smartphone applications.
Comparator (C)	No intervention, usual care and any other (digital or non-digital) intervention.
Outcomes (O)	Prevalence of mental health problems; scores of depression, anxiety or other mental health problem; quality of life; specific clinical indicators (eg, glycated hemoglobin (HbA1c) for diabetes); patient satisfaction; impact on care utilisation (eg, emergency department (ED) visits, hospitalisation and outpatient consultations); and costs (for the individual and the health system).

were reviewed by two reviewers independently at the first level of screening. We developed a standardised extraction form that included study characteristics (eg, authors, country and design), intervention characteristics (eg, type of digital intervention) and outcomes reported. A senior reviewer reviewed all full-text citations for inclusion. Single reviewers extracted data, which were then confirmed by a senior reviewer. We resolved discrepancies through discussion. We report data using a narrative approach that includes tables of study characteristics, intervention characteristics and mental health outcomes.

### Critical appraisal

We used the AMSTAR 2 tool to critically appraise each included review.<sup>11</sup> This revised version of the AMSTAR tool was developed for the evaluation of systematic reviews that include randomised or non-randomised studies of healthcare interventions. This tool has good inter-rater reliability, is widely used for healthcare research and uses a four-level rating of overall confidence. A single reviewer rated the critical appraisal tool and all judgements were verified by a second author.<sup>11</sup>



**Figure 1** PRISMA flow diagram of study inclusion process. PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analyses.

### Patient and public involvement

A panel of knowledge users (patients and clinicians) was involved throughout the research process, from funding acquisition to publication. The panel will also be involved in subsequent dissemination activities.

## RESULTS

### Characteristics of included reviews

Our search strategy identified 2320 individual citation. Following screening of titles and abstracts, we excluded 2153 records. We excluded an additional 132 citations during full-text screening, resulting in a total of 35 citations included in our review (figure 1).<sup>12–46</sup> Of these reviews, there were 17 systematic reviews, 17 systematic reviews with meta-analysis and one integrative review, totalling 702 primary studies with a total sample of 50 692 participants.

Most reviews described digital interventions performed in a specialised care setting (42%) and targeted an adult population (83%). They were looking at interventions to manage and treat a mental health problem (60%), testing web-based and internet interventions (32%) by comparing them with usual care (48%), for people affected with cancer or various chronic diseases (77%). We present the complete description of included reviews in table 2. A presentation of the reviews by technology used is available in additional table 1.

The overall confidence ratings of the AMSTAR 2 tool were mostly high or moderate (31/35) with a limited number of low ratings (4/35) and no critically low rating (table 3). A small percentage of the AMSTAR 2 items

were not reported in the included reviews with the exception of the source of funding of primary studies in the included reviews (0%) (figure 2).

We structured our synthesis according to four population clusters: (1) chronic diseases; (2) cancer; (3) mental health; and (4) children and youth. The mental health outcomes found in the included reviews were mainly depression and anxiety symptoms, assessed through heterogeneous outcomes measures. The results are further presented by type of reporting (quantitative or narrative).

### Chronic diseases cluster

We identified 13 reviews referring to people with various chronic diseases (table 2). Six of the 13 reviews reported their results using pooled difference of score mean.<sup>16 19 23 36 42 43</sup> The majority of the reviews presenting quantitative results reported improvement of depressive symptoms (5/6), but only one identified improvement in anxiety symptoms (1/3). One review reported improvement of general distress.<sup>42</sup> The synthesis with the largest effect size included 108 primary studies with only web-based and internet cognitive-behavioural therapy (CBT) interventions.<sup>23</sup> Most of the reviews that yielded narrative results reported improvement of depressive symptoms (6/7), improvement in anxiety symptoms (6/7) and psychosocial outcomes (1/1). Only one report of inferior effectiveness was identified for both depression and anxiety symptoms.<sup>18</sup> Narrative reports described a small to moderate effect size within group in depression and anxiety symptoms. One integrative review report based on qualitative data described that digital health interventions for people with chronic diseases promoted active acceptance of their disease, improved the awareness of physical manifestations of the disease, helped identify signs and symptoms of worsening and improved management of acute events.<sup>18</sup> The types of digital technology that had the most reports of improvements were web-based interventions, followed by email. Virtual reality and patient portal had no reports of improvements on outcomes when used (table 4).

