

Achieving quality in the Directly Observed Treatment Short-course (DOTS) strategy implementation process: a challenge for hospital Public–Private Mix in Indonesia

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Background: The Directly Observed Treatment Short-course (DOTS) expansion strategy through Public–Private Mix (PPM) is in progress at an international level as well as in Indonesia. The number of hospitals involved in PPM has been rapidly scaling up, requiring the assessment of quality of implementation.

Objective: The paper presents the assessment of quality in implementing DOTS strategy in hospitals in Indonesia and emphasises the challenge of achieving high process quality in managing adult TB cases seen in the outpatient unit.

Design: A multiple-case study, involving eight general hospitals in Yogyakarta and Central Java provinces. The cases are comprised of public and private hospitals as well as teaching and non-teaching hospitals. Using the Donabedian's model, the quality of DOTS strategy implementation in hospitals was assessed in three aspects, i.e. structure, process and outcome. Data were collected through self-administered questionnaires, focus group discussions, interviews, observation and documents.

Results: The study revealed the importance of process, i.e. mainly commitment and case holding process, to the treatment success rate, treatment completion rate and default rate.

Conclusion: A systemic approach and structural support from the hospital is critical in this endeavour. Process improvement in the implementation of DOTS strategy in hospitals should be given more emphasis in hospital PPM-DOTS.

Keywords: *tuberculosis; quality of health care; Public–Private Mix; hospital; Indonesia*

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The Directly Observed Treatment Short course Strategy (DOTS) was launched in 1994 to address the problem of tuberculosis (TB) globally. It consists of five components, i.e. political commitment, access to quality-assured sputum microscopy, standardized short-course chemotherapy including direct observation of treatment (DOT), uninterrupted supply of quality-assured drugs, and recording and reporting system (1).

To meet the challenge of the Millennium Development Goals, the DOTS strategy was extended to the Stop TB Strategy. One of the components of the Stop TB Strategy is to engage all care providers (1). The initiative to involve

all care providers in the implementation of quality DOTS strategy, known as Public–Private Mix (PPM) approach, has been conducted in 14 out of 22 countries with high cases of TB (2). The purpose of PPM evolved from acceleration of case detection rate (2–7), improvement of quality of TB care for all TB patients (2–6) and its potential in the prevention of MDR and XDR-TB cases (8). Various providers have been involved in PPM in different countries. For example, engagement of traditional providers in Bangladesh (9), village doctors in China (10), allopathic and non-allopathic private practitioners in India, Nepal and Indonesia (3, 11, 12), public and private hospitals (2, 6, 7, 13–16), medical

college hospitals, work places, prisons, military health facilities, Non-Government Organisations, and insurance agencies (2, 15–17). Despite different approaches, the published research has mainly focused on private practitioners and less on hospitals.

Ranked third in the world with estimated TB prevalence and incidence of 253/100,000 and 105/100,000 per year, respectively (18), Indonesia has identified involvement of public and private hospitals (known as Hospital DOTS Linkage or HDL) as the main PPM strategy to accelerate DOTS implementation. This was supported by the recent evidence from the TB prevalence survey (2004) which revealed that most TB patients in Java and Bali islands initiated (49%) and ended (47%) treatment in hospitals and lung clinics (19).

Pilot projects in HDL was carried out in four provinces (i.e. Yogyakarta, South Sumatra, West Sumatra and Bali) in the year 2000–2005, with the largest effort being in Yogyakarta province involving 29 public–private hospitals and lung clinics. Out of these four provinces, the findings in Yogyakarta showed the highest contribution of hospitals in case detection. In 2004, 51% of total TB cases and 56% of new smear positive cases were identified by hospitals (20). As a result of these pilot projects, the hospital PPM was scaled up at the national level. In the beginning of year 2007, 37% (492 out of 1316) of hospitals have been trained and involved in implementing DOTS strategy (21).

During this rapid expansion of hospital involvement in DOTS strategy in Indonesia, several lessons learnt were identified. Past experiences of hospital involvement on DOTS strategy revealed that involvement of hospitals has a potential to increase case notification (7), but quality of diagnosis and treatment has been a challenge (22). In response to the need to strengthen the involvement of hospitals in DOTS strategy, this paper describes the existing quality of DOTS implementation and explores the determinant factors to high-quality outcomes.

