International Journal of Nursing and Health Care Research

OPEN ACCESS

Estoque J, et al. Int J Nurs Health Care Res 9: 1706

www.doi.org/10.29011/2688-9501.101706

www.gavinpublishers.com

GAVIN PUBLISHERS

Research Article

Evaluating Asynchronous Video Directly Observed Therapy for Tuberculosis Treatment Adherence: A Real-World Implementation Study from a Low-Incidence Setting

Jeanne Estoque[1], Xiaodan Zhu[1], Hiu Kwan Wong[1], Hyejin Jeon[1], Georgina Paterson[1], Simone Barry[1,2]

[1]Department of Thoracic Medicine, Royal Adelaide Hospital, 1 Port Road, Adelaide, South Australia

[2]Precision Theme, South Australian Health Medical Research Institute, North Terrace, Adelaide, South Australia

[*]**Corresponding author**: Jeanne Estoque, Thoracic Medicine Outpatient Royal Adelaide Hospital, Adelaide, Australia

Citation: Estoque J, Zhu X, Wong HK, Jeon H, Paterson G, et al. (2026) Evaluating Asynchronous Video Directly Observed Therapy for Tuberculosis Treatment Adherence: A Real-World Implementation Study from a Low-Incidence Setting. Int J Nurs Health Care Res 9:1706. DOI: https://doi.org/10.29011/2688-9501.101706

Received Date: 28 April 2026; **Accepted Date:** 06 May 2026; **Published Date**: 08 May, 2026

Abstract

Background: Tuberculosis (TB) treatment adherence remains a challenge even in low-incidence, high-resource settings such as Australia. While synchronous video directly observed therapy (VDOT) is widely used, real-time monitoring can create logistical barriers. Asynchronous VDOT-where patients upload videos of medication intake for later review-may offer a more flexible and scalable alternative, but comparative evidence is limited. **Methods:** We conducted a retrospective cohort study evaluating asynchronous versus synchronous VDOT for TB treatment adherence in South Australia, guided by the RE-AIM framework. Patients treated between January 2021 and November 2023 were included if monitored via synchronous nurse–patient video calls (n = 67) or asynchronous self-recorded videos using Personify Care (n = 45). Treatment success was defined as completion of ≥ 80% of confirmed doses. Logistic regression adjusted for age, sex, employment status, and English language preference. A prespecified non-inferiority margin of –10% was applied. **Results:** Treatment success was achieved by 67% of synchronous and 69% of asynchronous VDOT patients (p = 0.85). The absolute risk difference was –2.0% (95% CI: –19.6% to 15.6%), supporting non-inferiority. Employment was more common among asynchronous VDOT patients (80% vs. 51%, p = 0.002), suggesting potential selection bias. No demographic characteristics were significantly associated with treatment success. Exclusions due to treatment withdrawal or transfer (n = 15) did not differ by VDOT modality. **Conclusions:** Asynchronous VDOT demonstrated non-inferior adherence compared with synchronous VDOT and provided greater flexibility for mobile and working populations. Using the RE-AIM framework, this evaluation supports asynchronous VDOT as a feasible, scalable model for TB treatment monitoring. Further research should examine patient experience, implementation fidelity, and cost-effectiveness to guide broader adoption.

Citation: Estoque J, Zhu X, Wong HK, Jeon H, Paterson G, et al. (2026) Evaluating Asynchronous Video Directly Observed Therapy for Tuberculosis Treatment Adherence: A Real-World Implementation Study from a Low-Incidence Setting. Int J Nurs Health Care Res 9:1706. DOI: https://doi.org/10.29011/2688-9501.101706

Keywords: Tuberculosis**;** Treatment adherence**;** Video Directly Observed Therapy (VDOT)**;** Asynchronous VDOT**;** Digital Health**;** Implementation Research

Introduction

Tuberculosis (TB) remains the leading cause of death from a single infectious agent globally. In 2024, the World Health Organisation (WHO) reported that 10.8 million people developed TB- a 4.6% increase from previous years [1]. Although Australia is classified as a low-incidence setting with a notification rate of 5 per 100,000 in 2022 [2], TB remains a notifiable disease, and the national strategy has set a goal of elimination by 2050, defined as fewer than one case per million population.