### Cancer cluster

We identified 14 reviews referring to people with cancer (table 2). Quantitative reporting was present in six reviews.<sup>17 24 25 30 44 46</sup> Four (4/6) of those reported improvements of depressive symptoms, and half showed improvements in anxiety symptoms (3/6). Other quantitative reports of improvements in mental health outcomes included distress and quality of life. The quantitative report with the largest effect size included 20 primary studies, a total sample of 2190 participants, and looked at web-based and teleconsultations CBT interventions.<sup>17</sup> Reviews that yielded narrative results reported improvements of depression symptoms (6/7), anxiety symptoms (5/5), distress (3/3), quality of life (1/1) and mood regulation (1/1). Pooling of the results was impossible in one review due to heterogeneity.<sup>12</sup> The narrative outcome

Table 2 Description of included reviews

Author, year	Review design	No. of primary studies, design	No. of patients (pooled)	Type of chronic diseases	Type of digital technology interventions	Depression outcomes	Anxiety outcomes	Other mental health outcomes
Chronic disease cluster								
Beatty 2013 <sup>14</sup>	SR	24 Experimental	NR	Chronic physical diseases	Web-based/internet intervention, app, email and telemedicine/teleconsultation.	Improvement between groups comparison. Improvement within group (moderate effect size). Improvement sustained at 12-month follow-up. iCBT with and without therapist showed no differences between groups. iCBT showed no difference when compared with group CBT.	Improvement at 3 months and at 12 months.	NR
Charova 2015 <sup>16</sup>	SR with MA	11 Experimental	1348	Any chronic disease with comorbid MH disorder	Web-based/internet intervention.	DW 0.31; 95% CI 0.17 to 0.45; p<0.01.	NR	NR
Clari, 2020 <sup>18</sup>	SR	1 Mixed	84	COPD	Telemedicine/teleconsultation.	No difference between groups.	No difference between groups.	Qualitative data: promoted active acceptance of their disease/improved the awareness of their physical sensations /helped identify signs and symptoms /improvement of the management of acute events.
Eccleston, 2019 <sup>19</sup>	SR with MA	14 Experimental	2012	Chronic pain	Web-based/internet intervention, app and telemedicine/teleconsultation.	SMD=-0.26 (95% CI -0.87 to 0.36).	SMD=-0.48 (95% CI -1.22 to 0.27).	NR
Hedman, 2012 <sup>23</sup>	SR with MA	108 Experimental	NR	Any	Web-based/internet intervention.	MD=-0.94 (95% CI 0.77 to 1.11) large effect size, within groups.	MD=1.12 (95% CI 0.61 to 1.62), large effect size.	NR
McCombie, 2015 <sup>31</sup>	SR	29 Mixed	3935	Chronic physical diseases	Web-based/internet intervention.	Improvement of depression scores (4/8).	Improvement (2/7).	NR
Mehta, 2018 <sup>33</sup>	SR with MA	25 Experimental	3450	Any	Web-based/internet intervention and email.	Improved depression symptoms with small to medium effect size. Therapist-guided iCBT showed larger effect size than self-guided iCBT.	Improved anxiety, similar effect size than usual care.	NR
Mikolasek, 2018 <sup>34</sup>	SR with meta-analysis	17 Experimental	1855	Chronic physical diseases	Web-based/internet intervention.	Active control: 2/7 showed superior effectiveness; 4/7 equal effectiveness; 1/7 inferior effectiveness. Usual care: 1/4 showed superior effectiveness; 3/4 showed equal effectiveness.	Active control: 2/7 showed superior effectiveness; 4/7 equal effectiveness; 1/7 inferior effectiveness. Usual care: 1/4 showed superior effectiveness; 3/4 showed equal effectiveness.	NR
Palacios, 2017 <sup>36</sup>	SR	7 Experimental	1321	Chronic physical diseases	Web-based/internet intervention, app, email and text message.	PHQ-9 score mean from 12 (2 post) to 8.4 (follow-up).	NR	NR
Paul, 2013 <sup>37</sup>	SR	36 Experimental	NR	Any chronic disease with comorbid MH disorder.	Web-based/internet intervention and online chat.	Improved depression in comparison between groups.	Improved anxiety in comparison with control.	Mixed results in psychosocial outcomes.
Toivonen, 2017 <sup>40</sup>	SR	16 Experimental	NR	Any	Web-based/internet intervention, email and online chat.	Improved depression symptoms with a small effect size.	Improved anxiety symptoms with a small effect size.	NR

