PROTOCOL
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E-health interventions for drug overdose monitoring and prevention: A scoping review
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Rationale for review

In 2020, it was estimated that 136 million people used illicit drugs in the past year (not including cannabis; United Nations, 2022b), with approximately 61 million people reporting opioid use, 34 million people reporting amphetamines use, 20 million people reporting ecstasy use, and 21 million people reporting cocaine use worldwide in the past year (United Nations, 2022a). Overdose deaths remain a significant health concern worldwide, with opioid use accounting for 77% of all deaths attributed to drug use and 23% of deaths attributed to other illicit substances such as amphetamine-type stimulants and cocaine-type substances (United Nations, 2022b). In North America, overdose levels reached epidemic levels during the COVID-19 pandemic (United Nations, 2022a). Global policy-makers have recommended that countries should invest in novel ways to prevent overdose fatalities (United Nations, 2022a).

While in-person overdose prevention, including supervised consumption services (SCSs), are impactful at reducing overdoses and transmission of disease (Kennedy et al., 2017), these services may be inaccessible due to geographic location, limited hours, and under-utilized due to stigma (Bristowe et al., 2021; Dong et al., 2020; Government of Alberta, 2020; Potier et al., 2014). For example, one study showed that physical SCSs reduced mortality by 30.7% within 500 meters of SCSs, but appeared less impactful at reducing overdoses that occurred at distances greater than 500 meters (B. D. Marshall et al., 2011). Nevertheless, in-person SCSs are impactful at reducing overdoses and are supported by evidence; however, further overdoses may be prevented especially among people facing stigma, those residing in rural locations or locations beyond 500m of existing SCSs by increasing availability of remote overdose monitoring and prevention.

Novel methods including e-health and web-based services might be an impactful way to monitor and mitigate risk of deaths from overdoses and accidental poisonings. In recent years, there has been an increased interest in e-health and web-based tools to prevent, assess, and treat addiction and mental health concerns (Ferreri et al., 2018; Segawa et al., 2020). E-health and web-based tools have the potential to address some of the barriers from accessing harm reduction services faced by people who use drugs (PWUD). E-health interventions are defined as the "*combined use of electronic communication and information technology in the health sector. This includes telehealth (health mediated by telecommunications tools: telemedicine, telemonitoring and mobile health/ mhealth) and robotics (techniques using automatic machines or robots, including machine learning*." (p.3, Ferreri et al., 2018). E-health interventions and web-based interventions have the potential to remove geographical barriers, reduce stigma associated with attending in-person services, and are more cost effective than in-person interventions (Bandawar et al., 2018). Further, in one recent study, nearly 70% of PWUD indicated that they would be interested in using mobile applications for overdose monitoring and prevention, suggesting that mobile applications may be a feasible solution for overdose prevention

(Tsang et al., 2021). In a similar study, more than 75% of PWUD who had a history of opioid use disorder, reported that they would be willing to wear a device that could automatically sense an overdose and administer a reversal agent (Kanter et al., 2021). Thus, PWUD may be interested in using technology designed for overdose monitoring and prevention.

While most existing e-health and web-based interventions are designed to address risk behaviors, reduce substance use, or treat substance use disorder, some people who use drugs (PWUD) may not be ready to reduce or abstain from substance use but may benefit from services designed to reduce harm associated with using substances. Unfortunately, harm reduction services for PWUD are vastly under-studied, for example, only 3% of all studies included in a recent review of psychosocial interventions used to treat opioid use disorders were classified as harm reduction interventions (Wild et al., 2021). Harm reduction interventions that utilize digital health tools may promote safer drug use and reduce the occurrence of overdose (Perri et al., 2021). Some existing e-health tools aim to educate about high-risk behaviors for preventing overdoses (e.g., Carrà et al., 2017). These harm reduction e-health tools are shown to increase knowledge of risk factors and intentions to reduce opioid use (e.g., Carrà et al., 2017); however, it is unclear whether these e-health tools would be effective at preventing overdoses and mortality among people who use illicit substances. Alternatively, other e-health technologies are currently being developed across North America to remotely monitor and provide help in the case of a suspected overdose (*Brave Technology Cooperative*, 2019; Bristowe et al., 2021; Marshall et al., 2022). These types of e-health tools provide immediate action by monitoring illicit substance use at the time of administration and dispatching emergency services if an overdose is suspected.

