Social Support and Nurse-Led Interventions to Improve Tuberculosis Medication Adherence in Vulnerable Populations: A Public Health Nursing Study

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Abstract

Tuberculosis remains a major global public health threat affecting a quarter of the world's populations including vulnerable populations in 30 high TB-burden countries. Antituberculosis medication consists of a long 6-month daily drug regimen and complex dosage. Tuberculosis is also prevalent mostly in low- and middle- income countries which increase the possibility of socioeconomic factors as major barriers to medication adherence. Non-adherence can result in relapse, drug-resistant tuberculosis, and death. Social support and nurse-led interventions are implemented to increase antituberculosis medication adherence through home-visits and psycho-emotional support. Through analysis of six primary studies of various research designs, a body of evidence is gathered to analyze the efficacy of the interventions. Primary studies are found through two databases: OVID Medline and Embase. LEGEND is used to analyze the strength of the body of evidence. Through analysis of the body of evidence, the evidence suggests that Social Support (SS) and nurse-led intervention increase antituberculosis medication adherence in the vulnerable populations. Clinical recommendations and change strategies are proposed at the end of this study to implement the project.

Effects of Social Support and Nurse-Led Interventions to Increase Antituberculosis Medication Adherence in Patients Living in Vulnerable Populations

Tuberculosis is a preventable and yet global leading cause of death that affects a quarter of the world's population (WHO & The Ministry of Health of the Russian Federation, 2017). 30 high TB burden countries, comprise of low- and middle- income countries, account for 90% of the people affected by TB each year (WHO, 2020). From the perspective of infectious disease and pathophysiology, the disease is caused by a single infectious agent, *Mycobacterium tuberculosis*, that affects the lung. But as the previous WHO data suggests, TB is a disease of poverty, inequality, economic distress, lack of access to essential healthcare, vulnerability, stigma, marginalization, and discrimination.

The gold standard to tuberculosis treatment is a 6-month daily drug regimen which has saved more than 60 million lives since 2000 (WHO, 2020). Unfortunately, the long duration and complexity of the dosage result in poor medication adherence, as high as 50.5% (Sahile, et. al., 2018). Patients who have poor medication adherence are at-risk for treatment failure, relapse, development of multi-drug resistant tuberculosis, and death (Chen, et. al., 2020). Acknowledging that tuberculosis control requires an intricate interplay of "biological, political, social, economic, cultural, and environmental factors" (Gonzales, 2017), researchers have suggested Social Support (SS) and home-based nurse-led interventions to address the socioeconomic and psycho-emotional barriers and to increase antituberculosis medication adherence.

This paper will analyze six primary studies that examine the efficacy of social support and home-based nurse-led interventions in tuberculosis patients living in vulnerable populations. Four primary studies are conducted in high TB burden countries: China, Ukraine, South Africa,

and rural Spain, as well as a refugee clinic in United States, a high-income country. Three studies (Guix-Comellas, 2018; Rogo, 2017; Van Elsland, 2018) focus on pediatrics population as part of the vulnerable population. One meta-analysis on antituberculosis adherence interventions in low- and middle- income countries by Alipanah and team (2018) is also included.

PICOT Question

The PICOT question for this research paper is: "How does Social Support (SS) and nurse-led interventions (I) affect antituberculosis medication adherence (O) in tuberculosis patients living in vulnerable population (P) in comparison to the same population with whom these interventions are not implemented (C) from 2010 to 2020 (T)?". This paper will focus on specific vulnerable populations such as tuberculosis patients living in high-TB burden countries (WHO, 2020), those who are not able to make decisions for themselves, such as children below the age of 18, and displaced persons who underwent forced migration, such as refugees. Interventions include low-cost, patient-centered approach that address socioeconomic and psycho-emotional barriers to medication adherence in tuberculosis patients. Outcome will be measured based on rifampicin drug-assay to examine medication adherence, rate of completion for the 6-month drug regimen in patients, and patient care satisfaction through interviews. Studies will be focused on studies from 2010 to 2020 to analyze the longitudinal efficacy of the intervention. PICOT table that includes analysis of each primary study is included as an appendix of this paper.

Significance of the Problem

Tuberculosis (TB) is one of the leading causes of mortality with the prevalence of one in three individuals globally (WHO, 2020). According to the WHO, more than 10 million people have developed Tuberculosis in 2017 that includes a global economic burden up to $12 billion annually (WHO, 2018). An estimated number of 230,000 children passed away due to tuberculosis, in which 80% were younger than 5 years old (WHO, 2020). Due to its prolonged and frequent dosing regimen, TB treatment is challenging to adhere and complete successfully. This increases the possibility for the development of antimicrobial resistance (AMR) crisis (O'Neill, 2016).