Continued

Table 2 Continued

Author, year	Review design	No. of primary studies, design	No. of patients (pooled)	Type of chronic diseases	Type of digital technology interventions	Depression outcomes	Anxiety outcomes	Other mental health outcomes
van Beugen, 2014 <sup>42</sup>	SR with MA	23 Experimental	2299	Any	Web-based/internet intervention, app, email, text message and online chat.	SMD=0.21 (95% CI: 0.08 to 0.34).	SMD=0.17 (95% CI 0.01 to 0.32).	General distress: SMD=0.21 (95% CI 0.00 to 0.41).
Vugt, 2018 <sup>43</sup>	SR with MA	46 Experimental	NR	Chronic physical diseases	Web-based/internet intervention, email, text message, online chat and telemedicine/teleconsultation.	SMD=-0.18 (95% CI -0.28 to -0.07). SMD=-0.18 (95% CI -0.28 to -0.07) passive control (post). SMD=-0.29 (95% CI -0.48 to -0.10) passive control (follow-up). SMD=0.14 (95% CI -0.37 to 0.09) active control (post). SMD=0.31 (95% CI: -0.78 to 0.16) active control (follow-up).	NR	NR
<b>Cancer cluster</b>								
Agboola, 2015 <sup>12</sup>	SR	20 Experimental	3789	Cancer	Web-based/internet, app, virtual reality, text message, online chat and telemedicine/teleconsultation.	Heterogeneous studies no pooling possible.	Improvement in anxiety symptoms (3/8).	Improvement in anxiety symptoms NR
Bártolo, 2019 <sup>13</sup>	SR	8 Experimental	1016	Cancer	Web-based/internet, patient portal, app, email and telemedicine/teleconsultation.	Improvement in depression symptoms 3 weeks postinterventions. Small effect size. The telephone intervention yielded medium effect size improvement.	NR	Improvement in global distress, small effect size.
Bourma, 2015 <sup>15</sup>	SR	16 Experimental	2620	Cancer	Web-based/internet intervention.	Improvement on depression symptoms (1/7) (between groups).	Improvement in anxiety symptoms (2/10).	Improvement on quality of life (3/11).
Chen, 2018 <sup>17</sup>	SR with MA	20 Experimental	2190	Cancer	Web-based/internet intervention and telemedicine/teleconsultation.	SMD=-1.29 (95% CI 2.28 to 0.30).	SMD=0.09 (95% CI 0.22 to 0.04).	Distress: SMD = ¼ 0.25, (95% CI 0.40 to 0.10, p<0.001).
Forbes, 2019 <sup>21</sup>	SR	16 Experimental	2446	Cancer	Web-based/internet intervention, email and online chat.	Improvement of depression score within group. Better improvement with CBT compared with online forum.	NR	Psychological distress: effect size larger with ICBT compared with forum.
Fridriksdottir, 2017 <sup>22</sup>	SR	20 Experimental	NR	Cancer	Web-based/internet intervention and email.	Improvement in depression symptoms (2/10).	Improvement in anxiety symptoms (4/10).	Improvement on psychological distress (3/8).
Kim, 2015 <sup>24</sup>	SR with MA	37 Experimental	NR	Cancer	Web-based/internet intervention, email, text message, online chat and telemedicine/teleconsultation.	Hedges' g=-0.169 (-0.282 to -0.055).	Hedges' g=-0.293 (-0.465 to -0.122).	QOL: Hedges' g=-0.221 (-0.359 to -0.084).
Kim, 2017 <sup>25</sup>	SR with MA	19 Mixed	2381	Cancer	Web-based/internet intervention and telemedicine/teleconsultation.	d=-0.07, p=0.284 (post). d=-0.2, p=0.477 (follow-up).	d=-0.2, p=0.132.	NR
Lin, 2020 <sup>27</sup>	Mixed	16 Mixed	1053	Cancer	Web-based/internet intervention, app, email and text message.	Improvement of depression scores (5/11).	Improvement of anxiety scores (5/11).	Improvement of anxiety scores NR
McCaughan, 2017 <sup>30</sup>	SR	6 Experimental	492	Cancer	Web-based/internet intervention, patient portal, email and online chat.	SMD=-0.37 (95% CI -0.775 to 0.00).	Mean 0.4 lower at end of intervention (95% CI 6.42 lower to 5.62 higher). MD=-0.40 (95% CI -6.42 to 5.62); low-quality evidence between groups.	NR
Qan'ir, 2019 <sup>38</sup>	SR with MA	10 Experimental	1124	Cancer	Web-based/internet intervention, app and online chat.	Improvement of depression score (between group) (2/7). Improvement of depression score (within group)(1/7).	Improvement of anxiety score (between group) (1/5). Improvement of anxiety score (within group) (1/5).	NR

