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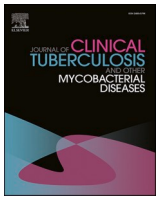

Patient perceptions of video directly observed therapy for tuberculosis: a systematic review

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ABSTRACT

Virtual modes of tuberculosis (TB) treatment monitoring have become increasingly relevant in the last decade with the advancements and increasing accessibility of technology. We conducted a systematic review comparing people with TB's perceptions of standard directly observed therapy (DOT) versus video directly observed therapy (vDOT). Studies were obtained from MEDLINE and EMBASE between January 1, 1974 and February 4, 2021. Of the 22 articles reviewed, a qualitative thematic analysis was performed, drawing on common themes from people with TB's perception of their care. 21 studies showed relative preference for and acceptance of vDOT over DOT. Factors that increased acceptability toward vDOT included cost and time saving, personal sense of empowerment, convenience, and privacy. Studies also showed greater adherence to treatment and subsequent improved health outcomes. vDOT has the potential to be an empowering, person-centered treatment modality for TB therapy. The role of social determinants such as place of residence, access to technology, and patient-provider communication requires further exploration.

1. Introduction

The End TB Strategy of the World Health Organization (WHO) pursues a world free of tuberculosis (TB) by the year 2035 [24]. Directly Observed Therapy (DOT) has been a traditional strategy to increase TB treatment completion rates and support better health outcomes for people diagnosed with TB. DOT involves daily supervision of patients' treatment intake. The two common ways through which DOT is achieved are facility-based or community-based DOT. Facility-based DOT requires that individuals visit a facility to take their treatment under the supervision of a healthcare provider for the six month treatment course. Community-based DOT recognizes that others such as community health workers, peer groups, and, in some cases, family members can be substituting supervisors [23]. These in-person approaches to DOT are, however, time and resource intensive for patients and health systems alike. The quality of care can vary across the different modes of DOT delivery. DOT processes have also been perceived as disempowering and stigmatizing to persons receiving TB treatment [25].

In recent decades, widespread use of technologies, such as advancements with mobile phones, as well as increasing accessibility of the Internet has paved way for video-based directly observed therapy (vDOT). Instead of individuals with TB having to present at a healthcare facility or community supervisor, they can take medication in the comfort of their own home through a video call, or asynchronously by sending a video recording [28].

Various studies have analyzed the effectiveness of vDOT on treatment completion, finding it comparable and in several instances better than in-person modes [28]. However, to our knowledge, no studies have focused on the perspectives of people who have experienced TB vDOT. The purpose of this systemic review is to synthesize existing knowledge surrounding the use of vDOT from the perspective of people with TB. Specifically, the review aims to summarize factors contributing to the acceptance of and preference for vDOT as an alternative to in-person DOT, as well as hesistancies toward vDOT. The review helps to determine whether vDOT is in line with person-centered approaches envisioned within the WHO's End TB Strategy.

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2. Methods

We conducted literature searches on September 16, 2021, on MEDLINE and EMBASE, for studies published between January 1, 1974, and February 4, 2021, where video-based technology was used to supervise or support treatment for TB, including latent TB infection (LTBI) or TB disease, and where data was collected from the perspective of those using the service. From the MESH search, 10,962 articles were sourced. 81 duplicate studies were removed from the collection. Covidence was employed as a tool to help categorize the articles. The inclusion criteria were primary studies exploring people with TB's perspectives on vDOT, including cohort studies, qualitative studies, randomized controlled trials, or case-control studies. Studies were excluded if they did not include people with TB's perspectives, were reviews or second source documents, or were not in English. Four individual researchers (EC, RO, LG, and LH) independently reviewed titles and abstracts based on these predetermined criteria. Consensus between two researchers was required for an article to be included in the next review stage. 10,771 studies were removed, and 110 articles proceeded to full text review. Again, consensus between two researchers was required for articles to be included for data extraction.

88 studies were excluded for the following reasons: 1) not having primary data, 2) only an abstract was available; or, 3) not capturing patient perspectives. [Of note, one study for which the full-text was unavailable at the time of writing, was accessible only at the time of publication [27]. The study was not included in this review but findings corroborate our analysis.] Of the 22 articles included (Fig. 1), common themes were determined after tagging key findings within each article. We chose a thematic, narrative approach to capture the nuance of these differing perspectives and to minimize risk of erasure or over-generalization [26]. Where available, provider insights are also described. The data was insufficient for a *meta*-analysis as most of the papers employed qualitative methods.