Increasing tuberculosis treatment adherence in vulnerable populations is challenging due to various factors, including their biological, socioeconomic, political, psycho-emotional of the patients and their caregivers. A radical intervention needs to be implemented as soon as possible to reduce the spread of tuberculosis and increase treatment completion for this vulnerable population.

Search Strategy and Results

The databases that were used are Ovid Medline and Embase. The keywords "tuberculosis", "vulnerable population", "children", "refugees", "low-income countries", "middle-income countries", and "medication adherence" are used on both databases. In both databases, keywords "vulnerable populations", "children", "refugees", "low-income countries", and "middle-income countries" are combined using Boolean operator OR. The search results are then combined with Boolean operator AND with the keyword "medication adherence". The inclusion criteria are children and adults living in vulnerable populations and study is published

in between 2015 to 2020. The exclusion criteria are patients outside of the vulnerable population focus area used in this paper, study is older than 5 years old, and if articles are unrelated to PICO. Through OVID Medline, “Adherence to latent tuberculosis infection treatment in a population with a high number of refugee children” (Rogo, et. al., 2017), a retrospective review, and “Adherence interventions and outcomes of tuberculosis” (Alipanah, et. al., 2018), a systematic review and meta-analysis of trials and observational studies are retained. Through Embase, four articles are retained: “What works best for ensuring treatment adherence. Lessons from a social support program for people treated for tuberculosis in Ukraine” (Charyeva, et. al., 2019), a qualitative study; “The effects of family, society and national policy support on treatment adherence among newly diagnosed tuberculosis patients”, a cross-sectional study; “A treatment-support intervention evaluated in South African paediatric populations with HIV infection or tuberculosis meningitis” (Van Elsland, et. al., 2018), a randomized-controlled trial; and “Impact of nursing interventions on adherence to treatment with antituberculosis drugs in children and young people”, a non-randomized controlled trial. This concludes to one qualitative study, one cross-sectional study, one non-randomized controlled trial, one randomized controlled trial, one retrospective review, and one meta-analysis as a collective body of evidence. A search strategy figure is included in this paper as an appendix.

Critical Appraisal of the Literature

There are 6 articles that are chosen to create this Evidence-Based Practice (EBP) research: “Adherence interventions and outcomes of tuberculosis treatment: A systematic review and meta-analysis of trials and observational studies” by Alipanah and team (2018), “What works best for ensuring treatment adherence. Lessons from a social support program for people

treated for tuberculosis in Ukraine" by Charyeva and team (2019), "The effects of family, society, and national policy support on treatment adherence among newly diagnosed tuberculosis patients: a cross-sectional study" by Chen and team (2020), "A treatment-support intervention evaluated in South African paediatric populations with HIV infection or tuberculous meningitis" by Elsland and team (2020), "Tuberculosis in children and adolescents: Strategies for social workers' interventions" by and Angueira (2017), and "Adherence to Latent Tuberculosis Infection Treatment in a Population with a High Number of Refugee Children" by Rogo and team (2017).

Conceptualization of the Problem

Physiological effects of the medication, socioeconomic and psycho-emotional issues are consistent barriers to antituberculosis medication adherence in tuberculosis patients living in vulnerable populations. The long duration and complexity of the treatment, its side effects, time spent getting to the medical facility, lack of transportation and its costs, societal stigma, and lack of personal motivation are the main barriers to completion of antituberculosis treatment (Charyeva, et. al., 2019). As in the pediatrics population, adherence is influenced by socioeconomic issues in the family, such as their physical, mental, and social support, especially in their main caregiver (Van Elsland, et. al., 2018). The concepts and variables are consistent across studies in which socioeconomic issues, psycho-emotional or social support, and medication side effects are the main challenges for patients receiving antituberculosis treatment. The concepts are defined consistently and no evidence of conceptual or theoretical bias are detected across studies.