Continued

Table 2 Continued

Author, year	Review design	No. of primary studies, design	No. of patients (pooled)	Type of chronic diseases	Type of digital technology interventions	Depression outcomes	Anxiety outcomes	Other mental health outcomes
Ugalde, 2015 <sup>41</sup>	SR	4 Experimental	NR	Cancer	Web-based/internet intervention.	NR	NR	Improved self-efficacy for regulating negative mood.
Wang, 2020 <sup>44</sup>	SR with MA	7 Experimental	1220	Cancer	Web-based/internet intervention, app and email.	SMD=-0.58, 95% CI (-1.12 to -0.03), p=0.04 (between groups).	SMD=-1.03 (95% CI -2.63 to 0.57) (between groups).	NR
Zeng, 2019 <sup>46</sup>	SR with MA	6 Mixed	NR	Cancer	Virtual reality.	WMD=-1.11 (Z-scores=1.05, p=0.29).	SMD=-3.03 (95% CI=-6.20 to 0.15).	NR
Youth and children cluster								
Fisher, 2019 <sup>20</sup>	SR with MA	10 Mixed	697	Chronic pain	Web-based/internet intervention and app.	SMD 0.04 (95% CI -0.18 to 0.26).	SMD 0.53 (95% CI -0.63 to 1.69).	NR
Lopez-Rodriguez, 2020 <sup>28</sup>	SR	8 Mixed	286	Cancer	App and virtual reality.	Improved depression (3/3).	Improved anxiety (2/3).	NR
McGar, 2019 <sup>32</sup>	SR	22 Experimental	1764	Chronic physical diseases	Web-based/internet intervention.	Improved depression symptoms (3/7).	Improved anxiety (4/5) (post).	Improved PTSD symptoms (2/3) (post).
Tang, 2018 <sup>39</sup>	SR with MA	4 Experimental	404	Chronic pain	Web-based/internet intervention.	MD=-0.23 (95% CI 0.03 to 0.43) (within group). MD=-0.02 (95% CI 0.19 to 0.22) (between group) SMD=0.02 (95% CI 0.19 to 0.22, p=0.86) (follow-up).	SMD=-3.24 (95% CI 1.88 to 4.61) (within group). SMD=0.41 (95% CI 1.79 to 0.98) (between group).	NR
Mental health cluster								
Lewis, 2018 <sup>26</sup>	SR with MA	10 Experimental	720	PTSD	Web-based/internet intervention.	SMD=-0.61 (95% CI -1.17 to -0.05) (between groups/post). MD=-8.95, 95% CI -15.57 to -2.33 (between groups/follow-up).	SMD=-0.67 (95% CI -0.98 to -0.36)(between groups/post). MD=-12.59 (95% CI -20.74 to -4.44)(between groups/follow-up).	PTSD SMD=-0.60 (95% CI -0.97 to -0.24) (between groups/post). RR=0.53 (95% CI 0.28 to 1.00) (between groups/post).
Mayo-Wilson, 2013 <sup>29</sup>	SR with MA	43 Experimental	8403	Anxiety	Web-based/internet intervention, email, text message and telemedicine/teleconsultation.	NR	SMD=0.79 (95% CI 0.62 to 0.96) (internet delivered).	NR
Olthuis, 2016 <sup>35</sup>	SR with MA	38 Experimental	3214	Anxiety	Web-based/internet intervention, app, email, and rline chat.	NR	*RR=3.75 (95% CI 2.51 to 5.60) (generalised anxiety). SMD=-1.06 (95% CI -1.29 to -0.8) (disorder specific anxiety).	NR
Wickersham, 2019 <sup>45</sup>	SR	5 Experimental	653	PTSD	App	NR	NR	No improvement in PTSD between groups when compared with usual care.

