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CADTH Reference List

Remote Substance-Monitoring Devices and Mobile Applications for Substance Use Disorders

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Summary of Abstracts

CADTH

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About CADTH: CADTH is an independent, not-for-profit organization responsible for providing Canada's health care decision-makers with objective evidence to help make informed decisions about the optimal use of drugs, medical devices, diagnostics, and procedures in our health care system.

Funding: CADTH receives funding from Canada's federal, provincial, and territorial governments, with the exception of Quebec.

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Key Messages

- One health technology assessment and 3 randomized controlled trials were identified regarding the clinical effectiveness of remote substance-monitoring devices and mobile applications for the treatment of substance use disorders.
- No evidence was found regarding the cost-effectiveness of remote substance-monitoring devices and mobile applications for the treatment of substance use disorders.
- No evidence-based guidelines were identified regarding the use of remote substance-monitoring devices and mobile applications for the treatment of substance use disorders.

Research Questions

1. What is the clinical effectiveness of remote substance-monitoring devices and mobile applications for the treatment of substance use disorders?
2. What is the cost-effectiveness of remote substance-monitoring devices and mobile applications for the treatment of substance use disorders?
3. What are the evidence-based guidelines regarding the use of remote substance-monitoring devices and mobile applications for the treatment of substance use disorders?

Methods

Literature Search Methods

A limited literature search was conducted by an information specialist on key resources including MEDLINE, PsycINFO, the Cochrane Database of Systematic Reviews, the international HTA database, the websites of Canadian and major international health technology agencies, as well as a focused internet search. The search strategy comprised both controlled vocabulary, such as the National Library of Medicine's MeSH (Medical Subject Headings), and keywords. The main search concepts were substance use disorder, remote monitoring, and mobile applications. No filters were applied to limit retrieval by study type. Where possible, retrieval was limited to the human population. The search was also limited to English-language documents published between January 1, 2016 and October 25, 2021. Internet links were provided, where available.

Selection Criteria and Summary Methods

One reviewer screened literature search results (titles and abstracts) and selected publications according to the inclusion criteria presented in Table 1. Full texts of study publications were not reviewed. The Overall Summary of Findings was based on information available in the abstracts of selected publications. Open-access, full-text versions of evidence-based guidelines were reviewed when abstracts were not available and relevant recommendations were summarized.

Table 1: Selection Criteria

Criteria	Description
Population	People with substance use disorders (e.g., alcohol use disorder), with or without comorbid conditions (e.g., posttraumatic stress disorder, generalized anxiety disorder, major depressive disorder)
Intervention	Remote substance-monitoring devices or mobile applications, alone or in combination with other interventions (e.g., psychotherapy)
Comparator	Q1 and Q2: Alternative remote substance-monitoring devices or mobile applications; pharmacological interventions; non-pharmacological interventions (e.g., psychotherapy); no treatment with remote substance-monitoring devices or mobile applications Q3: Not applicable
Outcomes	Q1: Clinical effectiveness (e.g., substance use, abstinence, or relapse, functional status, severity of symptoms [e.g., depressive symptoms, anxiety symptoms], quality of life, safety [e.g., adverse events]) Q2: Cost-effectiveness (e.g., cost per quality-adjusted life-year gained) Q3: Recommendations regarding best practices (e.g., appropriate patient populations or clinical settings, recommended types of devices, strategies to mitigate harms and adverse events)
Study designs	Health technology assessments, systematic reviews, randomized controlled trials, non-randomized studies, economic evaluations, evidence-based guidelines

Results

One health technology assessment[1] and 3 randomized controlled trials[2-4] were identified regarding the clinical effectiveness of remote substance-monitoring devices and mobile applications for the treatment of substance use disorders. No relevant systematic reviews, randomized controlled trials, economic evaluations, non-randomized studies, or evidence-based guidelines were identified.

Additional references of potential interest that did not meet the inclusion criteria are provided in Appendix 1.