Findings

Key findings that are consistent across primary studies and meta-analysis are that socioeconomic support and nurse-led interventions increase antituberculosis medication adherence compared to patients who don't get any social support and nurse-led interventions. In particular, a meta-analysis conducted by Alipanah and team (2018) goes into the efficacy of various Directly Observed Therapy (DOT) through low-cost, culturally appropriate interventions such as education (for both patients and staff), material or psychological support, and reminders and tracer system. From these various options, patient-centered care approach to increasing medication adherence using "a package of interventions" that address their specific needs are pertinent (Alipanah, et. al., 2018). Home-visits by nurses are also an effective intervention that is consistent across studies. This has increased the rate of adherence and completion of treatment by decreasing the time and cost spent on transportation getting into the healthcare facilities, as well as "saving" tuberculosis patients from suspicions and stigma from the community (Charyeva, et. al., 2019). Through these home visits, nurses are also able to assess the physiological side effects of the medication as well as socioeconomic barriers that vulnerable patients face in their community. Especially in the case of pediatric antituberculosis medication adherence in which motivation and education of the caregiver is a deciding factor, assessing the social issues within the family can be a game-changer to providing psycho-emotional and social support for the caregivers (Van Elsland, et. al., 2018). Last but not least, another consistent finding that is important to increasing antituberculosis medication adherence is staff education and morale, especially in nurses. The quality of care provided by nurses and their interpersonal communication skills are critical to the success of nurse-led intervention program (Charyeva, et.

al., 2019). Quoting one of the patients in the study by Charyeva and team (2019), “We spoke a lot… She [the nurse] always told me: “You will get treated and everything will be alright, you’ll find a job, and everything will be normal.” She supported me.”. Nurses who comfort their patients with their words, seeing them as they are, and elevate their strengths not weaknesses, save lives.

Methodological Rigor

This research includes various research designs as its primary studies as well as one meta-analysis. The diversity of research designs across studies provide various perspectives on the efficacy of social support and nurse-led interventions, as well as the strength of internal and external validity. The retrospective study, or also called a case-control design, conducted by Rogo and team (2017) analyzes whether antituberculosis adherence has a direct correlation with being a “refugee” or a “non-refugee”. The cross-sectional survey which collects data from a single time point (Polit & Beck, 2019) by Chen and team (2020), shows the most current research on antituberculosis medication adherence in vulnerable populations. Even so, inferring changes over time can be problematic in the future but is useful in the purpose of this paper to show the most current findings. A qualitative study by Charyeva and team (2019) conducted through interviews shows data from a first-hand patients’ perspectives. Even so, interviewed patients are nominated by nurses that might decrease the variability of research samples and increase possibility for bias. A non-randomized controlled trial study by Guix-Comellas and team (2018) and a randomized-controlled trial study by Van Elsland and team (2018) increase the strength of internal validity of the primary studies used in this research paper.

Sampling criteria and the overall representativeness of the research samples across studies are robust and fit the criteria to answer the initial PICOT question of this paper. Level of

measurement of the outcomes from the primary studies is consistent across studies, which is through rifampicin drug assay, rate of completion for antituberculosis drug regimen, and patient care-satisfaction. The external validity of the primary studies used in this paper depends on where the interventions will be implemented. A thorough policy, socioeconomic and resources availability survey needs to be conducted and assessed on a case-to-case basis.

Strengths and Limitations

The strengths of the body of evidence are the diverse research designs and samples from various vulnerable populations. The purpose of each research design that contributes to the collective body of evidence is elaborated in the Methodological Rigor section of this paper. The body of evidence explores various low-cost, patient-centered nurse-led interventions and social support program that increase antituberculosis medication adherence in vulnerable populations from patient and staff education (Alipanah, et. al., 2018) to national policy implementation (Chen, et. al., 2020). Internal validity is also strengthened through the randomized and non-randomized controlled trial included in the body of evidence. Samples provided in this paper are diverse geographically and include four high TB burden countries from various continents. This paper can help high TB-burden countries learn barriers and enablers from each other on how to increase antituberculosis medication adherence.

The limitations of the body of evidence is there is no strong data provided to analyze the relationship between the prevalence of HIV in high-TB burden countries. This is important because people who are infected with HIV are more likely to become infected with TB, due to their low immune systems, and vice versa (CDC, 2020). The external validity is also not straight-forward and depends on a case-to-case basis on where the interventions proposed are going to be

implemented. Although the findings from primary studies are consistent, the diversity of the samples decreases the level of external validity of the intervention.

