Integrating Tuberculosis Services in Primary Health Care

Evidence Summary

July, 2017

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Purpose of the Document

The document presents a brief summary of best international practices in providing Tuberculosis (TB) services within Primary Health Care (PHC) in Low and Middle Income Countries (LMIC), and High-Income Countries (HIC). The summary is based on the review of the latest interventions and evidence reports from 2007-2017. The review is suitable for a wide audience including policy makers, healthcare researchers and health managers interested in learning more about tuberculosis management in primary health care. Full resources could be accessed at: https://goo.gl/K9V4NS

To access the shared library, please go to Zotero platform and register on the link. After that you will be able to access the full set of the resources used in the document.

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Background

Since the declaration of Alma-Ata on Primary Health Care in 1978, health systems worldwide have been developing better integration between levels of care to ensure patient-centered care which prioritizes the needs of patients and their families. To improve the performance of TB control program, many countries have started the process of integrating Primary Heath Care (PHC) providers in TB control in order to deliver better patient-centered care. In most middle income countries like Georgia, participation of primary care providers is still limited, and their full potential is underutilized [1]. This literature review looks at the evidence from other HICs and LMICs regarding their experience in integrating vertical TB program into PHC, and presents lessons learned and best practices.

Why PHC?

The 2006 Stop TB Strategy emphasized that progress in TB elimination requires efforts to engage all care providers. This was further reiterated in the 2015 End TB Strategy, and in 2015 WHO resolution of Universal Health Coverage [2–4].

PHC centers (operated by a general practitioner (GP), or family doctor) are ideal sites for participating in patient-centered[1] TB control due to their geographic accessibility to patients, capacity to simultaneously address a wide range of health conditions, their maintenance of confidentiality and gate-keeping role in optimizing health system workload [5]. In the process of integration of PHC providers, countries aim to utilize the unique capacity of PHC to:

1. **Gather Holistic Patient Health Record and Manage Co-morbidities**

General practitioners are well suited to investigate patient disease history and identify additional health risk factors and co-morbidities that require special attention during TB treatment [6–8]. Family doctors can monitor adverse reactions to anti-tuberculosis drugs and refer a patient to health specialists or social services in a timely manner to prevent defaulting behaviors.

2. **Improve TB Case Notification through Opportunistic Diagnosis**

As patients' first contact point general practitioners are instrumental in early TB detection. GPs are encouraged to practice "Think TB" approach, whereby they pay close attention to TB symptoms and refer suspects for diagnostic, starting a patient on a pathway into TB care system [9]. Most recently, higher income countries have started to build capacity for latent TB screening at PHC facilities [7,10–12].

3. **Empower of patients to treat TB**

General practitioners also have the capacity to work more closely with the patient to demystify stigma regarding TB as well as provide education about TB treatment [13]. As a gatekeeper, GP can analyze each patient's needs and direct them to relevant social services and resources from Civil Society Organizations' (CSOs) [7,14,15]. Family doctors can also use their rapport with patients to encourage them to stay on TB treatment, and offer additional psycho-emotional support which proves to be crucial for treatment adherence.

[1] "*considers the patient as the central figure in the process or continuum of care,*" connecting the patients to the networks of "*social capital and social suppor*t" [5,39].

Challenges of PHC Participation in TB Care in Georgia

Georgia has achieved remarkable gains in the management of TB in recent years. In majority of cases outpatient TB service provision has been decentralized into general primary care units where TB doctors and nurses deliver TB services as part of the national TB program. While most of the former standalone TB dispensaries were structurally integrated into single PHC centers in Georgia, horizontal integration between the TB program and PHC has been poor, with remaining challenges in TB control, such as:

- Lack of horizontal integration of general PHC services with any vertical programs resulting in defragmentation of health care;
- Poor management of side-effects and co-morbidities at the PHC level, resulting in poor TB treatment adherence;
- Geographic access barriers in TB outpatient treatment among capital city residents due to lack of structural integration of TB services with PHC and limited number of standalone TB outpatient facilities;
- Poor understanding of PHC workers' capacity to absorb new responsibilities with regards to TB management;
- Shortcomings in public-private partnership regulations that undermines sustainability of continuation of TB services[2];
- Generally low utilization of PHC services: health system arrangements under the state funded schemes do not encourage family doctors to perform their gatekeeping role, resulting in high referral to specialists and to secondary level. In addition population's early care seeking behavior is poor and due to lack of appreciation of PHC services they tend to seek care directly with specialists at higher level.

[2] The agreement which obliges private service providers to provide TB services expires in 2018

Box 1. Methods for Evidence Review

Search was conducted within titles and abstracts in PubMed, Cochrane Library, and Google Search using combinations of search terms around tuberculosis, primary care, integration, general and family practice with a period restriction from 2007-2017. Gray literature was scored according to modified AACODS tool, and most relevant documents were retained. Data was extracted into a standardized excel sheet.

PubMed search yielded 111 results, and Cochrane Library 343. After removal of duplicates, and careful analysis of final search results, a total of 62 documents was reviewed and 34 cited in the following summary. 19 most relevant cases are included for detailed review in the appendix. The review included extensive analysis of grey literature. A total of 26 sources was reviewed and scored using the AACODS tool, after which 10 relevant studies were cited in the review.

Main Models of PHC Engagement in TB Care

Depending on healthcare system set-up, different countries have begun to involve PHC providers in TB control. Regardless of specifics of each country's model, all countries manage TB at PHC based on a variation of "cascade of care" approach, whereby TB specialist works together with general practitioner, managing TB in a coordinated and bidirectional manner. All health systems retain TB specialists responsible for clinical management and treatment oversight, while PHC providers are given additional supportive functions in TB control, and their roles vary by country. Some countries emphasize strengthening diagnostic capacity and improving patient follow-up at the PHC level (Norway, UK, Taiwan), while others include provision of DOT and elements of case-management into the role of general practitioner (Romania, Turkey, India).