A recent review examined digital interventions to prevent opioid-related overdose deaths during the COVID-19 pandemic and suggested that digital harm interventions could prevent overdose deaths (Donnell et al., 2022). Unfortunately, the Donnell et al. (2022) review only examined e-health interventions for opioid use, only examined interventions in Canada and Australia, only included a 5 year search (2016-2021), and narrowly focused on telehealth/telemedicine. Therefore, we will complete a scoping review to examine e-health and web based interventions designed to prevent and monitor overdose deaths resulting from any illicit substance (e.g., not only opioids), review literature from any country (that is published in English), and examine a more broad definition of e-health/web-based interventions. In this review, we will identify e-health and web-based interventions that are designed to monitor and prevent overdoses from occurring among PWUDs. We are completing a scoping review because evaluations around novel interventions are required to address the worsening overdose crisis (e.g., United Nations, 2022a), this area is an emerging area of research with no known randomized trials, and substantial heterogeneity among various novel interventions precluding a systematic review and meta analysis at this time.

Objective

1) To identify and describe the peer-reviewed literature around e-health interventions designed to monitor unregulated substance use and/or prevent harms associated with substance overdose/poisoning for individuals of any age.

Methods
Design
A scoping review will be conducted following PRISMA-SCR guidelines (Tricco et al., 2018) and will be pre-registered on the Open Science Framework (OSF; https://osf.io/).

Information sources
With the assistance of an experienced health sciences librarian, we will search the following databases from inception to present: Medline, EMBASE, PsycINFO, and Global Health, via OVID; CINAHL via EBOSCOhost; Scopus via Elsevier; and the Cochrane Library via Wiley. The search terms will be derived from two main concepts: 1) Drug overdose; 2) ehealth, including telemedicine, various forms of virtual or online interactions and modalities for facilitating those interactions (for example, video conferencing software and social media). Reference lists of relevant systematic/scoping reviews and included studies will be searched to ensure comprehensiveness. A preliminary search was conducted in July 2022 using OVID Medline to determine the feasibility of the review overall and test the scope of the search (see Appendix A for full search strategy). The first 100 articles were reviewed by AL to ensure that search strategy was appropriate for the proposed research aims. All articles found by the search will be uploaded in the Covidence Systematic Review data management software to be screened for inclusion or exclusion (*Covidence Systematic Review Software*, 2022).

Eligibility criteria
Study inclusion and exclusion criteria will be categorized according to i. Population, ii. intervention, iii. control group, iv. outcomes, and v. study design.

 i. Population - People who use illicit drugs other than cannabis (Tsang et al., 2021). People of any age will be included because a person of any age may freely access e-health or web-based interventions.

Inclusion: People of any age who report using unregulated drugs (e.g., cocaine, heroin, methamphetamine).
Exclusion: People who only use cannabis and/or alcohol, but not other drugs.

ii. Intervention - Any e-health or web-based intervention that includes an element of overdose monitoring and/or prevention will be eligible. E-health interventions will be defined as the "*combined use of electronic communication and information technology in the health sector. This includes telehealth (health mediated by telecommunications tools: telemedicine, telemonitoring and mobile health/ mhealth) and robotics (techniques using automatic machines or robots, including machine learning.*" (p.3, Ferreri et al., 2018). We will also include web-based interventions that may not otherwise be included in the definition of e-health interventions.

Inclusion: Intervention: any e-health or web-based intervention (as defined above) with the primary aim of providing drug overdose monitoring, response and/or prevention services using a harm reduction framework.

Exclusion: Interventions that encourage or require patient/client abstinence will not be included. Addiction treatment/recovery services (i.e., abstinence-based recovery services) that do not include an element of overdose monitoring or prevention will also be excluded from this review.

iii. Control group - Studies with or without control or comparison groups are eligible for inclusion. Inclusion/exclusion criteria: Not applicable.

iv. Outcomes - Quantitative and qualitative outcomes related to substance use, overdose, poisonings, and/or e-health/web-based intervention use/usability (i.e., willingness to engage with or access e-health or web-based interventions).
Inclusion - Studies that report quantitative and/or qualitative outcomes (e.g., narratives, themes) on substance use, overdose, poisonings, or intervention use (e.g., usability, feasibility, participant willinging to engage with or access intervention services).
Exclusion - Studies that do not report any outcomes or report outcomes that are not specified in the inclusion criteria.

v. Study design - Only peer-reviewed primary studies of any study design published in English.
Exclusion - Non peer-reviewed studies including research protocols, conference proceedings, abstracts, thesis dissertations, and poster presentation will not be included. Reviews will not be included in this scoping review.