Summary Statement Regarding Strength of the Evidence

Various critical appraisal and grading are conducted on each article to assess for its quality using the LEGEND (Let Evidence Guide Every New Decision) system. The systematic review conducted by Alipanah and team (2018) receives a grade of 1a. This grading is made based on its study design and the number of data that was collected and analyzed. The systematic review consists of robust data collection that comprises of 129 articles and thorough search strategy mechanisms that increases its validity. The second article, a research conducted by Charyeva and team (2019), receives a grading of 4a. This grading is made because of its study design which is a qualitative study that focuses on specific interventions and not on Knowledge, Attitude, and Belief (KAB). The third article, a cross-sectional study conducted by Chen and team (2020), receives a grade of 3a. This grading is made due to its study design and that the study focuses more on the prevalence of a phenomena, which is the efficacy of family, society, and national policy on TB adherence. The fourth article, a Randomized Controlled Trial (RCT) by Van Elsland and team (2018), receives a grading of 2a. This grading is made due to its study design and a good quality of the study. The study provides clear comparison between controlled group and comparison, as well as outlining the procedure of the study clearly. It also clarifies their interventions and results in a robust and reliable way. The fifth article, a research article by Guix-Comellas and team (2018), receives a grade of 2a. The non-randomized controlled trial is conducted in two phases which includes retrospective and retrospective with intervention. This increases the internal validity of the study. The research design is also explained thoroughly with

the use of CONSORT-adapted flow diagram of both phases. The last article, a retrospective review by Rogo and team (2017), receives a grade of 4a. This grading is made due to the paper's study design and also its robust description of the study procedure.

The overall strength of the Evidence is High. This assessment is made through the aggregate quality of individual studies, quantity of samples of individual studies, and consistency of findings across studies. Social Support (SS) and nurse-led interventions increase antituberculosis medication adherence in patients living in vulnerable populations.

Clinical Recommendations

Recommendation for Practice Change

Social Support and home-based nurse-led intervention program for patients are consistent across studies to have a positive effect on increasing antituberculosis medication adherence in vulnerable populations. Two recommendations for practice change are made based on the body of evidence: 1) to implement Social Support (SS) and home-based nurse-led intervention program for patients undergoing antituberculosis medication regimen and 2) to standardize socioeconomic background (living conditions, occupations, access to transportation, etc) assessment for tuberculosis patients.

Home-based nurse-led interventions are specifically successful for patients with tuberculosis in Ukraine where transportation costs and stigma are barriers to medication adherence, home-visits led by nurses increase the rate of medication adherence (Charyeva, et. al., 2019). Nurses who do home-visits are also able to assess and provide SS recommendations after assessing patient's living conditions. Daily home visits by nurses are able to provide direct care

delivery and observations of treatment as well as provide educational materials to encourage full antituberculosis medication adherence.

Secondly, as mentioned in the beginning of this paper, socioeconomic factors are the main barriers to antituberculosis medication adherence. Therefore, a standardized assessment on patient's socioeconomic background that might jeopardize medication adherence should be implemented. This also includes emotional and practical life support assessment that are critical to adherence (Van Elsland, et. al., 2018). After socioeconomic assessment, a patient-centered care can be delivered to patients undergoing tuberculosis medication regimen without inflicting personal blame or judgement on the patient.

Prescription for Change

The ACE Star Model of Knowledge Transformation is used as the EBP model to implement clinical practice change in this project. The ACE Star Model of Knowledge Transformation provides the five stages of knowledge that provides the framework to systematically positioning Evidence-Based Practice (EBP) to implement change (Orta, et. al., 2016). The model includes five stages: knowledge discovery, evidence summary, translation into guidelines, practice integration, and process and outcome evaluation (Orta, et. al. 2016). As the interventions proposed is an organizational practice change, this EBP model is appropriate for this paper.

Knowledge Discovery

In the "knowledge discovery" stage, in which traditional research methodologies and scientific inquiry are generated through various research designs (Orta, et. al., 2016), it is

important to provide evidence for stakeholders to provide the efficacy of the change. It has been conducted in this paper through the generation of the body of evidence.

Evidence Summary

In "evidence summary", in which results are synthesized and criticized to identify potential bias and limiting chance effects (Orta, et. al., 2016), findings from the body of evidence is summarized as mentioned in the "Critical Appraisal" section of this paper.

Translation into Guidelines

Before translating the evidence into implementable guideline, there are a couple of factors that need to be identified to ensure successful implementation. These factors are the stakeholders involved, barriers to change, and facilitators to change. Stakeholders are key players whose thoughts and practice need to possibly be changed or persuaded to ensure success of the project (Orta, et. al., 2016). In this project, the identified stakeholders are physicians, community social workers, hospital administration, nursing staff, as well as patients and their family members. The stakeholders need to be educated on why the clinical recommendations provided above can increase antituberculosis medication adherence in vulnerable populations. After providing the evidence and clinical recommendation, it is important to address possible barriers to change, or challenges, to the stakeholders as thorough as possible. The barriers to change identified in the projects are no sufficient nurses to conduct home-based nurse-led interventions for tuberculosis patients, long period of time to educate the community to break stigma on tuberculosis, insufficient funding to reimburse or support nurse's transportation to patient's home and/or patient's financial burden to access the healthcare facility. After addressing the barriers to change, facilitators to change will then be introduced. This can also include stakeholders. Based on this project, the facilitators to change are clinical nurse leaders as lead project managers,

nursing staff, physicians, community social workers, as well as patients and their family members. Including the stakeholders as facilitators to change might increase a sense of ownership and hope, that will increase collaboration and ensure success of the project.