Achieving this goal requires not only accurate diagnosis and effective treatment but also sustained adherence to a prolonged six-month treatment regimen. Barriers to adherence include medication side effects, logistical issues, and loss of income due to missed work. While treatment is free in Australia, traditional Directly Observed Therapy (DOT)-the global standard for ensuring TB medication adherence-can disrupt daily life and strain health system capacity [3]. DOT is typically delivered in person or through synchronous video calls, requiring real-time coordination between patients and healthcare providers. This synchronous model presents challenges for working individuals, shift workers, caregivers, and people in remote areas.

Video Directly Observed Therapy (VDOT), particularly asynchronous VDOT, has emerged as a promising alternative to in-person or synchronous approaches [4]. Asynchronous VDOT allows patients to record and submit videos of medication ingestion at their convenience, which can be reviewed later by healthcare staff. This model preserves the core principle of DOT while reducing rigidity, improving accessibility, and respecting patient autonomy. Although VDOT, both synchronous and asynchronous, has shown promise in international settings [4-6], it has not yet been evaluated in routine clinical practice in Australia.

To address this gap, South Australia TB Services implemented the country's first asynchronous VDOT program in 2023 using the Personify Care digital platform (Personify Care Pty Ltd, Adelaide, Australia). This retrospective cohort study evaluates the real-world implementation and effectiveness of asynchronous VDOT compared to synchronous VDOT in achieving treatment adherence. Drawing on the RE-AIM framework [7], this study considers both effectiveness and the potential for broader adoption of asynchronous VDOT as a patient-centred digital health strategy aligned with TB elimination goals in low-incidence, high-resource settings.

Methods

Aim, Design, and Setting

This study aimed to compare the effectiveness of asynchronous VDOT with synchronous VDOT in achieving treatment adherence among patients with TB. We conducted a retrospective cohort study using routinely collected clinical data from patients treated by South Australia Tuberculosis Services (SA TB Services) between January 2021 and November 2023. SA TB Services is a specialist statewide program responsible for TB management and operates through the Royal Adelaide Hospital, part of the Central Adelaide Local Health Network.

Framework application

The RE-AIM implementation science framework to inform the evaluation of asynchronous VDOT [7] guided this study. Specifically, RE-AIM domains were used to structure the selection and collection of data: Reach informed the inclusion of demographic variables (e.g., language preference, employment status) to assess access and equity; Effectiveness guided the primary outcome measure of treatment success; Adoption and Implementation shaped the documentation of how each VDOT model was introduced and operationalised; and Maintenance informed the consideration of sustained integration into service delivery. This structured approach ensured alignment between the study's aims and the broader goals of real-world implementation research.

Participants and Eligibility Criteria

Eligible participants were adults (aged ≥18 years) diagnosed with active TB disease and commenced on treatment under a VDOT model (either synchronous or asynchronous) during the study period. Patients were excluded if they transferred to a different model of care (e.g., in-person DOT or self-administered therapy), withdrew consent, or had incomplete VDOT records preventing assessment of adherence.

VDOT Models and Interventions

Participants received TB treatment according to national guidelines, typically consisting of the four-drug regimen of rifampicin, isoniazid, pyrazinamide, and ethambutol for drug-susceptible TB. All medications were prescribed and dispensed through SA TB Services.

Two models of VDOT were used

- Synchronous VDOT involved real-time video calls with nurses from the Royal District Nursing Service (RDNS). Patients were required to participate in scheduled daily video sessions during a pre-specified one-hour window.

• Asynchronous VDOT used the Personify Care platform (Personify Care Pty Ltd, Australia). Patients were trained to record and upload videos of themselves ingesting medication at a time of their choosing. They were also prompted to report side effects, request nurse callbacks, and confirm medication supply. Nurses at SA TB Services reviewed the submissions daily (Monday to Friday) and prioritised follow-up for patients reporting adverse effects (Figure 1).