CBT, cognitive-behavioural therapy; COPD, chronic obstructive pulmonary disease; dw, Cohen's effect size; ICBT, internet-based cognitive behavior therapy; MA, meta-analysis; MH, mental health; NR, not reported; PHQ-9, Patient Health Questionnaire; PTSD, post-traumatic stress disorder; QOL, quality of life; RR, risk ratio; SMD, standardized mean difference; SR, systematic review; WMD, weighted mean difference.

**Table 3** Critical appraisal of the included reviews

	1. Question and inclusion	2. Protocol design	3. Study design	4. Comprehensive search	5. Study selection	6. Data extraction	7. Excluded studies justify	8. Included studies details	9. Risk of bias (RoB)	10. Sources of funding	11. Statistical methods	12. Meta-analysis RoB	13. Individual studies RoB	14. Heterogeneity explanation	15. Publication bias	16. Conflict of interest	Overall confidence rating
Agboola 2015 <sup>12</sup>	N	PY	Y	PY	Y	Y	Y	PY	Y	N	N/A	N/A	Y	N/A	Y	Low	
Bartolo 2019	Y	Y	Y	Y	Y	Y	Y	Y	PY	N	N/A	N/A	Y	Y	N/A	Y	Moderate
Beatty 2012	Y	PY	Y	Y	Y	Y	Y	Y	Y	N	N/A	N/A	Y	N/A	N	Moderate	
Bouma 2019	Y	PY	Y	Y	Y	Y	Y	Y	Y	N	N/A	N/A	Y	N/A	Y	Moderate	
Charova 2015 <sup>16</sup>	Y	Y	Y	Y	Y	Y	Y	Y	PY	N	Y	Y	Y	Y	Y	Moderate	
Chen 2018 <sup>17</sup>	Y	PY	Y	Y	Y	Y	Y	Y	PY	N	Y	Y	Y	Y	Y	Moderate	
Chen 2020 <sup>18</sup>	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N/A	N/A	Y	N/A	Y	Moderate	
Clari 2020 <sup>18</sup>	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	High	
Eccleston 2019 <sup>18</sup>	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	High	
Fisher 2019 <sup>20</sup>	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	High	
Forbes 2019 <sup>21</sup>	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N/A	N/A	Y	N/A	Y	High	
Fridrikdotir 2017	Y	PY	Y	Y	Y	Y	Y	Y	Y	N	N/A	N/A	Y	N/A	Y	Moderate	
Hedman 2012 <sup>23</sup>	Y	N	Y	Y	Y	Y	Y	Y	PY	N	Y	Y	Y	Y	Y	Low	
Kim 2015 <sup>24</sup>	Y	PY	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Moderate	
Kim 2017 <sup>25</sup>	Y	PY	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	N	Moderate	
Lewis 2018 <sup>26</sup>	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	High	
Lin 2020 <sup>27</sup>	Y	PY	Y	Y	Y	Y	Y	Y	Y	N	N/A	N/A	Y	N/A	Y	Moderate	
Lopez-Rodriguez 2020 <sup>28</sup>	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N/A	N/A	Y	Y	Y	High	
Mayo-Wilson 2013 <sup>29</sup>	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	High	
McCaughan 2017 <sup>30</sup>	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	High	
McCombie 2015 <sup>31</sup>	Y	N	Y	Y	Y	Y	Y	Y	Y	N	N/A	N/A	Y	N/A	Y	Low	
McGar 2019 <sup>32</sup>	Y	PY	Y	Y	Y	Y	Y	Y	PY	N	N/A	N/A	Y	N/A	Y	Moderate	
Mehta 2019 <sup>33</sup>	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Moderate	