3. Results

The 22 studies included were conducted in 11 countries, specifically, three high-income (USA, England, and Norway), four upper-middle-income (Mexico, Belarus, Moldova, and China), three lower-middle-income (Kenya, Vietnam, and Cambodia), and one low-income country (Uganda), as defined by the World Bank. Video-based technology was used to monitor the treatment of TB. The predominant method was through an app created for the purpose of monitoring TB treatment that was accessed on handheld mobile devices. Ten studies utilized synchronized video-based technology whereby patients interacted in real time with healthcare professionals over a virtual video call. Eleven studies utilized asynchronous video-based technology whereby patients recorded their TB treatment medication intake and sent a recorded video

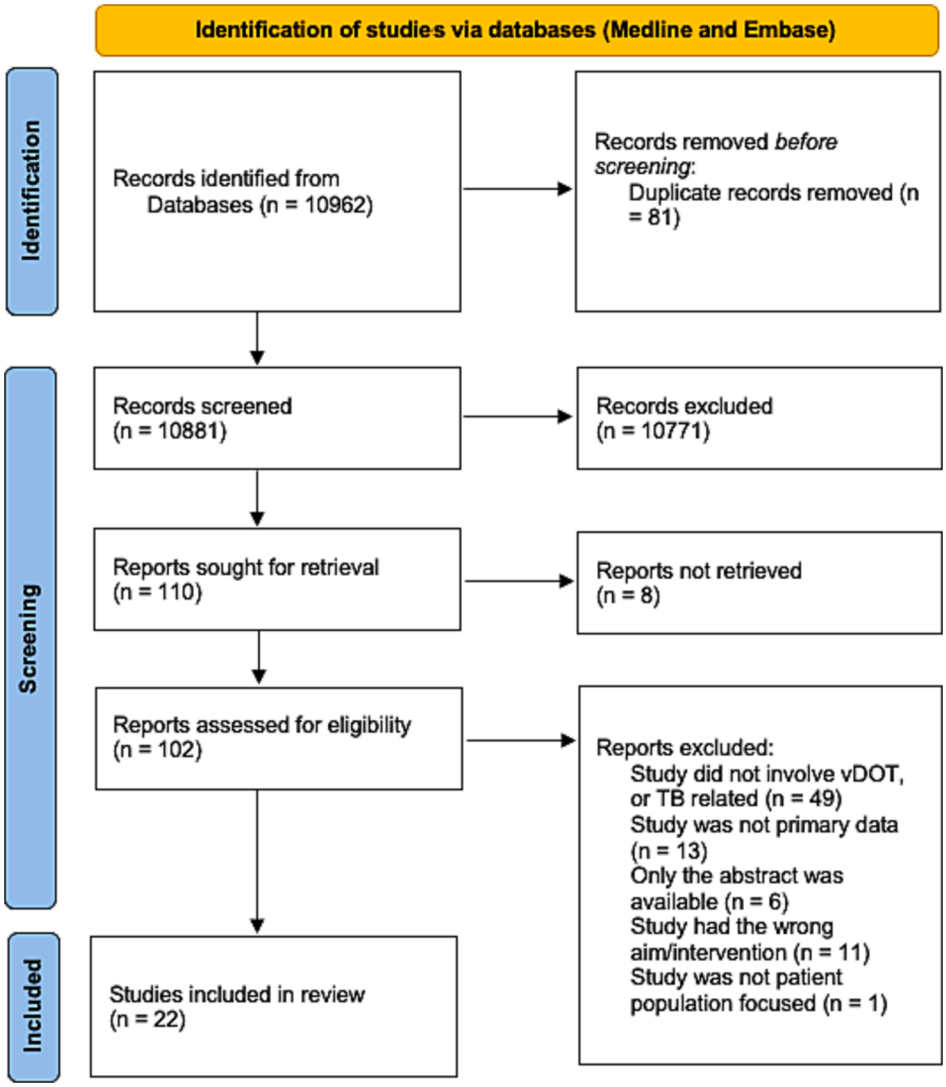

Fig. 1. PRISMA flow diagram detailing systematic review process.

to a healthcare professional to be reviewed and documented later. Sample sizes within a study ranged from 10 to 1,913 individuals. Many studies did not report on demographics of patients; however, of the few that did, the studied population ranged from 15 to over 65 years old, with relatively equal distribution of males to females, a greater proportion of populations that were categorized as Hispanic or Asian relative to European and North American, and with the greatest proportion of individuals' highest education level being upper secondary. For studies that completed a statistical analysis, no statistically significant difference was reported between age, sex, or employment status.