Overall Summary of Findings

One health technology assessment[1] and 3 randomized controlled trials[2-4] were identified regarding the clinical effectiveness of remote substance-monitoring devices and mobile applications for the treatment of substance use disorders. The health technology assessment investigated the comparative effectiveness of 2 smartphone apps with substance use monitoring capabilities, Connections and DynamiCare (as an adjunct to medication-assisted treatment), to standard care alone.[1] Authors identified 1 study regarding the cognitive behavioural therapy portion and 1 trial was identified for the Connections and DynamiCare apps, respectively.[1] Authors concluded that the impact of these apps in opioid use disorders was moderate, at best.[1] However, the authors stated that the evidence used remains controversial and lacks direct quantitative assessment.[1]

Three randomized controlled trials[2-4] evaluated the clinical effectiveness of smartphone apps with self-monitoring capabilities for substance use disorders — 1[3] specifically in individuals with alcohol use disorder and 1[4] in individuals with opioid use disorder. One randomized

controlled trial found that remote ecological momentary assessments, in combination with ecological momentary intervention, show the potential for increased abstinence that goes beyond substance use disorder treatment engagement.[2] Another randomized trial found no significant difference, at 6 months, in the mean number of drinks per week between individuals with alcohol use disorder who were provided with smartphone-based intervention access and those who had no such access.[3] In another randomized controlled trial, individuals receiving text messages and daily surveys on cravings, affects, triggers, responses, and social contexts were associated with a significantly lower number of days using drugs in the past week compared to the control group.[4] Additionally, there was a lower percentage of participants in the intervention group with a positive urine test than the control group.[4]

No relevant literature was found regarding the cost-effectiveness of remote substance-monitoring devices and mobile applications for the treatment of substance use disorders. Similarly, no evidence-based guidelines regarding its use for the treatment of substance use disorders were identified; therefore, no summary can be provided.

References

Health Technology Assessments

1. Tire JA, Whittington MD, Fluetsch N, et al. Digital health technologies as an adjunct to medication assisted therapy for opioid use disorder. *Final evidence report and meeting summary*: Boston (MA): Institute for Clinical and Economic Review; 2020: https://icer.org/wp-content/uploads/2020/08/ICER_DHTs_for_OUD_Final_Evidence_Report_121120.pdf. Accessed 2021 Nov 2.

Systematic Reviews and Meta-Analyses

No literature identified.

Randomized Controlled Trials

2. Scott CK, Dennis ML, Johnson KA, Grella CE. A randomized clinical trial of smartphone self-managed recovery support services. *J Subst Abuse Treat*. 2020 10;117:108089. PubMed
3. Bertholet N, Godinho A, Cunningham JA. Smartphone application for unhealthy alcohol use: pilot randomized controlled trial in the general population. *Drug Alcohol Depend.* 02 01 2019; 195: 101-105. PubMed
4. Liang D, Han H, Du J, Zhao M, Hser YI. A pilot study of a smartphone application supporting recovery from drug addiction. *J Subst Abuse Treat*. 05 2018; 88: 51-58. PubMed

Non-Randomized Studies

No literature identified.

Economic Evaluations

No literature identified.

Guidelines and Recommendations

No literature identified.

Appendix 1: References of Potential Interest

Systematic Review and Meta-Analyses

Comparator Not Specified

5. Carreiro S, Newcomb M, Leach R, Ostrowski S, Boudreaux ED, Amante D. Current reporting of usability and impact of mHealth interventions for substance use disorder: a systematic review. *Drug Alcohol Depend*. 10 01 2020; 215: 108201. PubMed

6. Ortis A, Caponnetto P, Polosa R, Urso S, Battiato S. A report on smoking detection and quitting technologies. *Int J Environ Res & Public Health*. 04 10 2020; 17(7): 2614. PubMed

7. Staiger PK, O'Donnell R, Liknaitzky P, Bush R, Milward J. Mobile apps to reduce tobacco, alcohol, and illicit drug use: systematic review of the first decade. *J Med Internet Res*. 11 24 2020; 22(11): e17156. PubMed
BACKGROUND: Mobile apps for problematic substance use have the potential to bypass common barriers to treatment