Mikolasek 2018 <sup>34</sup>	Y	PY	Y	Y	Y	Y	Y	Y	Y	N	N/A	N/A	Y	N/A	Y	Moderate	
Oltuis 2016 <sup>35</sup>	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Moderate	
Palacios 2017 <sup>36</sup>	Y	PY	Y	Y	Y	Y	Y	Y	Y	N	N/A	N/A	Y	N/A	Y	Moderate	
Paul 2013 <sup>37</sup>	Y	PY	Y	Y	N/A	N/A	Y	Y	PY	N	N/A	N/A	Y	N/A	Y	Moderate	
Qan'ir 2019 <sup>38</sup>	Y	PY	Y	Y	Y	Y	Y	Y	Y	N	N/A	N/A	Y	N/A	Y	Moderate	
Tang 2018 <sup>39</sup>	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	High	
Toivonen 2017 <sup>40</sup>	Y	N	Y	Y	Y	Y	Y	Y	Y	N	N/A	N/A	Y	N/A	Y	Low	
Ugalde 2017	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N/A	N/A	Y	N/A	Y	High	
van Beugen 2014 <sup>42</sup>	Y	PY	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Moderate	
Vaughts 2018 <sup>43</sup>	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	High	

Continued



Table 3 Continued

	1. Question and inclusion	2. Protocol	3. Study design	4. Comprehensive search	5. Study selection	6. Data extraction	7. Excluded studies justify	8. Included studies details	9. Risk of bias (RoB)	10. Sources of funding	11. Statistical methods	12. Meta-analysis RoB	13. Individual studies RoB	14. Heterogeneity explanation	15. Publication bias	16. Conflict of interest	Overall confidence rating
Wang 2020 <sup>44</sup>	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	High
Wickersham 2019 <sup>45</sup>	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N/A	N/A	Y	Y	N/A	Y	High
Zeng 2019 <sup>46</sup>	Y	PY	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Moderate

NA, not applicable; N, no; P,Y, partial/yes; Y, Yes.



Figure 2 Overall critical appraisal of the included studies using the AMSTAR 2 tool.

reports described a small effect size within group for depression and anxiety symptoms.<sup>21</sup> The types of digital intervention that had the most reports of improvements were web-based interventions and email. Virtual reality had no reports of improvements (table 4)

**Children and youth cluster**

We identified four reviews related to digital health interventions targeting children and youth (table 2). Two reviews reported a quantitative synthesis presenting mixed effects: one showing within group improvements in depression and anxiety and both showing no between group difference on these outcomes.<sup>20 39</sup> As for narrative syntheses, both reported improvements on depression and anxiety, with one of the reviews reporting on post-traumatic stress disorder (PTSD) symptoms improvement.<sup>28 32</sup> The limited reports on improvement for this population was associated with the used of web-based interventions (3/4), smartphone applications (2/4) and virtual reality (1/4) (table 4).