1. Multi-disciplinary TB teams

Due to various social determinants underlying the disease and complex needs of TB patients, successful TB management requires a multidisciplinary approach. Several countries, including United Kingdom and Norway have achieved rather successful TB management in multidisciplinary teams (MDT), providing comprehensive and patient-centered care. MDT usually consists of professionals with a mix of skills to meet the needs of TB patients, especially those with more complex MDR-TB who require additional psycho-emotional and clinical support [10]. In the **UK** and **Norway**, MDT includes TB lead physician, case manager (usually a TB nurse directly accessible to both TB doctor and patient), general practitioners, social worker, specialized doctors per patient need, a peer supporter and a psychologist. In this model, primary care clinicians provide early TB

identification and referral to TB specialist who confirms diagnosis, after which the team together with the patient develops a care plan which is implemented at the PHC level (OECD/WHO 2011). In the UK, TB specialist also provides training, supervision, monitoring and evaluation of TB care at the PHC level. At the PHC level, the work of general practitioner is supported by multi-disciplinary specialists (including psychologist and pharmacist) who treat co-morbidities and side-effects from anti-TB drugs ("Collaborative Tuberculosis Strategy for England 2015-2020"). In addition, TB teams in UK and Norway also include family members, patients, and representatives of social services (if requested) in the preparation of individual care plans to provide psycho-emotional support to patients and achieve maximum treatment adherence. While UK and Norway have achieved high TB treatment success rates, these countries still struggle with sub-optimal early detection of TB cases at the PHC level. Most recent recommendations for both Norway and UK emphasize the need to improve training among general practitioners in case detection and foster better collaboration of PHC sector with social services and civil society organizations to reach most vulnerable patients [10,16]. Similar trend in TB control program is noted in **Canada** which emphasizes the importance of primary health clinicians in TB elimination. While general practitioners are not given responsibility for clinical TB treatment, they play crucial role in early identification and referral of TB cases to specialized facilities, as well as screening and treatment of latent TB [17]. It should be noted that such model works well in countries with low TB burden, where the system can mobilize resources around those few cases of active TB, meaning that this model may not be directly replicable in transitory health systems.

2. Japanese Public-Private Mix DOTS

In the early 2000s, Japanese pursued a so-called "T" model of TB control program, by increasing the number of inpatient beds as part of the vertical structure while simultaneously encouraging general practitioners at outpatient health centers to deliver DOTS through horizontal integration. In the "T-shaped" approach, the disease-specific program and general health strengthening activities are two systems—lines—that depend on each other (Takemi 2015). "T-shaped" approach, also known as "Think PHC, do TB," emphasized the importance of strong infectious disease control measures though inpatient treatment together with effective referral network of general physicians who are accessible for DOTS in the community [20]. In the Japanese public-private mix, private outpatient health centers operated by general practitioners were contracted to deliver TB treatment and equipped with diagnostic technology [21]. To ensure quality of TB treatment, TB advisory committee was set up in each private health center and included two TB specialists overseeing TB treatment. In this model, general physicians could treat TB after the approval of treatment plan by the health

center TB committee. General physicians were able to prescribe anti-TB drugs monthly and observe patient's treatment adherence. They also coordinated with primary health nurse at health centers to monitor patient's follow-up and treatment progress [22,23]. MDR-TB prevalence has been on decline in Japan, and largely credited to successful implementation of Japanese DOTS strategy. However, several challenges remain and need to be addressed, including lack of sufficient number of trained physicians who work with TB, poor remuneration for TB services leading to loss of health workers motivated to work with TB, and weak TB boards that lack referral mechanisms to higher level facilities [22]. It is worth noting that success of TB control in Japan was largely facilitated by several external factors unique to Japan in the aftermath of the World War II. Specifically, stronger workforce of trusted general practitioners with a wider expertise enabled Japan to tap into pre-existing capacity of family doctors to treat more complex conditions like TB (Mori & Kobayashi 2009; Seita 2017; Katsuda et al. 2015).

3. TB management in General Practice in Middle Income Countries

However, health systems of most middle income countries are still in transition, and countries experiment with different variations of integrated TB management. In **Romania**, there was an effort to delegate comprehensive TB management to general practitioners, including the responsibility of DOT, and provision of psychological support. The role of a family physician in Romania, as outlined in the National Program for Control of Tuberculosis (NPCP), includes the task of "*identifying TB suspects and contacts, to administer anti-tuberculosis medication under direct surveillance, to take part in the epidemiologic investigation and to contribute to the health care education of contacts*" (Acs & Simona 2012; Laszlo et al. 2017). However, most recent health reports suggest that gatekeeping role of family doctors in TB case management is still limited, since family doctors refer only 15-30% of patients to TB specialists from compared to 25-35% who go to hospital directly (Ciutan, Dosius & Oanca 2016). Recognizing underutilization of the capacity of family doctors which is stimulated by the financial arrangement that incentivizes hospital care, Romania commissioned a working group to develop a performance-based TB model to align health resources with patient need. Under the proposed scheme, TB is included in the package of basic services reimbursable to family doctors as outcome-related fee for service plus age-weighted capitation fee. It is recommended to ensure that reimbursement to family doctors is commensurate to workload and comparable to payments for non-TB services to avoid dis-incentivizing other care. In addition, awards should include non-financial appraisals to encourage health workers' inherent

motivation and commitment. In terms of management, TB care should be provided by a team consisting of TB specialists, family doctors, and social workers under supervision at TB-specialized facilities. All members of the team should be trained to perform their new roles, and develop multidisciplinary team work and communication skills. Finally, it is emphasized that integration should include use of information management system shared by all providers [6].

Since 2012, performance-based scheme for PHC providers is also practiced in **Moldova**, where family doctors have responsibilities in TB control such as identification and referral of presumptive TB patients to TB specialist from the National TB program, screening TB contacts and risk groups, DOT, and tracing patients lost to follow-up. Structurally, family doctors are not accountable to hospital directors at the municipality and district levels. While TB doctors are still administratively accountable to district hospital directors, operationally they are linked to family doctors. The latest results-based reimbursement model consisted of 85% of salary based on a capitation fee and 15% paid based on performance, measured by the number of people screen for TB, the number of diagnosed TB cases, and the number of treated cases. However, 2013 review of the national TB program found that performance pay was too low and divided among all family medicine providers, which made the incentive scheme unproductive (Colombani et al 2013).