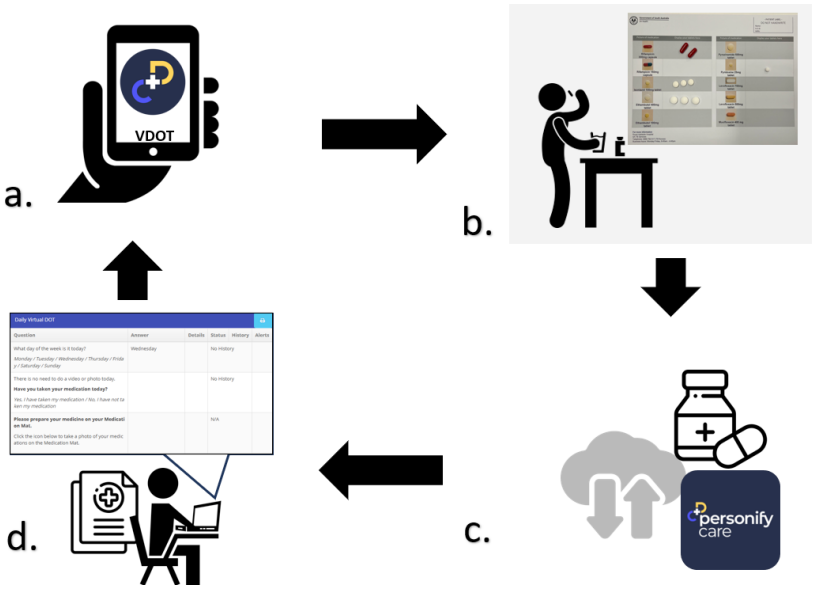

Figure 1: Workflow of the Personify Program.

a. Patient Login

The patient logs into the Personify program using their secure credentials.

b. Medication Documentation

The patient captures a photo and video while administering their medication.

c. Data Upload & Storage

The recorded data is automatically uploaded to a secure web-based platform, where it is stored in encrypted data centres.

d. Nurse Review & Follow-up

A nurse reviews the uploaded media, checks for any reported side effects, and can initiate a follow-up call if needed

Participants were introduced to their assigned VDOT model at treatment initiation. Assignment was based on service availability and patient suitability, reflecting real-world conditions.

Data Collection and Measures

Data were extracted from electronic health records and VDOT platforms. Collected variables included demographic data (age, sex, employment status, and preferred language), treatment modality, and adherence metrics. The primary outcome was treatment success, defined as ≥ 80% of confirmed doses taken. This threshold is consistent with widely used adherence benchmarks in TB programmatic and implementation research [4,5,8]. The adherence rate was calculated as the number of confirmed doses divided by the total number of prescribed doses during the monitored period.

Statistical Analysis

Baseline characteristics were summarised using means and standard deviations for continuous variables and frequencies for categorical variables. Differences between groups were assessed using independent t-tests for continuous variables and chi-square tests for categorical variables.

To assess the primary outcome, a two-proportion z-test compared treatment success rates between synchronous and asynchronous VDOT groups. A non-inferiority margin of -10% was prespecified, based on clinically meaningful thresholds identified in prior TB adherence studies [8]. Non-inferiority was established if the lower bound of the 95% confidence interval (CI) for the difference in treatment success exceeded -10%.

Logistic regression was used to adjust for potential confounders, including age, sex, employment status, and preferred language. Adjusted odds ratios (ORs) with 95% CIs were reported. Statistical significance was set at $p < 0.05$. All analyses were conducted using Stata version 17 (StataCorp LLC, College Station, TX, USA).

Reporting Standards

This manuscript was prepared in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines for observational research [9]. A completed STROBE checklist is provided as Supplementary Table 1.

Item No	Recommendation	Where Addressed in Your Paper
1a	Indicate study design in title or abstract	Title & Abstract: "retrospective cohort study"
1b	Informative and balanced abstract summary	Abstract
2	Scientific background and rationale	Introduction, Paragraphs 1–3
3	Objectives and prespecified hypotheses	Introduction, final paragraph
4	Study design key elements	Methods – "Aim, Design, and Setting"
5	Setting, location, dates	Methods – "Aim, Design, and Setting"
6a	Eligibility criteria, selection methods	Methods – "Participants and Eligibility Criteria"
6b	Matching criteria (if any)	N/A (not a matched study)
7	Variables, outcomes, confounders	Methods – "VDOT Models and Interventions" & "Data Collection and Measures"
8	Data sources and measurement methods	Methods – "Data Collection and Measures"
9	Efforts to address bias	Methods – "Participants and Eligibility Criteria"; Discussion – "Limitations"
10	Study size explanation	Methods – "Participants and Eligibility Criteria"
11	Handling of quantitative variables	Methods – "Statistical Analysis"
12a	Statistical methods incl. confounding	Methods – "Statistical Analysis"
12b	Subgroups and interactions	Not performed – no subgroup analysis
12c	Missing data handling	Methods – "Statistical Analysis"
12d	Loss to follow-up	N/A (retrospective cohort, no follow-up loss reported)
12e	Sensitivity analysis	Not performed
13a	Numbers at each stage	Results – "Participant Characteristics and Exclusions"
13b	Reasons for non-participation	Results – "Participant Characteristics and Exclusions"
13c	Flow diagram	Not included (optional)
14a	Participant characteristics and confounders	Results – Table 1 and accompanying text
14b	Missing data	Results – Not explicitly stated; if none, clarify
14c	Follow-up time summary	Not applicable (non-longitudinal follow-up)
15	Outcome events or summary	Results – "Treatment Success"
16a	Unadjusted and adjusted estimates	Results – "Predictors of Treatment Success" & Table 2
16b	Boundaries for categories	Methods – "Data Collection and Measures"