**Mental health cluster**

We identified four reviews related to population with mental health conditions (table 2). The quantitative reports showed improvements in anxiety symptoms for generalised anxiety disorder and disease-specific anxiety (3/3), improvements of depression symptoms (1/1) and PTSD symptoms (1/1). The only narrative report for that cluster showed no improvement on PTSD symptoms between groups.<sup>45</sup> The types of digital technology that had the most reports of improvement were web-based interventions (3/4) and email (2/4) with unique reports for smart phone applications, text messages and online chat (table 4).

**DISCUSSION**

We conducted a rapid review of systematic reviews to identify digital health interventions effective to prevent, detect or manage mental health problems in individuals with a pre-existing chronic disease. In total, 35 reviews were included.

Our findings are in line with the extensive evidence that internet CBT interventions are effective and comparable to face-to-face interventions.<sup>47</sup> Our analysis adds to



**Table 4** Studies reporting improvements classified by the type of digital technology used

	Chronic diseases cluster			Cancer cluster			Children and youth cluster			Mental health cluster		
	Depression	Anxiety	Other	Depression	Anxiety	Other	Depression	Anxiety	Other	Depression	Anxiety	Other
Web-based interventions	23 42 43 16 36 31 14 40 33 34 37	23 31 14 40 33 34 37	37	17 44 24 21 13	17 30 44 24	24 17 21 41 13 20 39	20 39 32	20 39 32	32	26	29 35 26	26
Patient portal		30										
Smartphone application	42 36 14	14	44	44	44	20 28	20 28	20 28			35	
Virtual reality						28	28	28				
Email	42 43 36 14 40 33	14 40 33		44 24 21 13	30 44 24	21 24 13					29 35	
Text message	42 43 36			24	24	24					29	
Online chat	42 43 40 37	40 37	37	24 21	30 24	21 24					35	
Telemedicine/teleconsultation	42 14	14		17 24 13	17 24	24 17 13					29	

the body of evidence on effectiveness regarding concomitant chronic diseases in four clusters of population. For people with various chronic diseases, most of the included reviews showed that digital health interventions have a positive effect on depression, anxiety, distress and psychosocial outcomes. The data showed that interventions have a moderate effect size within the intervention group and a small effect size when compared with usual care. For the cluster of population affected by cancer (including survival), evidence already exists regarding the effectiveness of digital mental health interventions with positive to mixed effect.<sup>48</sup> Our data also showed that digital health interventions are effective in improving depression, anxiety, distress, quality of life and mood regulation. Also, teleconsultation and web-based interventions were the most effective modes of delivery for this population. Regarding the paediatric population, a meta-review targeting digital mental health interventions for children and youth reported a positive effect for the use of web-based CBT but only in children and youth with anxiety and depression with no other concomitant conditions.<sup>49</sup> Quantitative data were inconclusive regarding effectiveness and effect size within group but showed a non-inferiority when compared with usual care. All included reviews in this population combined smartphone applications and web-based interventions, making it difficult to draw any conclusion about the most effective mode of delivery for the intervention at this level of analysis. For the mental health population, the included reviews emphasised that digital health interventions are effective for individuals with a combination of physical and mental conditions, as well as for people with multiple mental health problems.