Randomized Controlled Trials

Unclear Population — Substance Abuse Disorder Diagnosis Unknown

8. Krishnan N, Elf JL, Chon S, Golub JE. COach2Quit: a pilot randomized controlled trial of a personal carbon monoxide monitor for smoking cessation. *Nicotine Tob Res.* 10 26 2019; 21(11): 1573-1577. PubMed

9. Crane D, Garnett C, Michie S, West R, Brown J. A smartphone app to reduce excessive alcohol consumption: identifying the effectiveness of intervention components in a factorial randomised control trial. *Sci. Rep*. 03 12 2018; 8(1): 4384. PubMed

10. Aharonovich E, Stohl M, Cannizzaro D, Hasin D. HealthCall delivered via smartphone to reduce co-occurring drug and alcohol use in HIV-infected adults: a randomized pilot trial. *J Subst Abuse Treat*. 12 2017; 83: 15-26. PubMed

Alternative Population

11. Thompson RG, Aivadyan C, Stohl M, Aharonovich E, Hasin DS. Smartphone application plus brief motivational intervention reduces substance use and sexual risk behaviors among homeless young adults: results from a randomized controlled trial *Psychol Addict Behav.* Sep 2020; 34(6): 641-649. PubMed

12. Tsui JI, Leroux BG, Radick AC, et al. Video directly observed therapy for patients receiving office-based buprenorphine - a pilot randomized controlled trial. *Drug Alcohol Depend.* 10 01 2021; 227(): 108917. PubMed

Non-Randomized Studies

No Comparator

13. Kelly PJ, Beck AK, Deane FP, et al. Feasibility of a mobile health app for routine outcome monitoring and feedback in SMART recovery mutual support groups: stage 1 mixed methods pilot study. *J Med Internet Res*. Oct 06 2021; 23(10): e25217. PubMed

14. Malte CA, Dulin PL, Baer JS, et al. Usability and acceptability of a mobile app for the self-management of alcohol misuse among veterans (Step Away): pilot cohort study. *JMIR Mhealth Uhealth*. 04 08 2021; 9(4): e25927. PubMed

15. Mitchell MM, Mendelson J, Gryczynski J, Carswell SB, Schwartz RP. A novel telehealth platform for alcohol use disorder treatment: preliminary evidence of reductions in drinking. *Am J Drug Alcohol Abuse* 05 03 2020; 46(3): 297-303. PubMed

16. Bertholet N, Daeppen JB, McNeely J, Kushnir V, Cunningham JA. Smartphone application for unhealthy alcohol use: a pilot study. *Subst Abus*. Jul-Sep 2017; 38(3): 285-291. PubMed

17. You CW, Chen YC, Chen CH, et al. Smartphone-based support system (SoberDiary) coupled with a Bluetooth breathalyser for treatment-seeking alcohol-dependent patients. *Addict Behav*. 02 2017; 65: 174-178. PubMed

Alternative Population

18. Attwood S, Parke H, Larsen J, Morton KL. Using a mobile health application to reduce alcohol consumption: a mixed-methods evaluation of the Drinkaware track & calculate units application. *BMC Public Health*. 05 17 2017; 17(1): 394. PubMed

Review Articles

19. Davis-Martin RE, Alessi SM, Boudreaux ED. Alcohol use disorder in the age of technology: a review of wearable biosensors in alcohol use disorder treatment. *Front Psychiatr*. 2021; 12: 642813. PubMed

20. Goldfine C, Lai JT, Lucey E, Newcomb M, Carreiro S. Wearable and wireless mHealth technologies for substance use disorder. *Curr Addict Rep*. Sep 2020; 7(3): 291-300. PubMed

21. Suffoletto B, Scaglione S Using digital interventions to support individuals with alcohol use disorder and advanced liver disease: a bridge over troubled waters. *Alcohol Clin Exp Res*. Jul 2018; 42(7): 1160-1165. PubMed

Additional References

22. Gordon A, Jaffe A, McLellan AT, et al. How should remote clinical monitoring be used to treat alcohol use disorders?: Initial findings from an expert round table discussion. *J Addict Med*. Mar/Apr 2017; 11(2): 145-153. PubMed