Taiwan also tried a results-based financing scheme for primary care providers delivering TB treatment. In **Taiwan**, vertical TB program was completely phased out and fully integrated into primary health care, enabling patients to receive anti-TB drugs in all private or public clinics with at least one TB specialist [26,27]. A 2015 retrospective study which evaluated Taiwanese pay-for-performance (P4P) program demonstrated higher treatment success rate and lower loss to follow-up among P4P participants [27]. However, another 2015 study found increase in Health System Delay, or the time between diagnosis and treatment initiation, since the start of the reform, citing lack of sufficient TB expertise among general clinicians [26]. Simultaneously, Lee et al found that well-managed information sharing system can be instrumental in improving integrated case-management. In Taiwan, a successfully launched “information integrated platform" allowed all members of TB management team to update and monitor patient information such as follow-up activities and notices of adverse reactions, holding team members informed and accountable for required action steps in each case [27]. With mixed successes and challenges, it is concluded that general health system is not sufficiently prepared to provide TB control in Taiwan, and requires on-going trainings along with improved referral system between primary care clinics and specialized TB centers [26].

In line with 2006 WHO Stop TB strategy which endorses PHC engagement in TB control, **Serbia** also integrated former TB dispensaries into PHC units. Similar to Romania and Moldova, general practitioner became formally responsible for TB identification, DOT and side-effects observation. Quite uniquely, family doctor also has the right of prescribing anti-TB drugs in Serbia, and can transfer this responsibility to a TB specialist. However, a 2015 study of PHC participation in TB control in Serbia found that despite formally expanded roles of PHC providers, PHC centers performed only passive TB detection and selective treatment of co-morbidities, while none of the centers performed DOT or monitored side-effects [1]. Moreover, it was noted that PHC centers in Belgrade do not give TB specialist the authority of prescribing TB drugs, which, according to the TB Institute, negatively affects treatment monitoring and might result in treatment default [1].

Since 2010, **Turkey** also rolled out family medicine practice, whereby responsibility for TB surveillance was transferred from TB dispensaries to family health care centers in which family physicians took up comprehensive TB management roles including DOT, contact investigation, dealing with noncompliance and adverse reactions (Aydemir 2015; Yasin & Karabey 2016). Such transition has not been successful yet, with studies revealing lack of expertise among family doctors to diagnose TB accurately and treat patients appropriately (Yasin & Karabey 2016). In addition, transition to family medicine increased salary of family physicians, while salaries of TB doctors remained twice as low, causing tension among health workers [28].

Knowledge gaps in TB among PHC health workers have been cited in several studies on **Brazil**. In Brazil, TB is managed by PHC generalist teams comprised of a general doctor, nurse, and Community Health Worker (CHW) at Family Health Units who are responsible for TB diagnosis and treatment including DOTs, and supported by municipal TB program staff. While in some municipalities of Brazil, formal integration of TB activities in Family Health Units has increased PHC utilization thus improving access to treatment, service quality has remained low [30]. Several studies indicate lack of well-trained health professionals at PHC level resulting in poor PHC integration and treatment at predominantly specialized TB centers (Silva-Sobrinho et al. 2014; Wysocki et al. 2017; Villa et al. 2011; Villa & Ruffino-Netto 2009).

Lessons learned

Since TB treatment requires specialized knowledge, most reports clearly emphasize the need to retain TB specialists with sound expertise in TB control, working alongside general practitioners.

Collective experiences of other countries suggest that successful TB management requires commitment of health system managers and strong coordination and continuity between all levels of health care [30]. Several studies emphasize the need for on-going training of all members of TB team, both in TB clinical practices and in team management and communication (Wysocki et al. 2017; Cs Villa et al. 2011; Chen et al, Aydemir 2015). To improve coordination between all members, it is recommended that trainings focus not only on specific skills of each professional, but on developing techniques of effective team collaboration [33]. Evidence from **Brazil** stresses the importance of training not just among PHC health workers, but also among health managers. A 2014 study on ambivalence regarding TB control in PHC in Brazil found that lack of commitment and training among managers to support PHC integration undermined motivation of PHC staff to engage in TB activities (Silva-Sobrinho et al. 2014). In addition, several reports recommend designing PHC-integrated TB models in a way that foster culture of continuous institutional learning and team work improvement in the spirit of "permanent health education" [33].

A consistent challenge in achieving effective horizontal collaboration appeared in the lack of clearly articulated responsibilities of all health workers involved in TB control. Studies on **Brazil, Turkey, Serbia and Romania** found that missing clarity about new roles within integrated system resulted in diluted responsibilities and lack of commitment among health workers, contributing to poor case management. Furthermore, Sa et al also found that poor coordination between PHC staff and TB specialists can weaken social bonds between health workers and patients, undermining their credibility in PHC providers. Recommendations for general practitioners treating TB in the UK also warn that roles in TB management can overlap between PHC workers and TB specialists based on the specifics of each health unit, urging TB teams to clarify and modifies roles as needed to achieve patient-centered care [10,18]. As the evidence from Brazil and Taiwan suggests, it is also essential to ensure that PHC providers and TB specialists have access to updated medical records to prevent fragmentation of care or duplication of activities [27,35].

Several studies also cite that poor engagement of family members and civil society as well as lack of programmatic input from PHC providers and TB patients undermine potential for comprehensive care at PHC level, and result in poor treatment adherence [6,33,36].