Available evidence suggests that digital health interventions such as web-based CBT, email messaging and teleconsultation could be effective and provide an alternative to face-to-face psychological interventions to prevent and manage mental health problems in people affected by cancer or other chronic diseases. In line with our findings, Torous *et al*<sup>50</sup> described that offering health provider-directed synchronous digital health solutions such as teleconsultation is the first step to increase access to quality mental healthcare in the midst of the COVID-19 pandemic. Many of these innovations support the care of people in need of special attention, including those with chronic illnesses. Due to smaller effect size, we were not able to draw any conclusion related to the other forms of digital health interventions such as online chat, text message and smartphone applications. These types of digital health interventions are asynchronous; they may improve access and promote low-threshold alternatives to mental health consultations within the healthcare system. However, more evidence regarding implementation and evaluation to be safe for patients would be required.<sup>50</sup> Included reviews that looked at other intervention delivery methods reported smaller to no effect, but it could be related to heterogeneity of the data. Even with reports of effectiveness, there is still a lack of evidence of economic data to perform a proper cost analysis of digital health interventions.<sup>51 52</sup>



This review was rapidly performed to inform knowledge users in a timely matter. In line with recommendations for rapid reviews,<sup>53</sup> methods that would lead to a systematic review were not followed as strictly to allow for a faster methodology. We limited the scope of the search to the aim of the study by looking at limited databases and imposing a period of publication. These methodological choices resulted in the ability to perform an appropriate and structured study selection, data extraction and critical appraisal.

This rapid review of reviews has limitations. In order to respect the requirements of this urgent strategic call in response to the COVID-19 pandemic and provide stakeholders and decision makers with up-to-date evidence, we limited the search to the most relevant databases and the last 10 years. Despite our best efforts, we may have missed some publications. Moreover, we did not assess the overlapping of primary studies in the included reviews. While we rigorously followed guidance for the conduct of rapid reviews, results from this study should be interpreted with caution. Further analyses will be required for stronger recommendations, notably by considering the potential publication bias, as well as other factors that could decrease the level of confidence in the reported effects.

Future research on digital mental health interventions should provide economic data to give a broader insight for possible implementation. Research on digital mental health interventions could also further assess the safety and limitations of asynchronous and self-administered technologies. Finally, efforts should be put on developing a structured method to report what kind of technology (eg, internet based and smartphone app) and function (eg, communication, intervention and evaluation) were used in the intervention. A structured method of reporting would improve the evidence precision and knowledge implementation.

## CONCLUSION

This rapid review outlines the current evidence regarding the use of digital health interventions for people with a concomitant chronic disease. For individuals with a chronic disease or cancer, health provider directed digital interventions (eg, teleconsultation) are effective and safe. However, further analyses of this large body of evidence are required in order to provide precise recommendations regarding relevance for specific populations (such as children and youth), modes of delivery and type of intervention. In response to the current crisis, but also to better prepare for the post-crisis and future crises, digital technologies could be used to prevent and manage mental health problems in people living with chronic conditions, with consideration for the age group and type of technology used.

### Author affiliations

<sup>1</sup>Department of Health Sciences, Université du Québec à Chicoutimi, Chicoutimi, Québec, Canada

<sup>2</sup>Nursing Faculty, Université Laval, Québec, Québec, Canada

<sup>3</sup>VITAM Research Center on Sustainable Health, Québec, Québec, Canada

<sup>4</sup>Family medicine and emergency medicine, Université Laval, Québec, Québec, Canada

<sup>5</sup>Nursing Faculty, Université de Montréal, Montreal, Québec, Canada

<sup>6</sup>Omnimed, Québec, Québec, Canada

<sup>7</sup>Department of Anesthesiology, Université de Sherbrooke, Sherbrooke, Québec, Canada

<sup>8</sup>Independent information specialist, Ottawa, Ontario, Canada

<sup>9</sup>Centre intégré universitaire de santé et de services sociaux de la Capitale-Nationale du Québec, Québec, Québec, Canada

<sup>10</sup>Patient partner, Québec, Québec, Canada

<sup>11</sup>Groupe Santé Concerto, Montréal, Québec, Canada

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### ORCID iDs

Maxime Sasseville <http://orcid.org/0000-0003-1694-1414>

Annie LeBlanc <http://orcid.org/0000-0002-5377-8102>

Marie-Pierre Gagnon <http://orcid.org/0000-0002-0782-5457>

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