16c	Translate relative to absolute risk	Not applicable
17	Other analyses (e.g. subgroup)	Results – "Predictors of Treatment Success"
18	Key results	Discussion – Opening paragraph
19	Limitations	Discussion – "Limitations" paragraph
20	Interpretation	Discussion – Final two paragraphs
21	Generalisability	Discussion – Last paragraph & RE-AIM section
22	Funding	Declarations – "Funding" section

Supplemental Table 1: STROBE Checklist for Cohort Studies.

Checklist of items that should be included in reports of cohort studies, with corresponding locations where each item is addressed in the manuscript. Adapted from the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) Statement. This checklist is provided to support transparency and completeness in reporting observational research.

Results

Participant Characteristics and Exclusions

Between January 2021 and November 2023, 127 patients were assessed for inclusion. Fifteen were excluded: nine withdrew from treatment and six were transferred to a non-VDOT model. Of the final 112 participants included in the analysis, 67 (61%) were assigned to synchronous VDOT and 45 (39%) to asynchronous VDOT. The exclusions were not significantly associated with treatment modality ($p = 0.36$).

Table 1 presents baseline characteristics by VDOT group. The mean age was 42.5 years (SD 18.2) in the synchronous group and 40.2 years (SD 15.5) in the asynchronous group ($p = 0.49$). Males represented 57% of the synchronous group and 44% of the asynchronous group ($p = 0.20$). English language preference was reported by 63% of synchronous participants and 76% of asynchronous participants ($p = 0.15$). Notably, employment status differed significantly between groups, with 80% of asynchronous participants employed, compared to 51% in the synchronous group ($p = 0.002$). There were no significant differences in housing status ($p = 0.41$) (Table 2).

Factor	Level	synchronous VDOT	asynchronous VDOT	p-value
N (%)		67 (61%)	45 (39%)	
Age, mean (SD)		42.54 (18.20)	40.22 (15.51)	0.49
Homeless (yes = 1)	0	66 (99%)	45 (100%)	0.41
	1	1 (1%)	0 (0%)	
Employ (yes = 1)	0	33 (49%)	9 (20%)	0.002
	1	34 (51%)	36 (80%)	
Sex (male = 1)	0	29 (43%)	25 (56%)	0.20
	1	38 (57%)	20 (44%)	
Language (English = 1)	0	25 (37%)	11 (24%)	0.15
	1	42 (63%)	34 (76%)	
Treatment success rate yes =1 (>80)	0	22 (33%)	14 (31%)	0.85
	1	45 (67%)	31 (69%)	
Note: VDOT = Video Directly Observed Therapy; SD = Standard Deviation.				

Table 1: Participant Characteristics by Treatment Group.

Variable	Odds Ratio (OR)	p-value	95% Confidence Interval
Age	1.024	0.110	0.995 – 1.055
Sex (Male)	1.321	0.515	0.573 – 3.042
Employment Status	1.011	0.982	0.393 – 2.606
Language (English)	2.620	0.083	0.881 – 7.765
Note: OR = Odds Ratio; CI = Confidence Interval.			

Table 2: Logistic Regression Analysis for Treatment Success.

Multivariable logistic regression results examining demographic predictors of treatment success, defined as confirmation of ≥ 80% of expected doses. Odds ratios (OR), p-values, and 95% confidence intervals (CI) are shown for each variable. No demographic factor was significantly associated with treatment success at the $p < 0.05$ level.