Aside from structural and logistical barriers to TB integration, cultural attitudes regarding primary healthcare may add additional challenges. A 2010-2011 qualitative study with 21 private practitioners in **India** offered several insights regarding their perceptions of their role in the Private-Public Mix TB program (Salve et al 2016). Since 2002, India piloted and scaled up nation-

wide Private-Public Mix (PPM) DOTS models, engaging private general practitioners in the TB program. Depending on the capacity of private practitioners (PPs), they could get involved as DOT providers only or take up additional activities such as referring TB suspects for diagnosis and treatment at specialized TB centers. One of the major findings revealed that private practitioners felt that their uniqueness as primary care providers was compromised and their expertise undervalued as a result of instructions from the TB program. Specifically, PPs expressed their opinion that they had "little flexibility" in TB management, while they were ready to "go beyond DOTS provision" (Salve et al 2016). Lack of powers to treat TB by themselves, as well as the requirement to follow the instructions from TB center even when they had correct professional judgement about suspected TB cases, made them feel undervalued within TB program. As a result, primary care practitioners gradually stopped referring suspect patients. Meanwhile, PPs also highlighted that the PPM program focused too much on the disease, which prevented them from attending to side-effects and holistic patient condition which they prioritize as primary care providers. The experience of the Indian model of private practitioners' engagement in the TB program shows the need for involving PHC providers as partners, and finding a model that would empower them to exercise their unique roles as general physicians while collaborating with TB specialists.

Evidences from **Brazil** and **South Africa** suggest that PHC providers may resist taking more responsibilities for TB treatment. In Brazil, family doctors resisted DOT as "labor-intensive and paternalistic," and in South Africa they maintained that TB care was the responsibility of specialists [5,31,32]. From patient perspective, it is common among middle-income countries with good access to health specialists to bypass PHC due to perceptions that PHC providers are less qualified than specialists. Furthermore, evidence from Brazil also suggests that lack of uniformity in TB service provision and limited working hours among PHC facilities can undermine patients' credibility in primary care [30,38]. To address these challenges, it is recommended to add systematic public awareness activities in collaboration with civil society and other non-health sectors to make PHC services more acceptable among the population. This suggestion should be taken with a note of caution, bearing in mind that first, primary health services should be truly accessible to patients in order to avoid public disillusionment with PHC care.

Box 2. Major Lessons Learned

- Ensure that TB care in PHC is managed in close collaboration with TB specialist to ensure correct diagnosis and treatment;
- Foster multi-disciplinary TB management to improve treatment adherence;
- Develop strong coordination and continuity between all levels of health care to improve case management;
- Ensure commitment of health managers to avoid dis-empowering health workers entrusted with roles that they cannot perform well;
- Provide on-going training for all members of TB team, including medical specialists and health managers to ensure quality of care;
- Emphasize team building and communication skills in training workshops to improve case-management;
- Establish clear roles for all TB team members, and ensure mutual understanding and acceptance of these roles;
- Avoid strictly hierarchical relationships, and position general practitioners and TB specialists as partners in team management to avoid inter-professional competition;
- Develop adequate financing modalities to ensure motivating and equitable reimbursement for TB activities;
- Conduct regular auditing to ensure uniformity and consistency of service quality;
- Include patients and family members in treatment plan design to find most acceptable form of TB care;
- Ensure that PHC providers and all TB team members have access to patient medical records to prevent duplication of activities and fragmentation of care;

Finally, successful transition of TB activities into PHC is impossible without adequate financial reallocations. Lessons from Romania, South Africa, Taiwan and Turkey indicate that it is important to ensure that reimbursement for TB activities is equitable between family physicians and TB specialists, and payment is commensurate with workload to not disincentive family doctors from

treating TB. To improve quality of services at PHC level, results-based financing (RBF) scheme were introduced in Taiwan and Moldova, and a pilot scheme proposed in Romania. Although Taiwanese RBF scheme showed improvements in TB indicators, and study participants in Romania expressed acceptance of outcome-based incentives for TB teams, Moldova did not have significant impact from RBF model. This mixed evidence suggests that RBF schemes can improve quality of care, but only if accompanied by contextually-relevant financing mechanisms, with sufficient managerial commitment and human resources capacity [39].

Conclusions

Each country still has its challenges in fighting TB, yet international evidence shows that well-designed models of PHC engagement in TB activities can improve treatment access by improving access to TB treatment, increasing case notification and treatment success, as well as improving treatment adherence. Lessons from TB integration in PHC show that successful TB control requires holistic preparedness of the health system, including removal of structural barriers, adequate supply of well-trained human resources, managerial competency and multi-disciplinary approach to patient health. While effective TB management requires clinical management and treatment oversight by TB specialists, the extent of the roles given to family doctor or general practitioner in TB control depends on the underlying health system structure and cultural determinants which should inform the design of a unique, best-suited model for each country.

Annex 1: Evidence summary from key sources

Location	*Type of Study*	*PHC roles*	*Outcomes*	*Challenges*	*Recommendations*	*Source*
Japan		GP can treat a TB patient after presenting a treatment plan to the health center. Government-subsidized Japanese version of DOTs, whereby general practitioners were encouraged to provide DOT at health clinics with enhances liaising between HC and hospitals.	During the reform, between 1950 and 1970, Japan achieved one of the most rapid declines of tuberculosis mortality in the world from: almost 12% annual reduction.	The number of doctors or physicians who provide DOTs at outpatient facilities is still scarce due poor remuneration for the provision of TB services. The TB boards of the health centers are poorly managed, with functioning mechanism for referring a patient for higher level facility and specialized services.		Mori, Toru, and Noriko Kobayashi. 2009. "Tuberculosis Treatment in Japan: Problems and Perspectives — How to Expand the Japanese Version of DOTS —." JMAJ 52 (2): 112–16. https://www.med.or.jp/english/journal/pdf/2009_02/112_116.pdf.