Materials and methods

Description of settings

In 1999, hospital PPM-DOTS in Yogyakarta was initiated by a collaborative project of Ministry of Health (MoH), hospital association (PERSI/Perhimpunan Rumah Sakit Seluruh Indonesia), Royal Netherlands Tuberculosis Association (KNCV/*Koninklijke Nederlandse Centrale Vereniging tot Bestrijding der Tuberculose*), World Health Organization (WHO) and University of Alabama, USA. Initially, there was a letter of intent followed by a Memorandum of Understanding (MoU) between provincial authorities and PERSI in Yogyakarta. All hospitals in Yogyakarta province (24 hospitals) involved in this initiative (Data from the National Tuberculosis Program Unit/NTP, Unpublished). A sys-

tematic stepwise implementation had been established including a system of follow up and referral in collaboration with health centres. Furthermore, the Provincial DOTS Committee (PDC), consisting of actors from professional organisations, hospital specialists, provincial and district officers and university, was established in 2002. The PDC was responsible for ensuring the implementation of standards through the mechanisms of training, supervision, protocol development, monitoring and evaluation and troubleshooting (7). The pilot project was completed in 2005 and was further managed by the Provincial Health Office (PHO) and District Health Office (DHO).

Hospital PPM-DOTS in Central Java was initiated in 2003 in a teaching hospital owned by the Province authority. Till 2007, 38% (71 out of 186) of public and private hospitals had agreed to implement DOTS strategy (Data from NTP, Unpublished). The hospital PPM-DOTS in Central Java was initiated by the NTP through the PHO of Central Java and funded by KNCV. No written agreement with hospitals and PDC were created as PDC is not compulsory. However, the national policy which was presented in the National Guideline did include a district-based DOTS committee. When the research was conducted, the district-based DOTS committee was not yet established. Training was provided by PHO while anti-TB drugs, forms and lab supplies were distributed by the DHO (23).

In the two provinces, the implementation of DOTS in hospitals is usually initiated by invitation for training from the PHO/DHO to hospital staffs. Reagents for sputum examination, recording/reporting forms and anti-TB drugs to the hospitals are then provided. The DOT component is usually done by a family member of the TB patient. The patients, sometime together with the family member, collect the drugs on regular intervals from the hospital. The TB patients in hospitals normally pay for consultation and sputum fee. Supervision of the hospital programme should be conducted by the District TB Officer/Provincial TB Officer and the Provincial Laboratory also cross-checks the sputum examinations from the hospital laboratories.

Study design

This paper presents an explanatory multiple-case study. The case study was selected to satisfy the aim in describing and exploring ‘the phenomena’ (24–26), that is the DOTS strategy implementation in hospitals. The case study method comprises of different steps: establishing the research questions, designing unit of analysis and aim of study, data collection with various techniques, describing the full case, building on themes related to the purpose of analysis and analyse the findings based on the research question (25). A multiple-case study was chosen to capture the various types of hospitals involved in

DOTS strategy and to improve generalisation of the result.

This case study is part of a larger operational research entitled ‘Assessment of the implementation of DOTS strategy in hospital on Java Island, Indonesia’, carried out from August 2006 to July 2007. This was a cross-sectional study conducted by Gadjah Mada University. The MoH and the WHO gave the endorsement for the research, as well as input to the proposal development and interpretation of results.

Within the larger study, a total of 117 hospitals and lung clinics in six provinces which were recognised by the National TB program as hospitals implementing DOTS strategy were surveyed. The larger research project aimed to estimate the TB case load, followed by visits to 50 hospitals and lung clinics to assess the hospital’s commitment and preparedness in implementing DOTS strategy. Among those 50 hospitals and lung clinics, six hospitals in Yogyakarta and 13 hospitals in Central Java were visited.

Selection of cases

Before selecting the hospitals, two propositions were taken into consideration: better quality among public than private hospitals; and better quality in teaching hospital compared to non-teaching hospital due to the academic atmosphere. Only general hospitals were selected as they were the most common hospitals involved in PPM. Two settings were identified, i.e. hospital PPM-DOTS in Yogyakarta and Central Java provinces. Yogyakarta represents an ‘intensive’ PPM with more external resources while PPM in Central Java reflects the national policy of scaling-up DOTS. Hospitals were then selected purposively from those that were included in the larger study. The proposition necessitates to sample following characteristics: teaching and non-teaching public general hospitals, and private general hospitals. Maximum variation sampling was applied in relevant to length of experiences in implementing DOTS strategy, hospital capacity and patient volume. Finally, four hospitals in Yogyakarta and four hospitals in Central Java were included in this case study. One public teaching hospital, one public non-teaching hospital and two private hospitals were selected from each setting.