Practice Integration

Practice integration should include implementable and specific change strategies in the community of practice. Facilitators to change also need to be assigned to specific change strategies in which they have power or responsibility over. There are five change strategies that are proposed in this paper: 1) educating stakeholders on the importance of socioeconomic background assessment for tuberculosis patients who undergo tuberculosis medication regimen as elaborated previously in this paper. Clinical nurse leaders are responsible for this change strategy as they are the lead project managers for this intervention; 2) distributing pamphlets and brochures to educate the community about tuberculosis transmission and safety procedures to break stigma in the community. All facilitators to change that include patients, their family members, community social workers, clinical nurse leaders, nursing staff, and physicians are pertinent to this change strategy, not only through community outreach but also in their daily clinical and personal practice; 3) allocating a number of nurses for home visits at the beginning of every nursing shift daily. Clinical nurse leaders and nursing staff (including the charge nurse) are responsible for this change strategy; 4) conducting a Monitoring and Evaluation (M&E) after one month (30-day medication adherence with intervention) of implementation to gather data and measure impact. Clinical nurse leaders, nursing staff, community social workers, and patients are involved in this change strategy; 5) updating stakeholders through weekly meetings about the progress of tuberculosis medication adherence on patients undergoing intervention.

Feedbacks should also be asked during all the weekly meetings. All of stakeholders and facilitators to change are involved in this change strategy.

Process and Outcome Evaluation

Evaluation of the intervention will be measured in two criteria: formative and summative. Formative is an "ongoing assessment of a product or program as it is being developed to optimize its quality and effective" (Polit & Beck, 2017) and summative is the "evaluations that assess the worth of the program" (Polit & Beck, 2017) or the "O" in the PICOT question. The formative evaluation of this project is achieved through measuring if all change strategies mentioned above can be executed and implemented successfully. This can be measured specifically by conducting drug-assay through urine test on tuberculosis patients who receive interventions to assess their medication adherence. Orange/red drug assay means detection of rifampicin thus medication adherence. The summative evaluation of this project is achieved through assessing longitudinal data of 6-month antituberculosis regimen completion for patients who receive interventions, a standardized protocol for socioeconomic assessment for all tuberculosis patients, longitudinal data of decreased tuberculosis patients' relapses, prevalence of drug-resistant resistant tuberculosis and/or mortality due to antituberculosis medication non-adherence. Last but not least, there is an increased awareness of tuberculosis in the larger community of practice that will break the stigma surrounding tuberculosis patients. This will increase patients' quality of life thus increasing Social Support and patient's personal motivation for medication adherence.

Conclusion

Tuberculosis remain the “neglected cry” of a global public health pandemic. As 90% of tuberculosis patients are from low- and middle- income countries, the approach to treatment needs to go beyond physiological or symptoms management. The long duration of 6-month daily antituberculosis drug regimen with complex dosage are challenging to complete especially when access to transportation and poverty are prevalent in the patients’ lives (Charyeva, et. al., 2019). Through this paper, socioeconomic barriers to adherence are introduced to increase caregivers and healthcare providers’ awareness to these barriers and change their approach to care delivery. As proven by the body of evidence, when tuberculosis patients have adequate social support and are paired with daily home-visits by nurses, the challenging daily antituberculosis regimen can be completed. When healthcare system, healthcare providers, patients, their caregivers, and the community work together, they save lives.