		In 1950, japan took an intermediate approach between horizontal and vertical integration, called "integration-based scale-up" based on "Think PHC, do TB" philosophy. They scaled up the number of hospital beds (to treat more severe cases), and extended the number of general practitioners who diagnosed and delivered DOTs at outpatient health centers.			The success was possible to unique to Japan factors, like strong network of general physicians, financial resource availability and political stability, which may not be the case for transitory countries.	Akihiro Seita. Think PHC, Do TB: Integration based scale up of tuberculosis control in Japan. Harvard THChan Sch Public Heal. http://www.hsph.harvard.edu/takemi/RP217.htm. Accessed July 4, 2017.
Serbia	Cross-sectional study	Former TB dispensaries were integrated into PHC units. General practitioner (GP) refers patients to specialists, including for TB. Formal GP roles: implementation of anti-TB preventive measures, passive TB detection based on symptoms, community nursing visits to patients and their families, involvement in direct supervision of TB treatment and detection of adverse	While PHC centers performed passive TB detection and community nursing visits during treatment, none of the centers deal with side effects or directly supervised treatment. PHC practitioners prescribed anti-TB drugs in 55% of cases, treated co-morbidities	PHC centers in Belgrade did not transfer the responsibility for prescribing anti-TB drugs to TB specialists, possibly causing treatment default.	n/a	Stosic, Maja, Natasa Lazarevic, Vesna Kuruc, and Lidija Ristic. 2015. "Assessment of the Role of Primary Health Care in Tuberculosis Control in Serbia." Med Pregl 68 (9–10): 331–35. doi:10.2298/MPNS1510331S.

		effects, referral of vulnerable groups to TB specialist. GP has the exclusive right of prescribing drugs.	in 33% conducted early TB detection in 14% of the cases. The role of PHC providers in TB control is not aligned with the established regulatory framework.			
Romania	Review	Since 2005, PHC is involved in TB control. General practitioners are responsible for: passive and active TB detection, identification the TB suspects and contacts; DOT provision, administration of chemotherapeutic prophylaxis to contacts, patient education to increaser adherence, epidemiologic investigation, administration of later the BCG vaccine, anti-tobacco education.	n/a	n/a	n/a	Valeria, Á., & Simona, I. E. (2012). The Role of the General Practitioner in Detection and Control of Tuberculosis, 58(6), 485–489.

Romania	Report	n/a	Vertical organization of Romania health system forces patients to seek care at different specialized facilities to treat co-morbidities or side-effects. Study respondents demonstrated acceptance of multidisciplinary model of TB care, and outcome-based incentives for TB teams.	There difficulties in developing a uniform package of support for TB patients, although patient-centered approach requires flexibility regarding treatment options.	Staff multidisciplinary teams in the most cost-effective manner: hire licensed nurse driver and a psychologist rather than a full time driver and a doctor with responsibilities of a psychologists without proper psychological education. Adopt "cascade of care" approach in the management of TB case network, ensuring that all members of TB care team are clear about their roles and responsibilities.	Stillo, J., Turusbekova, N., & Consult, T. B. C. (2017). Romanian Integrated Community Support Services for Tuberculosis.

Romania	Report (intervention proposal)	It is proposed to create teams for TB control which should include hospital pulmonologist, dispensary pulmonologist, family doctor and social worker. Family doctors perform the following roles: screen patients for TB and refer to specialized facilities; coordinate with TB facility to ensure epidemiological investigation; decide on a patient care plan together with family and chose either DOT, coordinate the plan with Community Health Workers, ensure weekly follow up with patients to monitor adverse reactions, and provide timely referrals, coordinate with specialized TB facility, ensure that patients follow up with monthly visits to TB facility; investigate other co-pathologies, and refer patients to specialized services; identify	the model is newly implemented and has not been evaluated yet.	Only few doctors agree to provide DOT on the basis of goodwill or personal connections with referring TB doctor.	Ensure that reimbursement is commensurate with the workload, and compares to compensation that family doctors receive for other services to not disincentive them from treating TB.	WHO. 2017. "Improving Payment Mechanisms to Support a New Delivery Model for TB Care in Romania."

		other psycho-social needs and ensure that they are followed up by specialists; continue providing educational messages to TB patients; provide and monitor administration of TB drugs to the patients; Performance Based reimbursement model is proposed			
Norway	Report	Following the first two weeks in hospital, TB coordinator organizes a multidisciplinary team meeting to develop individual care plan for each TB patient. The team consists of: patient, relatives, physician and nurse from the ward, public health nurse, homecare nurse, TB coordinator.	DOT is mostly provided by municipal nurses at home, which is not welcome by some patients.	Diversify modalities of DOT by appointing general practitioner for direct observation. DOT should be adapted to individual needs. TB coordinator's function in coordinating treatment between a patient and health services is crucial to ensuring treatment	Report Joint ECDC / WHO Regional Office for Europe Tuberculosis country visit Norway. (2011).

					adherence and providing patient support.	
Brazil	Cross-sectional study	PHC role includes: active case finding, contact tracing, DOT	Due to decentralization, PHC is serving more than 50% of new TB cases.	Since PHC providers operate in limited hours and not always provide TB diagnostic and treatment, many people do not consider PHC as entry point for TB care.	The health systems must ensure that logistics and management components are in place for integration of TB care into PHC. Programmatic development should include community beliefs and wishes.	Bartholomay, P., Pelissari, D. M., de Araujo, W. N., Yadon, Z. E., & Heldal, E. (2016). Quality of tuberculosis care at different levels of health care in Brazil in 2013. Revista Panamericana de Salud Publica = Pan American Journal of Public Health, 39(1), 3–11.
Brazil	Report	TB is managed by PHC generalist teams comprised of a doctor, nurse and Community Health Worker (CHW) who are references for TB and are supported by	PHC health team are poorly committed to team work, and poorly integrated with one another.	Barriers to effective incorporation of TB program in PHC: resistance and turnover of professionals,	Ensure that all members of the team, including management (not only nurses) undergo ongoing	Wysocki, A. D., Ponce, M. A. Z., Brunello, M. E. F., Beraldo, A. A., Vendramini, S. H. F., Scatena, L. M., …