Studies employed various methods to gauge acceptability, often framed as satisfaction or preference, toward vDOT, including self-reported questionnaires or surveys, interviews, focus groups or, on occasion, inferring acceptability by comparing the adherence level between the vDOT and DOT groups. The following factors were found to shape acceptability of vDOT:

1) Patient convenience, privacy and satisfaction

Seven studies revealed that patients were satisfied with and preferred vDOT over DOT, commonly due to convenience and in one study, privacy. Chuck [3] found that "patients who chose vDOT over in-person DOT reported that it was more convenient than travelling to the clinic or arranging in-person visits". Demaio [1] too found that vDOT reduced the distance between the patient and healthcare provider. Patients in Nguyen's [15] study indicated that because of vDOT's convenience they would recommend it to other patients. vDOT was also shown to attract acceptability among diverse patients by Sinkou [16].

Beyond convenience, patients indicated that privacy was an important driver of their preference for vDOT. In Sekandi's study [18], majority (78 %) of patients not only completed vDOT, they perceived it to be more confidential than traditional DOT. However, vDOT was not without privacy challenges; 18% of participants reported failing to record a video because they were worried someone was watching them [18].

Two studies quantified and compared patient satisfaction and recommendations for each vDOT mode. Guo [17] found that 40.5 % of patients on DOT were satisfied or very satisfied while 35.1 % were not satisfied or were very dissatisfied. By contrast, 81.3 % of patients on vDOT were satisfied or very satisfied and only 3.4 % were not satisfied; 81.3 % indicated they would prefer vDOT. In Garfein's study [19] 96 % of patients went on to recommend vDOT and 90% preferred vDOT over DOT.

2) Patient empowerment and centeredness

Three studies indicated that vDOT contributed to patient empowerment. Hoffman [12] indicated that "both patients and health professionals appear empowered by the ability to communicate with each other and appear receptive [toward vDOT]." Beyond empowerment, Holzman [13] stated vDOT could be successfully integrated into patient-centered, individualized case management plans to enable adherence and treatment success. Cattamanchi [14] too recommended vDOT supported a more patient-centered approach and "an alternative treatment supervision modality for those patients who are willing and able to use it".

3) Program efficiency and costs

11 studies indicated the main driver for acceptability of vDOT was its ability to mitigate costs, time- and resource- related barriers for patients and/or programs, and support a more efficient approach to treatment supervision. Demaio [1] stated that costs for videophone equipment (5 units) "easily offset" savings in travel and personnel expenses. Garfein [2] suggested vDOT was "a promising, low-burden alternative to in-person DOT". Garfein [19] too found vDOT to be 32% less costly than DOT. Chuck [3], Holzschuh [4], Story [5], and Bendiksen [6] concurred, stating that video technology also required less staff time compared to in-person DOT. Patients were understood to receive the same treatment with greater efficiency. Where individuals required more time for detailed care, the staff were more likely able to afford lending this time over a call, supporting the delivery of quality TB care. Lam [7] stated that "staffing needs were minimal to account for the variable rescheduling time for monitoring nonadherent patients and providing reminder calls and SMS text messages when patients were late". A single vDOT worker was adequate to support 50 patients, thereby utilizing minimal health system resources and mitigating critical patient barriers to treatment completion. Buchman [8] calculated mileage and time saved with vDOT. After adjusting for the specific context of their study, they recorded a mileage savings of $9,929.07 and time savings of 614 h or 17.5 weeks of staff time over 33 months. Ravenscroft [10] suggested that because vDOT improved adherence compared to clinic-based DOT, vDOT could yield gains well beyond immediate cost-savings, by supporting responses to TB more broadly. Donahue [11] l found that vDOT helped to prevent treatment lapses among patients at a military pediatric clinic, an otherwise common challenge due to changes to parents' duty stations or prolonged travel. vDOT offered a more consistent mode of treatment monitoring and continuity of care for this unique mobile population.