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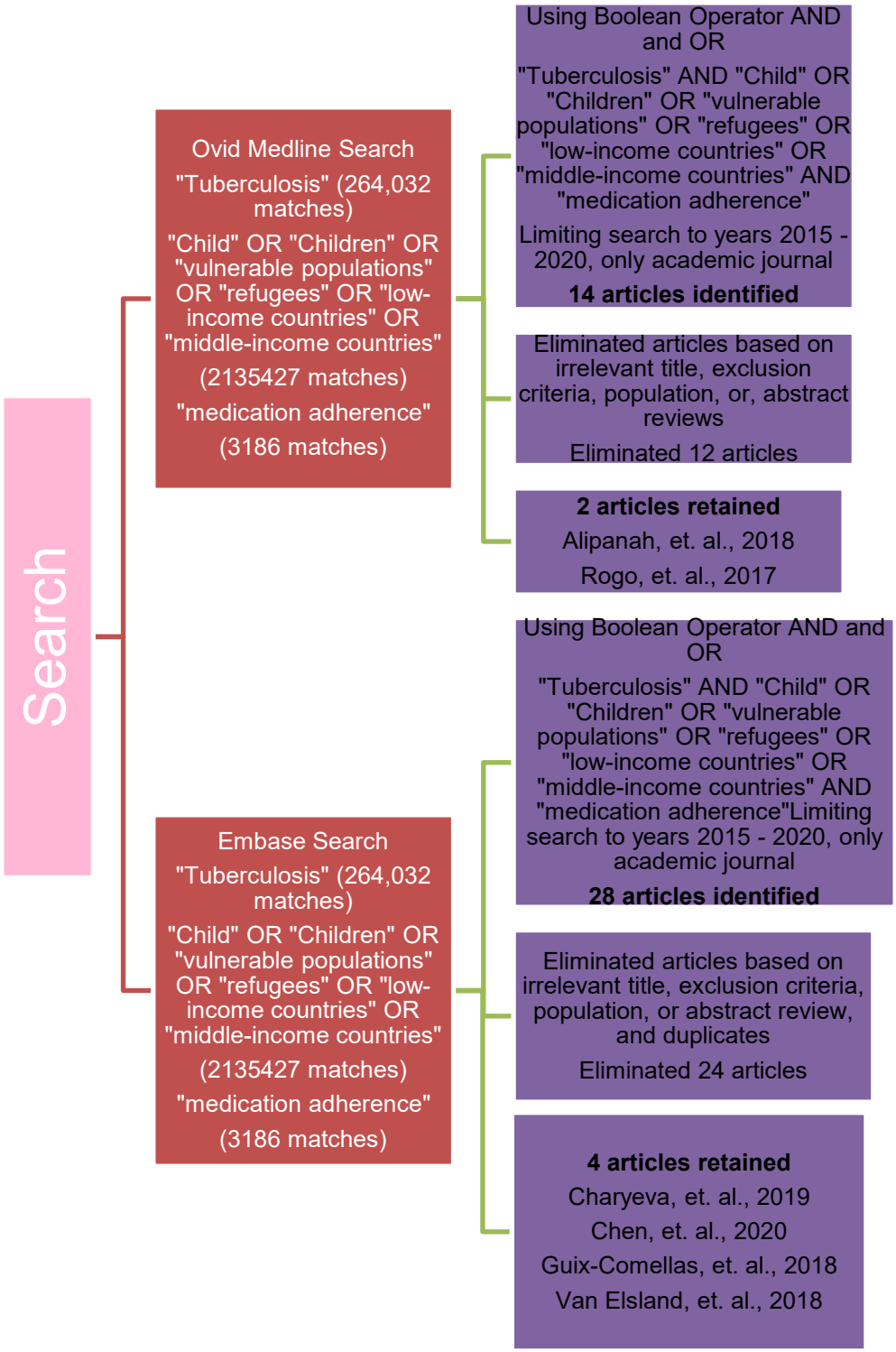
tuberculous meningitis. *Tropical Medicine & International Health*, *23*(10), 1129-1140. https://doi.org/10.1111/tmi.13134

Tables and Figures

Figure 1. Search Strategy Figure


Search
Ovid Medline Search
"Tuberculosis" (264,032 matches)
"Child" OR "Children" OR "vulnerable populations" OR "refugees" OR "low-income countries" OR "middle-income countries" (2135427 matches)
"medication adherence" (3186 matches)
Using Boolean Operator AND and OR
"Tuberculosis" AND "Child" OR "Children" OR "vulnerable populations" OR "refugees" OR "low-income countries" OR "middle-income countries" AND "medication adherence"
Limiting search to years 2015 - 2020, only academic journal
14 articles identified
Eliminated articles based on irrelevant title, exclusion criteria, population, or, abstract reviews
Eliminated 12 articles
2 articles retained
Alipanah, et. al., 2018
Rogo, et. al., 2017
Embase Search
"Tuberculosis" (264,032 matches)
"Child" OR "Children" OR "vulnerable populations" OR "refugees" OR "low-income countries" OR "middle-income countries" (2135427 matches)
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Using Boolean Operator AND and OR
"Tuberculosis" AND "Child" OR "Children" OR "vulnerable populations" OR "refugees" OR "low-income countries" OR "middle-income countries" AND "medication adherence"Limiting search to years 2015 - 2020, only academic journal
28 articles identified
Eliminated articles based on irrelevant title, exclusion criteria, population, or abstract review, and duplicates
Eliminated 24 articles
4 articles retained
Charyeva, et. al., 2019
Chen, et. al., 2020
Guix-Comellas, et. al., 2018
Van Elsland, et. al., 2018