		municipal TB control program staff.		overload and lack of qualified human resources.	training. Establish new working relationships, redistributing functions and responsibilities among each health professional. Ensure that PHC staff has access to medical records to ensure efficiency and coordination between the levels of care.	Villa, T. C. S. (2017). Primary Health Care and tuberculosis: services evaluation. Revista Brasileira de Epidemiologia, 20(1), 161–175. https://doi.org/10.1590/1980-549720170001001 4
Brazil	Cross-sectional study	Generalist team provides TB care in Family Health Strategy Units, or Basic Health Units. Due to georgraphic diversity there are two models of TB control: 1. TB treatment remains centralized in TB reference centers; 2. TB activities are partly decentralized at PHC services.	Treatment is done only at TB control centers without partnership with PHC facilities.	Decentralization can result in diluted responsibilities, lack of commitment, fragmentation of treatment regimens and programs, difficulties to accomplish DOT and flaws in information systems capable of	Commitment of managers is necessary since the expansion of PHC alone does not guarantee sustainability of TB activities. PHC providers should be responsible for the inclusion of family	Cs Villa, T., Ruffino-Netto, A., Scatena, L. M., Andrade, R. L., Brunello, M. E., Nogueira, J. A., … Arakawa, T. (2011). Health services performance for TB treatment in Brazil: a cross-

		Overall, decentralization is insufficient.		providing reliable reports	members in TB patient care process. Specialized TB units should be responsible for training, monitoring and supervising TB care at PHC level. Incentives to improve care organization and management can improve performance of PHC.	sectional study. *BMC Health Services Research*, *11*, 241.
Brazil	Qualitative study	Organization of TB care through Family Health Strategy and Community Health Agents Program (PACS). DOTS were decentralized into Family Health Units.	Lack of intersectoral engagement	Lack of continued training hampered the efficiency of PHC units. Lack of well-managed intersectoral management can weaken social bonds between patients, community and health providers, and	All actors (PHC clinics, TB specialists, social services) should have clearly articulated responsibilities and established communication. Involve family for additional patient	Sá, L. D. de, Gomes, A. L. C., Nogueira, J. de A., Villa, T. C. S., Souza, K. M. J. de, & Palha, P. F. (2011). Intersectorality and bonding in tuberculosis control in Family Health. Revista Latino-Americana

				undermine credibility in provider's capacity.	support. Ensure the participation of civil society. Investigate co-morbidities, and integrate other sectors in PHC units (mental health, drug/alcohol abuse). Ensure that training focuses on team performance besides considering the specific skills of each professional.	de Enfermagem, 19(2), 387–395. https://doi.org/10.1590/S0104-11692011000200022
Brazil	Qualitative study	PHC centers are given responsibility to: diagnosis, treat and monitor patients through medical consultations, provide nursing consultations, and DOT.	Even after trainings, PHC centers continued referring suspected or newly diagnosed TB cases to specialized TB outpatient facilities.	Managers do not have sufficient training to assist in decentralization. Logistical, structural barriers as well as lack of human resources prevent PHC staff from delivering adequate treatment,	Emphasize managerial training.	Silva-Sobrinho, R. A., Zilly, A., Monroe, A. A., Pinto, É. S. G., Silva, R. M. M. da, & Villa, T. C. S. (2014). Ambivalence regarding tuberculosis control actions in primary health care. Northeast

				undermining their motivation.		Network Nursing Journal, 15(4). https://doi.org/10.15253/REVRENE.V15I4.4888
United Kingdom	Online course	General practitioner is responsible for: early TB case finding, LBTI testing for new entrants in PHC with IGRA test, monitoring liver function and side-effects, informing TB specialists about co-morbidities and other treatments that may interfere with anti-TB drugs. GPs assist in identifying risk group patients and are crucial in adherence support. In a bigger family clinic, selected GP can become a TB lead and provide consultations to other GPs. Based on patient preference, GPs can deliver DOT in consultation with the TB specialist. GPs help demystify the condition and treatment,	n/a	n/a	Ensure coordination with the TB specialist. Under supervision of TB specialist, modify the role of GP as needed in order to provide patient-centered care.	Royal College of General Practitioners (RCGP Learning). (2016) "Tuberculosis in General Practice." Online course. Retrieved online (requires registration): http://elearning.rcgp.org.uk/course/view.php?id=107

		and provide on-going education to patients.				
United Kingdom	Report	Primary care clinicians provide active early TB identification, while the TB specialists confirms diagnosis and develops care plan. Upon diagnosis PHC doctor works with specialized TB multidisciplinary team which includes TB doctor, specialized doctors per patient need, HIV team, pediatrician, nurses, microbiologist. The team discusses issues with TB cases fortnightly. Provincial TB services sometimes join via video conference.	n/a	n/a	The effective delivery of TB services requires cooperation between all level of care, public health, social services and third sector organizations working with groups at increased risk.	British Thoracic Soviety (2014). *Defining a Model for a Gold Standard for a TB Multidisciplinary Group and Associated Networks*.

Taiwan	Thesis	In 2001, Taiwan undertook complete phasing out of vertical TB program, and its full integration into general hospitals. CDC took over public health function of the national TB program. Medical officers and senior nurses were assigned as supervisors for each county/city. They reviewed records of TB cases and provided advice to general clinicians. Clinicians in general clinics became responsible for TB diagnosis and treatment.	Despite significant improvements in TB epidemic, the study found that in the beginning of health system transportation, TB diagnostic quality was unsatisfactory and anti-TB drugs prescribing practices were substandard.	n/a	Conduct regular clinical audits at PHC level to monitor TB activities.	Chen-yuan, C. (2012). *Integration of tuberculosis services in Taiwan , 2001 : challenges and opportunities*. University of Bergen.
Taiwan	Retrospective cohort study	Vertical TB program has been decentralized and horizontally integrated into primary health care.	Health System Delay (the time from initial consultation to treatment initiation) increased from 26 days in 2003 to 33.5 days in 2008, thereafter slightly decreased to 32 days in 2010.	Increased Health System Delay due to lack of sufficient TB expertise among general clinicians.	Countries that integrate TB care into PHC should be vigilant about HSD and monitor it. Educational activities among general practitioners and public should be ongoing.	Chen, C., Chiang, C., Pan, S., Wang, J., & Lin, H. (2015). Health system delay among patients with tuberculosis in Taiwan : 2003 – 2010. *BMC Infectious Diseases*, 1–9.