Baseline demographic and clinical characteristics of patients receiving either synchronous or asynchronous video directly observed therapy (VDOT). Categorical variables are presented as frequencies and percentages; continuous variables are presented as means with standard deviations (SD). P-values are based on chi-square tests for categorical variables and independent t-tests for continuous variables. Treatment success was defined as confirmation of ≥ 80% of expected doses.

Treatment Success

Treatment success, defined as confirmation of ≥ 80% of expected medication doses, was achieved by 67% of synchronous VDOT participants and 69% of asynchronous participants ($p = 0.85$). The absolute risk difference was -2% (95% CI: -19.6% to 15.6%), and the lower bound of the confidence interval exceeded the non-inferiority margin of -10%, establishing non-inferiority of asynchronous VDOT.

Predictors of Treatment Success

Logistic regression analysis was conducted to assess whether selected demographic variables were associated with treatment success. The variables included age, sex, employment status, and English language preference. The results indicated that none of these factors was statistically significant predictors of treatment success. Specifically, age was not associated with treatment success (odds ratio [OR] 1.02; 95% confidence interval [CI]: 0.995 to 1.055; $p = 0.110$). Similarly, male sex did not significantly predict treatment outcomes (OR 1.32; 95% CI: 0.57 to 3.04; $p = 0.515$), nor did employment status (OR 1.01; 95% CI: 0.39 to 2.61; $p = 0.982$). While participants who preferred English had higher odds of treatment success, this association did not reach statistical significance (OR 2.62; 95% CI: 0.88 to 7.77; $p = 0.083$).

Discussion

This study provides real-world evidence that asynchronous VDOT is non-inferior to synchronous VDOT for supporting TB treatment adherence in a low-incidence, high-resource setting. These findings reinforce the role of asynchronous models as a flexible, patient-centred alternative to real-time observation, particularly for individuals facing structural or occupational barriers to care.

Our results align with a recent randomised controlled trial by Garfein et al. [10], which demonstrated the effectiveness of asynchronous VDOT for TB infection. While our study focused on active TB and employed a retrospective cohort design, both studies suggest that asynchronous VDOT is a feasible and acceptable strategy across the TB care continuum. Similarly, a systematic review by Sundaram et al. [4] found that both synchronous and asynchronous VDOT models have been successfully implemented in diverse settings, further supporting their generalisability.

The strengths of this study include its integration within a government-run TB program, inclusion of two operationally distinct VDOT models, and use of the RE-AIM framework to guide evaluation. However, several limitations must be considered. Notably, while none of the demographic characteristics-including age, sex, employment status, or English language preference-were significantly associated with treatment success, the asynchronous group had a significantly higher proportion of employed participants (80% vs 51%). This may indicate selection bias, as patients with greater scheduling constraints may have been more likely to receive asynchronous VDOT. The absence of randomisation and reliance on service-based assignment limits causal inference. Furthermore, patients who withdrew or transferred care were excluded from analysis, which may underestimate broader implementation challenges related to retention and fidelity.

From an implementation standpoint, asynchronous VDOT offers substantial advantages. It reduces the burden on both patients and health services by enabling flexible medication documentation and batch review of adherence data. Features such as symptom prompts and nurse alerts also enable timely clinical response,

even in the absence of real-time monitoring. These attributes may enhance accessibility, especially for mobile populations or those in remote areas.

Future research should investigate patient experience, long-term outcomes, and cost-effectiveness-including Quality-Adjusted Life Years (QALYs) and health system efficiency. Broader application of asynchronous VDOT to other conditions, such as hepatitis C or opioid substitution therapy may also warrant exploration. Mixed-methods studies could further illuminate how digital adherence tools influence engagement and health equity.

This study applied the RE-AIM framework to assess the potential scalability of asynchronous VDOT. The model demonstrated Reach across diverse patient groups; Effectiveness in achieving non-inferior adherence; Adoption and Implementation within an existing TB program; and potential for Maintenance through high flexibility and acceptability. These insights support the integration of asynchronous VDOT into routine TB care in similar contexts.

Conclusion

Asynchronous VDOT was found to be non-inferior to synchronous VDOT in supporting treatment adherence among TB patients in this retrospective cohort study. This flexible, patient-centered approach may improve accessibility and engagement for individuals facing barriers to scheduled care, including employment and travel constraints. While findings must be interpreted in light of limitations including potential selection bias and the observational design, this study provides important implementation evidence to inform TB policy and digital adherence strategies in low-burden, high-income settings. Future research should explore cost-effectiveness and patient experience to support broader integration into routine practice.