Tables

Table 1. PICOT Components

PICOT	(Alipanah, 2018)	(Charyeva, 2020)	(Chen, 2020)	(Van Elsland, 2020)	(Guix-Gomellas, 2018)	(Rogo, 2017)
Population: Tuberculosis patients living in vulnerable populations	Adults or children who currently undergoing current TB active treatment	Tuberculosis patients (adult male and female) undergoing treatment in Ukraine.	Newly diagnosed TB patients in Dalian, north-eastern China	Caregivers and TBM (Tuberculosis Meningitis) patients aged 0-14 years old.	Children and young people with tuberculosis less than 18 years old.	Patients with LTBI (Latent Tuberculosis Infection) aged 1-18 years old who are refugees in Rhode Island.
Intervention: Social Support (SS) and nurse-led interventions	Directly observed therapy (DOT) such as: reminders and tracers, incentives and enablers, patient education, digital technologies, staff education, and combination of these interventions. This relates to	Social Support Programs through daily home visits by nurses.	Family, society, and national policy support on antituberculosis medication adherence through cross-sectional survey	Local standard care and non-digital treatment support intervention such as Short Messaging Service to increase patient's medication adherence	Two-step nurse-led intervention: educational (written information in child's native language and follow-up telephone calls) and monitoring (Eidus-Hamilton test and follow-up questionnaire)	Follow-up and social support for refugees undergoing tuberculosis treatment. This study analyzes whether there are socioeconomic factors that affect antituberculosis medication adherence in the refugee population.

	my intervention of increasing social support and nurse (or staff)-led intervention for antituberculosis patients through a more direct and low-cost, culturally appropriate approach.					
Comparison: Tuberculosis patients not receiving Social Support and nurse-led intervention	Self-administered therapy (SAT) without psycho-emotional and socio-economic support.	No comparison is provided in this study.	No comparison is provided in the study.	Only local standard care.	Antituberculosis patients less than 18 years old not receiving nurse-led interventions.	Non-refugees undergoing tuberculosis treatment.
Outcome(s): Completion of a full course antituberculosis treatment	Higher rates of medication compliance for tuberculosis patients who received Directly Observed Therapy (DOT) measured by various internal and external	Home-visits result in increasing tuberculosis treatment adherence and completion	Family support, spiritual encouragement, good provider-patient relationship, patient knowledge, and policy support increased patient's rate of medication	Non-digital treatment that is also low-cost and culturally friendly increase pediatric patients' adherence to medication regimen. Medication	Adherence and completion increased to 87.8% after nurse-led intervention. Non-adherence is associated mostly in immigrant born abroad or have	Refugees attended more scheduled visits than non-refugees and appropriate pill counts of 270 pills that indicate medication adherence.

	control groups in this meta-analysis study.		adherence. Adherence is measured by MMAS-8.	adherence is measured through drug assay urine test of rifampicin. Red/orange indicates medication adherence.	families living abroad.	
Timing	No timing is provided.	August to September 2016 for interviews. Timing for research analysis is not mentioned.	September 2019 to January 2020	September 2012 to September 2013	2011 to 2016	August 2009 to September 2011

Table 2. Critical Appraisal

Author (Year):	Study Purpose or Aim	Population (Sample)	Setting	Research Design	Intervention	Comparison	Findings or Outcomes	Timing	Appraisal Rating
Alipanah (2018)	Tuberculosis, one of the leading global health problems, remains the leading cause of	All adults or children undergoing current active TB treatment, identified in 129 articles.	Various settings.	Systematic review and meta-analysis of trials and observational studies	Directly observed therapy (DOT), reminders and tracers, incentives and enablers, patient education,	Self-administered therapy (SAT)	• Self-administered therapy (SAT) has lower rates of treatment success. • Public health interventions are necessary to provide resources		1a

	death caused by a single pathogen. Long-course of tuberculosis treatment causes low rate of medication adherence. This study aims to explore various public health programs to encourage medication adherence for tuberculo				digital technologies (Short Message Services via mobiles phones and video-observed therapy), staff education, and combination of these interventions.		overcome individual challenges in completing treatment. • Patient-centered support interventions can improve tuberculosis control efforts.		