Taiwan	Population-based natural experimental design with intervention and comparison groups	Hospitals and clinics with at least one TB specialists were contracted to go under pay-for-performance program. Participating clinics received payments for TB treatment (differentiated from MDR-TB and DS-TB, and progressive scale based on the months of treatment adherence), as well as additional payments for complimentary services such as diagnosis, follow-up and education fees. The program also incentivized the use of "information integrated platform," which facilitated communication between public health agencies and healthcare institutions.	Patients enrolled in P4P program had higher treatment success rate and lower loss to follow up than those in control group.	n/a	Performance-based financial incentives could be a feasible model for improved TB control	Lee, C.-Y., Chi, M.-J., Yang, S.-L., Lo, H.-Y., & Cheng, S.-H. (2015). Using Financial Incentives to Improve the Care of Tuberculosis Patients. American Journal of Managed Care, 21(1)

Turkey	Qualitative study	In 2012, Turkey reduced the number of TB dispensaries and transferred the role of TB control to Family Health Centers. General practitioners became responsible for DOT, contact tracing, management of side-effects and treatment non-adherence.	Health staff at PHC were inexperienced regarding TB.	Transition to family medicine increased salary of family physicians, while salaries of TB doctors at dispensaries remained twice as low, which caused traction among health professionals. There was lack of agreement and understanding of the role of family clinics in TB control.	Remedy lack of knowledge of family physicians, include clear roles in TB control in the job descriptions of family physicians. Ensure equitable compensation for TB program staff and family physicians undertaking TB activities.	Aydemir, Y. (2015). Knowledge Level of Family Physicians about Tuberculosis and their Attitudes and Views Regarding their Willingness to Work at a Tuberculosis Dispensary, 166–171.
Uzbekistan	Report	National TB Program decentralized vertical TB program, and delegated nationwide provision of DOT to PHC facilities. Both family medicine and TB managers oversee TB care. PHC facilities report of 4 indicators: case detection, successful treatment, contact	TB care shifted into lower level settings making it more accessible to patients. The reform was followed by a decrease in the number of new TB cases between 2010 and 2014.	n/a	Align reforms with previous efforts in TB control. Ensure multi-sectoral partnership, including civil society and TB patients to add diverse expertise and programmatic input.	WHO Regional Office for Europe. (2016). *Lessons from transforming health services delivery: compendium of initiatives in the WHO European Region*.

	investigation and preventive service coverage.

References

1. Stosic M, Lazarevic N, Kuruc V, Ristic L. Assessment of the role of primary health care in tuberculosis control in Serbia. *Med Pregl*. 2015;68(9-10):331-335. doi:10.2298/MPNS1510331S.
2. WHO. *THE STOP TB STRATEGY: Building on and Enhancing DOTS to Meet the TB-Related Millennium Development Goals*.; 2006. http://apps.who.int/iris/bitstream/10665/69241/1/WHO_HTM_STB_2006.368_eng.pdf. Accessed July 10, 2017.
3. WHO. *The End TB Strategy: Global Strategy and Targets for Tuberculosis Prevention, Care and Control after 2015*.; 2015. http://www.who.int/tb/strategy/End_TB_Strategy.pdf?ua=1. Accessed July 10, 2017.
4. WHO. *Universal Health Coverage*. Regional Office for the Western Pacific; 2015. http://www.wpro.who.int/about/regional_committee/66/documents/wpr_rc66_06_uhc_7sep.pdf. Accessed July 10, 2017.
5. Mayers P. Nurses' experiences of guideline implementation in primary health care settings. 2010. https://scholar.sun.ac.za/handle/10019.1/1437.
6. WHO. *Improving Payment Mechanisms to Support a New Delivery Model for TB Care in Romania*.; 2017.
7. Harvard Medical School. *Stemming the Tide of Drug-Resistant Tuberculosis: Handbook on Best Practices for Clinical and Program Management of Drug-Resistant Tuberculosis: Lessons Learned from Global Fund to Fight AIDS, Tuberculosis, and Malaria TB Grants in Eastern Europe and Cent*. Vol 1. Dubai; 2016.
8. Ahamed N, Yurasova Y, Zaleskis R, Grzemska M, Reichman L, Mangura B. Brief Guide on Tuberculosis Control for Primary Health Care Providers. 2004:75.
9. Madhukar P. *Let's Talk TB: A Supplement to GP Clinics*. Second Edi.; 2016.
10. NICE. *NICE Guideline: Tuberculosis*.; 2016. www.nice.org.uk/guidance/ng33.
11. Pealing L, Moore D, Zenner D. The resurgence of tuberculosis and the implications for primary care. *Br J Gen Pr*. 2013;63(612):344-345. doi:10.3399/bjgp13X669077.
12. Wysocki AD, Villa TCS, Arakawa T, et al. Latent Tuberculosis Infection Diagnostic and Treatment Cascade among Contacts in

Primary Health Care in a City of Sao Paulo State, Brazil: Cross-Sectional Study. *PLoS One*. 2016;11(6). doi:10.1371/journal.pone.0155348.

