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What is the clinical effectiveness and cost-effectiveness of using digital health technologies to improve treatment adherence and outcomes in patients with tuberculosis?

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Introduction

Non-adherence to tuberculosis (TB) therapy increases the risk of treatment failure, leading to poor clinical outcomes and a significant financial burden to healthcare services. Digital health technologies may offer innovative solutions to this, but studies evaluating their utility remain sparse. To address this research gap, a systematic review was undertaken to evaluate the existing evidence for the clinical effectiveness and cost-effectiveness of using digital health technologies to improve TB treatment adherence and clinical outcomes.

Materials and methods

Articles were retrieved by systematically searching MEDLINE, EMBASE, Web of Science, Scopus, CENTRAL, ClinicalTrials.gov, World Health Organization (WHO) Clinical Trials Registry Platform, WHO publications and the grey literature. Technologies under consideration were short message service (SMS), smartphone applications, medication monitors, video observed therapy (VOT), ingestible sensors with wirelessly observed therapy (WOT) and social media platforms. Studies were included if they were randomised controlled trials (RCTs), observational studies with controls or economic studies. Primary outcome measures were treatment adherence, cure, treatment completion, treatment failure, loss to follow-up and treatment success, as defined by WHO.[1] A further outcome measure of interest was any related cost or cost-effectiveness data.

Results and discussion

4,044 records were initially identified. After removal of duplicate records and articles unrelated to either TB or digital health technologies, 111 records remained. Of these, 16 articles were eligible for inclusion in the qualitative analysis.

SMS

Compared to directly observed therapy (DOT), one-way SMS improved TB treatment completion[2] but did not improve treatment success or cure rates.[3] The remaining one-way SMS studies and all the two-way SMS studies did not demonstrate significant improvements in adherence or outcomes.[4–8] An economic study on SMS use in TB care demonstrated an incremental cost-effectiveness ratio of 350 'international dollars' per disability adjusted life year.[9]

Smartphone applications

The one study on smartphone applications did not demonstrate an improvement in TB treatment outcomes.[10] No evidence was available regarding cost-effectiveness.

Medication monitors

Medication monitors may improve TB cure rates compared to DOT[11] and, when used alone or in conjunction with SMS, they may decrease treatment non-adherence rates, but they did not affect treatment failure rates, death or loss to follow-up when compared to standard self-administered treatment or DOT.[8] A cost minimisation analysis projected lower costs per patient when using medication monitors compared to DOT.[11]

VOT

VOT did not improve TB treatment completion rates compared to DOT.[12,13] Economic studies suggested that VOT may be associated with cost savings.[13–16]

Ingestible sensors with WOT

No eligible studies were identified regarding the clinical effectiveness of WOT in TB treatment. One economic modelling study suggested that using WOT may lower costs compared to DOT.[17]

Social media platforms

No eligible studies were identified regarding the clinical effectiveness or cost-effectiveness of using social media platforms in the management of TB.

Conclusion

There is currently insufficient evidence available on the clinical effectiveness and cost-effectiveness of using these digital health

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technologies to improve TB treatment adherence and outcomes. These findings will be of relevance to health policymakers who determine how best to invest in resources for TB control and to healthcare providers seeking to establish which technologies may be of value at a local level. The paucity in evidence means that, at present, policymakers cannot make definitive evidence-based decisions regarding wider implementation of these technologies. Further robust studies are needed, particularly in regions with the highest TB burden. ■

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