	sis patients.								
(Charyeva, 2019)	Analyzing the efficacy of Social Support (SS) to improve antituberculosis medication adherence in Ukraine.	21 patients and 11 social support program providers/ nurses from 4 cities in from 2 regions in Ukraine (Odessa and Dnipropetrovsk).	Outpatient TB treatment at Ukrainian Red Cross Society (URCS) and a TB health facility.	Qualitative study. The study was conducted through the In-Depth Interviews (IDI) method.	Social Support programs, such as daily home visits by nurses and direct observation treatment.	No comparison was made in the study.	• URCS social support programs are successful in increasing tuberculosis treatment adherence and completion, including high risk patients. • Nurses are paramount in these programs due to their commitment and qualities of social support that they provided. • Specific barriers to treatment adherence need to be assessed on a case-to-case basis for high risk patients.	-	4a
(Chen, 2020)	To analyze	48 newly diagnosed	Outpatient	Cross-sectional	Providing outpatient	No comparison	• Level of non-adherence was	September 2019	3a

	TB treatment adherence in Dalian, north-eastern China, and assess the effects of support from family, society, and national policy to TB treatment adherence.	adult TB patients in Dalian, north-eastern China.	department at Dalian Tuberculosis Hospital.	study to then be assessed using Chi-square tests and Fisher's exact tests. Logistic regression analysis was used to compile factors that predict adherence.	TB patients with undergoing treatments with family, society, and national policy support through a conducted survey.	was made in the study.	especially high among newly diagnosed TB patients. • Family support, spiritual encouragement, good doctor-patient relationship, increased TB-related knowledge in patients, and policy support contributed to high level of medication adherence. • Side-effects of the medication affect ($p < 0.05$), family support ($p < 0.05$), good doctor-patient relationship ($p < 0.05$), awareness of national policy support ($p < 0.05$) affect antituberculosis	to January 2020.	

							medication adherence.		
(Van Elsland, 2020)	To analyze the efficacy of non-digital treatment-support intervention in pediatric tuberculosis meningitis patient through home-based treatment in South Africa.	100 caregivers and the patients with TBM (aged 0-14 years old) who were admitted to For the purpose of this research, analysis will be focused on TBM pediatrics patients.	Tygerberg Hospital and continued to home-setting when patient was discharged on home-based treatment.	Randomized Controlled Trial (RCT) study. Outcomes are measured through 3 and 30-day self-report, RMP urine color, INH urine IsoScreen, PZA saliva HPLC health-related quality of life, family impact and problems.	Local standard care and non-digital treatment-support intervention.	Only local standard care.	• Non-digital treatment support which are also low-cost and culturally friendly showed significant results in increasing pediatric patients' adherence to antituberculosis medication regimen. • Adherence to medication regimen is a dynamic process, in which routinization needs to be implemented through anticipatory behaviors. • Socioeconomic background of	September 2012 to September 2013	2a

							the family, such as family income, affect the patient's medication adherence (p = 0.040)		
(Guix-Comellas, 2018)	To analyze the effectiveness of nurse-led interventions to increase antituberculosis medication adherence in patients < 18 years old	Children and young adults < 18 years old taking antituberculosis medications.	Outpatient TB Unit of a tertiary-care pediatric center in Catanolia, Spain	Non-randomized controlled trial	Two-step nurse-led intervention: educational (written information in patient's native language and follow-up call) and monitoring (Eidus-Hamilton test and follow-up questionnaire)	Patients only receiving Phase 1 (educational)	• Adherence to antituberculosis patient increased from 74.7% in Phase 1 to 87.8% in Phase 2. • P values= 0.014 (chi-square test)	2011 to 2016	2a
(Rogo, 2017)	To assess and evaluate factors that relate to the	120 patients with LTBI (Latent Tuberculosis Infection),	Pediatric Tuberculosis Clinic at Hasbro	Retrospective review	Follow-up and social support for refugees undergoing tuberculosis treatment.	Non-refugees undergoing tuberculosis treatment.	• Refugees attended more scheduled visits compared to non-refugees.	August 2009 – September 2011	4b

	adherence of patients to tuberculosis treatment in refugee and non-refugee children in Rhode Island	age 1-18 years old 93% were foreign-born and 30% were refugees.	Children's Hospital (HCH).				• Nurses and Community Health Workers (CHW) have significant impact to increasing follow-up visits for tuberculosis patients. • Patient population with higher rates of treatment completions were "female, referred within the same hospital system, used an interpreter, and did not report any side effects" (Rogo, et. al., 2017)		