4) Adherence to treatment and improved patient outcomes

Seven studies revealed greater adherence when patients used vDOT as opposed to in-person modes of DOT, with effects extending to key and vulnerable populations affected by TB. "A higher proportion of expected doses were observed as scheduled among vDOT participants than among in-person DOT participants, resulting in shorter treatment duration", stated Garfein [19]. Similarly, Guo [17] stated "the fraction of doses observed in the vDOT group to be higher than that observed in the DOT group… vDOT also had significantly less missed observed doses and less discontinuation than the DOT group". From Holzman [13]: "Our results suggest that vDOT is able to more effectively measure TB treatment adherence, compared with in-person DOT". "VDOT increased observed medication adherence for TB patients compared to clinic-based DOT, a difference of 4 days of adherence per 2 week period" according to Ravenscroft [10]. Adherence was also attributed to vDOT over demographics by Garfein [20]: "Although patients differed across cities by age, race/ethnicity, income, and country of birth, their treatment adherence and satisfaction with vDOT were high and did not differ by city". When analyzing impacts of adherence over the short- and long-term, Story [5] stated "vDOT enabled higher levels of treatment observation for patients with TB both over the first 2 months of treatment and throughout treatment, than DOT. vDOT also supported daily dosing, was effective for socially complex populations and had a lower drop-out rate than DOT" [5]. Socially complex groups were defined by Story [5] as "people with history of homelessness, imprisonment, or drug use or alcohol problems". Likewise, Cook's [9] study showed greater adherence with vDOT in both the short and long term. "Among those using vDOT, it represented the primary means of adherence verification, among these individuals, the median proportion of all prescribed treatment monitored using vDOT was 100 %", stated Perry [21]. Sekandi [18] stated that not only was vDOT feasible and demonstrative of greater adherence, it allowed for more holistic and complete TB management by removing logistical barriers of daily monitoring: "Patients using vDOT were able to submit videos 7 days a week, including weekends, providing a more complete picture of medication dosing than the standard in person DOT, which typically covers a 5-day period" [18]. vDOT was understood to consider all aspects of a person's life outside of their TB treatment while retaining quality of care.

Only one study (in Cambodia) revealed a net negative perception of vDOT based on patients' preference for at-home DOT. Rabinovich stated: "Participants tended to highlight the practical benefits of the home visits… Issues of stigma and privacy regarding an individual's TB and treatment status were not reported as significant concerns…there was widespread agreement that home visits not only were more convenient but also enabled the healthcare provider to provide the encouragement, reassurance, and support that patients needed to adhere to the treatment" [22].

4. Discussion

The support for and positive perception toward vDOT from individuals who have TB suggests that vDOT stands as a promising alternative to DOT for those undergoing TB treatment and may be considered for implementation, in ways that are suited the specific context of extant healthcare systems. With the aim of person-centered care which considers the patient as a person first, vDOT's inherent increased flexibility allows for catering to a care plan that is more in line with fulfilling and addressing the needs of a person with TB beyond their medical needs. This could include restoring autonomy over their treatment plan in terms of controlling their time, resources (finances related to seeking care), as well as personal privacy. In line with the WHO End TB agenda to end TB by 2035, the vDOT process offers some advantages that are considerate of resource constraint healthcare systems, while enabling a person-centered approach. That said, concerns about confidentiality and a preference for in person care in some settings cautions consideration and the need to develop alternate approaches for patients with unique needs. Moreover, this review unveiled the relative acceptability of vDOT over traditional DOT. Patient preferences and acceptability related to other modes of TB treatment monitoring - including non-supervised approaches - remains to be studied.

There are some limitations in this review paper. While our study aimed to incorporate relevant papers within the timeframe, we recognize that it is limited in scope and breadth, and thus, may have failed to capture other nuances expressed by those with TB in other studies. We recognize that the research sourced in this study quantified actual cost savings from the healthcare providers and estimates from the person with TB's perspective. Thus, we recommend further research into quantifying the actual cost savings for individuals receiving TB treatment when they opt for vDOT compared to those receiving treatment at a facility-based practice. This could include cost associated with travel to facility, child-care needed during this time, the opportunity cost associated with this daily routine. Beyond cost savings, we recommend an analysis on the carbon footprint associated with receiving DOT treatment; an implication that was not studied in this present paper. Upon reviewing the studies included in this review, many articles did not state the type of TB experienced by the individual or the total duration of their TB treatment. Thus, it is unclear as to whether certain types of TB presented different challenges when using vDOT, especially those with longer treatment durations. One can foresee these challenges including treatment fatigue or technology burnout. This study was also unable to explore different perceptions related to synchronous versus asynchronous vDOT. While synchronous vDOT could improve accessibility to healthcare providers and provide the opportunity to build rapport, it also has the potential to be perceived as paternalistic, akin to DOT. We recommend that future studies investigate the different perceptions of synchronous vs asynchronous vDOT care from the perspective of the person receiving the care. The role of other social determinants such as place of residence, access to technology, and patient-provider communication requires further exploration. Finally, a potential limitation of the review is the inability to report bias. Though efforts were made to remove potential biases, we recognize that it has not been validated.

Author Contributions

This review was undertaken as part of an Independent Study course at the School of Global Health, Faculty of Health, York University. Ilo-Katryn Maimets performed the initial search. En Chi Chen, Rumia Owaisi and Leah Goldschmidt completed independent abstract screening, full text review, and data extraction. En Chi Chen completed data synthesis and manuscript draft. Rumia Owaisi supported manuscript writing. Amrita Daftary supported each step of the process and supervised the research project.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jctube.2023.100406.

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