13. RCGP. Tuberculosis in General Practice. 2016. http://www.rcgp.org.uk/learning/online-learning/ole/tuberculosis-in-general-practice.aspx.
14. Society BT. Defining a model for a gold standard for a TB MDT group and associated networks. 2014;(March).
15. Valeria Acs, Ianosi Edith Simona. The role of the general practitioner in the prevention of tuberculosis. *Acta Medica Marisiensis*. 2012;58(6):485-490. http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1591723&tool=pmcentrez&rendertype=abstract.
16. OECD, WHO. Report Joint ECDC / WHO Regional Office for Europe Tuberculosis country visit Norway. 2011.
17. Amaratunga KR, Alvarez GG. Primary care pearls to help eliminate tuberculosis in Canada. *Can Comm Dis REp*. 2016;3(42):63-67. https://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/16vol42/dr-rm42-3/assets/pdf/16vol42_3-ar-03-eng.pdf. Accessed July 4, 2017.
18. *Collaborative Tuberculosis Strategy for England 2015-2020*.; 2015. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/403231/Collaborative_TB_Strategy_for_England_2015_2020_.pdf. Accessed June 23, 2017.
19. Takemi K. Global Health and Human Security | Lessons from Japan's "T-Shaped" Approach to TB. JCIE Global Health Special Series. http://www.jcie.or.jp/cross/globalhealth/jcie_global_health_special_series_4.html. Published 2015. Accessed July 7, 2017.
20. Seita A. Think PHC, Do TB:Integration based scale up of tuberculosis control in Japan. *Harvard THChan Sch Public Heal*. http://www.hsph.harvard.edu/takemi/RP217.htm. Accessed July 4, 2017.
21. Shimao T. Peculiarity of National Tuberculosis Programme, Japan--Public-Private Mix from the Very Beginning, and Provision of X-ray Apparatus in Most General Practitioner's Clinics. *Kekkaku*. 2016;91(2):69-74. http://www.ncbi.nlm.nih.gov/pubmed/27263229. Accessed July 7, 2017.
22. Mori T, Kobayashi N. Tuberculosis Treatment in Japan: Problems and perspectives — How to expand the Japanese version of DOTS

—. *JMAJ*. 2009;52(2):112-116. https://www.med.or.jp/english/journal/pdf/2009_02/112_116.pdf. Accessed June 20, 2017.

23. Katsuda N, Hirosawa T, Reyer JA, Hamajima N. Roles of Public Health Centers (Hokenjo) in Tuberculosis Control in Japan. *Nagoya J Med Sci*. 2015;77(28). https://www.med.nagoya-u.ac.jp/medlib/nagoya_j_med_sci/7712/03_Katsuda.pdf. Accessed July 4, 2017.
24. Ciutan M, Dosius M, Oanca R. Hospital Morbidity in Romania. *Manag Heal*. 2016:20-28. http://journal.managementinhealth.com/index.php/rms/article/viewFile/438/1172. Accessed June 27, 2017.
25. WHO. *Review of the National Tuberculosis Programme in the Republic of Moldova, 4–15 February 2013*.; 2013. http://www.euro.who.int/__data/assets/pdf_file/0003/236154/e96959.pdf?ua=1. Accessed July 10, 2017.
26. Chen C, Chiang C, Pan S, Wang J, Lin H. Health system delay among patients with tuberculosis in Taiwan : 2003 – 2010. *BMC Infect Dis*. 2015:1-9. doi:10.1186/s12879-015-1228-x.
27. Lee C, Chi M, Yang S, Lo H, Cheng S. Using Financial Incentives to Improve the Care of Tuberculosis Patients. *Am J Manag Care*. 2015;21(1):e35-e42.
28. Aydemir Y. Knowledge Level of Family Physicians about Tuberculosis and their Attitudes and Views Regarding their Willingness to Work at a Tuberculosis Dispensary. 2015:166-171. doi:10.5152/ttd.2015.4664.
29. Yasin Y, Karabey S. Disconnecting the DOTS: misconceptions about the therapeutic paradigm of tuberculosis patients at family healthcare centers in Istanbul. *J Public Health (Bangkok)*. 2016;24(2):141-146. doi:10.1007/s10389-016-0708-9.
30. Bartholomay P, Pelissari DM, de Araujo WN, Yadon ZE, Heldal E. Quality of tuberculosis care at different levels of health care in Brazil in 2013. *Rev Panam Salud Publica*. 2016;39(1):3-11. http://www.ncbi.nlm.nih.gov/pubmed/27754532. Accessed June 13, 2017.
31. Silva-Sobrinho RA, Zilly A, Monroe AA, Pinto ÉSG, Silva RMM da, Villa TCS. Ambivalence regarding tuberculosis control actions in primary health care. *Northeast Netw Nurs J*. 2014;15(4). doi:10.15253/REV RENE.V15I4.4888.
32. Wysocki AD, Ponce MAZ, Brunello MEF, et al. Primary Health Care and tuberculosis: services evaluation. *Rev Bras Epidemiol*. 2017;20(1):161-175. doi:10.1590/1980-5497201700010014.
33. Villa TC, Ruffino-Netto A, Scatena LM, et al. Health services performance for TB treatment in Brazil: a cross-sectional study. *BMC Health Serv Res*. 2011;11(241):1-8. doi:10.1186/1472-6963-11-241.

34. Villa TC, Ruffino-Netto A. Performance assessment questionnaire regarding TB control for use in primary health care clinics in Brazil. *J Bras Pneumol*. 2009;35(6):610-612. doi:10.1590/S1806-37132009000600014.
35. Figueiredo TMRM de, Villa TCS, Scatena LM, et al. Performance of primary healthcare services in tuberculosis control. *Rev Saude Publica*. 2009;43(5):825-831. http://www.ncbi.nlm.nih.gov/pubmed/19768237. Accessed June 13, 2017.
36. Trigueiro JVS, Nogueira J de A, Sá LD de, Palha PF, Villa TCS, Trigueiro DRSG. Tuberculosis control: decentralization, local planning and management specificities. *Rev Lat Am Enfermagem*. 2011;19(6):1289-1296. doi:10.1590/S0104-11692011000600003.
37. Salve S, Sheikh K, Porter JD. Private Practitioners' Perspectives on Their Involvement With the Tuberculosis Control Programme in a Southern Indian State. *Int J Heal Policy Manag*. 2016;5(11):631-642. doi:10.15171/ijhpm.2016.52.
38. Sá LD de, Gomes ALC, Nogueira J de A, Villa TCS, Souza KMJ de, Palha PF. Intersectorality and bonding in tuberculosis control in Family Health. *Rev Lat Am Enfermagem*. 2011;19(2):387-395. doi:10.1590/S0104-11692011000200022.
39. ECDC, FILHA, Consult T. Romaniann Integrated Community Support Services for Tuberculosis. 2017.