List of Abbreviations

CI- Confidence Interval; DOT- Directly Observed Therapy; OR- Odds Ratio; RE-AIM- Reach, Effectiveness, Adoption, Implementation, and Maintenance; RDNS- Royal District Nursing Service; SA TB Services- South Australia Tuberculosis Services; SD- Standard Deviation; TB- Tuberculosis; VDOT- Video Directly Observed Therapy; QALY- Quality-Adjusted Life Year; WHO- World Health Organization

Acknowledgements

We acknowledge the support of the TB nursing staff at SA Tuberculosis Services and Personify Care for technical assistance in implementing the asynchronous VDOT platform.

Ethics approval and consent to participate

The Central Adelaide Local Health Network Human Research Ethics Committee (CALHN HREC) reviewed this study. It was granted full ethics approval in accordance with the National Health and Medical Research Council (NHMRC) National Statement on Ethical Conduct in Human Research (2023).

The Central Adelaide Local Health Network Human Research Ethics Committee (CALHN HREC) waived the requirement for informed consent under Section 2.3.10 of the National Health and Medical Research Council (NHMRC) National Statement, as the study involved a retrospective review of de-identified patient records (Reference No. 21249).

This study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki.

Consent for Publication

Not applicable.

Availability of Data and Materials

The datasets generated and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing Interests

The authors declare that they have no competing interests.

Funding

No external funding was received for this study.

Authors' Contributions

JE conceived the study, oversaw implementation, and led manuscript preparation. SB conducted the data analysis and contributed to results interpretation. XZ, HW, HJ, and GP assisted with data collection, interpretation, literature review and manuscript editing. All authors read and approved the final manuscript.

Authors' Information

JE, XZ, HW, and HJ are respiratory nurses in SA TB Services. They hold appointments at the Royal Adelaide Hospital. GP is the nurse unit manager at Thoracic Medicine Outpatient. She holds appointments at the Royal Adelaide Hospital. SB is a thoracic and sleep physician and the medical lead for SA TB Services. She holds appointments at the Royal Adelaide Hospital.

References

1. WHO (2024) editor. Global Tuberculosis Report 2024. World Health Organization: Geneva, Switzerland.
2. Bright A, Denholm J, Coulter C, Waring J, Stapledon R (2020) Tuberculosis notifications in Australia, 2015-2018. Commun Dis Intell 25; 44.
3. Sagbakken M, Frich JC, Bjune GA, Porter JD (2013) Ethical aspects of directly observed treatment for tuberculosis: a cross-cultural comparison. BMC Med Ethics. 14: 25.

4. Sundaram KK, Ahmad Zaki R, Shankar D, Hoe V, Ahmad NAR, et al. (2024) Effectiveness of Video-Observed Therapy in Tuberculosis Management: A Systematic Review. Cureus. 16: e71610.

5. Garfein RS, Liu L, Cepeda J, Graves S, San Miguel S, et al. (2024) Asynchronous Video Directly Observed Therapy to Monitor Short-Course Latent Tuberculosis Infection Treatment: Results of a Randomized Controlled Trial. Open Forum Infect Dis. 11:ofae180.

6. Nguyen TA, Pham MT, Nguyen TL, Nguyen VN, Pham DC, et al. (2017) Video Directly Observed Therapy to support adherence with treatment for tuberculosis in Vietnam: A prospective cohort study. Int J Infect Dis. 65: 85-89.

7. Holtrop JS, Estabrooks PA, Gaglio B, Harden SM, Kessler RS, et al. (2021) Understanding and applying the RE-AIM framework: Clarifications and resources. J Clin Transl Sci. 5: e126.

8. Wekesa C, Sekaggya-Wiltshire C, Muyanja SZ, Lume I, Nabaggala MS, et al. (2023) Comparing adherence to MDR-TB treatment among patients on self-administered therapy and those on directly observed therapy: non-inferiority randomized controlled trial. Trials. 24: 326.

9. Cuschieri S (2019) The STROBE guidelines. Saudi J Anaesth. 13: S31-S34.

10. Garfein RS, Doshi RP (2019) Synchronous and asynchronous video observed therapy (VOT) for tuberculosis treatment adherence monitoring and support. J Clin Tuberc Other Mycobact Dis. 17: 100098.