Data extraction plan

After piloting the search (described under the heading Information Sources), two reviewers will independently screen titles and abstracts using Covidence Systematic Review software (*Covidence Systematic Review Software*, 2022). Disagreements will be resolved by a third reviewer. Data will be extracted from papers that make it to the full-text assessment. Two reviewers will extract data independently and disagreements will be resolved by discussion or third reviewer if arbitration is required. The following data will be extracted from peer-reviewed literature.

1) Bibliographic characteristics
    a) Author
    b) Year of publication
    c) Country
    d) Study title

2) Methodological characteristics
    a) Study objective/aim
    b) Study design (e.g., RCT, NRCT)
    c) Study setting
    d) Inclusion criteria

  e) Description of intervention (manuscript text, including type of e-health intervention(mobile, web-based etc)

  f) Primary outcomes (list) and how outcomes were measured

3) Participant characteristics
  a) Sample size (n)
  b) N (%) Participants who completed the study (n)
  c) N (%) participants who dropped out
  d) Mean Age (range, mean, SD, years)
  e) Age classification (children < 15, youth 15-18, adults 18+)
  f) Gender identity and/or biological sex (depending on what is reported in the manuscript)
  g) Types of substance use, how substance use was screened or diagnosed, and percentages of participants who used

4) Main findings - Results - outcomes
  a) Summary text of main findings (related to the identified aim)
  b) Any adverse events reported
  c) Author's limitations
  d) Author's Conclusions

Data charting plan

We will report a summary of the key study characteristics including bibliographic data (author, country), setting, aim, participant population (adults, youth, children), methodology, intervention type, primary outcome, and main findings.

Data synthesis plan

Narrative synthesis is planned to describe the studies according to intervention type and the population (by age, gender, substance use) that might benefit most from each intervention. In addition, we will report how much variety/ homogeneity there is among the interventions, and what study designs/methods have been conducted.

Risk of bias assessments

Risk of bias among individual studies will not be assessed as this process is outside the scope of our review.

Significance

We will identify key literature gaps in knowledge around e-health interventions for overdose monitoring and prevention, which will be used to guide future systematic reviews and/or meta-analyses and will be used to guide an ongoing Delphi study and inform the development of future Canadian clinical practice guidelines.

Ethics

Ethics approval will not be required to conduct a secondary analysis of published literature.

Trial search (completed July 12th)

Ovid MEDLINE(R) ALL <1946 to July 13, 2022>

1   exp Drug Overdose/   13804
2   (overdose* or over-dose* or overdosing).mp.   30329
3   1 or 2   30329
4   Telemedicine/   34227
5   Remote Consultation/   5563
6   ((virtual* or web* or online* or internet* or digital* or computer* or technolog* or video* or distance) adj4 (intervention* or practice* or program* or clinic* or setting* or care or health* or treatment* or prescription* or "follow* up" or monitor* or surveillance or communicat* or collaborat* or presence or screen or doctor* or nurs* or therap* or psycholog* or deliver*)).mp.   265479
7   (Ehealth or e-health or mhealth or m-health or "mobile health").mp.   23604
8   (Telemedicine or tele-medicine or telehealth or tele-health or telemedication or tele-medication or cyberthera* or telecare or telecollaborat* or teleconsult* or teleguide* or telediagnos* or telemonitor* or telescreen* or teletherap*).mp. 54989
9   electronic mail/ or telephone/ or exp cell phone/ or videoconferencing/ 37866
10   ("Smart phone*" or "cell phone*" or "cellphone* mobile app*" or iphone* or iPad or samsung or "google play" or itunes or telephone or phone* or "text messag*" or imessag* or SMS or texting or email or e-mail or "smart technology" or computer? or laptop*).mp.   961367
11   ((Facetime or "video conferenc*" or Zoom* or "google meet" or GMeet WebEx or Epic or InTouch or "Doximity Dialer" or WeChat or Skype or teleconferenc* or tele-conferenc* or audiovisual* or "video link*" or (remote* or virtual* or web* or video* or online* or internet* or cyber or tele or distance)) adj3 (consult* or meet* or conferenc* or appointment* or session* or visit* or counsel* or therap* or chat* or support*)).mp.   36268
12   Social Media/   13799
13   ("Social media" or facebook or instagram or twitter or "tik tok" or snapchat or WhatsApp).mp. 31513
14   or/4-13 1214731
15   3 and 14   1063

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