Conceptual framework and study variables

We used Donabedian’s model to assess the quality of DOTS strategy implementation in hospitals, particularly in managing adult TB cases seen in the outpatient unit. Three aspects of quality can be assessed according to the model: structure, process and outcome (27).

Structure variables

Ownership of hospitals was defined as public and private hospitals. The quality assurance system comprises of

accreditation status given by national authority and other quality management system. The number of TB cases in the hospitals was obtained from the medical record register in 2005 (Fig. 1). Trained staffs are those who received standard NTP training since the start of DOTS strategy implementation in hospitals. DOTS teams formed by the hospitals are responsible for implementing DOTS strategy. DOTS unit is a room dedicated for providing TB services using DOTS strategy. Based on the national guidelines, availability of DOTS team and DOTS unit are compulsory in initiating DOTS strategy in hospitals (23). Financial incentive was provided by DHO to hospital staff for detecting and curing sputum smear positive (SS (+)) cases. In 2006, the incentives were 2 US\$ (Central Java) and 3 US\$ (Yogyakarta) for detecting a SS (+) case. Additional incentives of 3 US\$ and 2-4 US\$ per SS (+) case were given in Central Java and Yogyakarta, respectively, once the case is cured.

Process variables

Hospital commitment is defined as support or participation from hospital director, lung/internal medicine specialist, general physician, nurses to the DOTS strategy. The commitment was explored qualitatively using focus group discussions (FGDs) and interviews. Commitment of hospital director was explored by asking about the existing policy and support to the implementation of DOTS strategy at the hospital. Commitment among physicians was explored by discussing the diagnosis and treatment practices of TB patients as well as promotion of DOTS strategy to other physicians. Commitment among nurses was identified in terms of recording and

Structure	Process	Outcome
Ownership of hospitals	Commitment of hospital	Treatment success rate
Quality assurance system in hospital	Adherence to standard of diagnosis and treatment	Treatment completion rate
TB case load	Conversion rate	Default rate
Trained staff	Case holding	Coverage of DOTS within a hospital
DOTS team	process	
DOTS unit		
NTP guidelines		
Financial incentives from DHO to hospital		

Fig. 1. The conceptual framework for assessing quality of DOTS strategy implementation in hospital.

reporting routines and processes of case holding of TB patients.

The adherence to standard of diagnosis and treatment was measured by proportion of TB suspects having at least two sputum examinations for diagnosis and proportion of TB cases checked with follow-up sputum examination among all registered TB cases. Conversion rate among SS (+) TB cases was also used to evaluate the treatment process. The case holding process was explored qualitatively as the collaboration among TB nurses at the hospitals, District Tuberculosis Officers (*Wasor*) and health centres in preventing drop-out cases.

Outcome variables

The 2005 DOTS registers were used to assess treatment success rate, treatment completion rate, default rate and coverage of DOTS within the hospital. However, we faced missing values in the register, ranging from 0% (hospitals 1 and 2) to 54.3% (hospital 8). Considering that the hospital visits were starting from September 2006 (hence, all TB patients registered in 2005 should have completed their treatment), we considered TB patients without treatment outcome as default cases. However, when analysing the data, we also considered missing information on treatment outcome just as missing data which do not necessarily imply default. The national guideline stated that the expected treatment success rate is more than 85% and the target for default rate for all TB cases treated at hospital is less than 5% (23). Coverage of DOTS within the hospital refers to the scope of DOTS program within the hospitals, whether it is limited to one department or beyond one department. In the case that it is in only one department, it could be lung or internal medicine or general practitioner department. The coverage of DOTS was assessed through the discussion or interview with the hospital staffs and assessing the DOTS register.

Data collection

The research team held meetings with hospital representatives and district PHOs to disseminate the study proposal and to distribute the self-administered questionnaires. Two to three weeks after the dissemination meetings, surveyors were sent to the hospitals to collect the questionnaires and secondary data on input and outcome from Medical Record and DOTS unit. Once the input and outcome data were collected, hospital visits were carried out by the research team to collect data on the process. The following activities were conducted during these 2–3 day visits in each hospital: validating secondary data from the self-administered questionnaire, performing semi-structured interviews with the nurse/doctor/laboratory staff or FGD to DOTS team, observing the DOTS unit if any and the activities related to DOTS strategy, and assessing documents/DOTS records.

Analysis

In a multiple-case study, pattern matching is used to explore the relationship between independent and dependent variables (24). In this case study, we used a specific type of pattern matching, i.e. cross-case analysis. As the first step, we made a description of structure, process and outcome of each hospital. Following the description, the pattern of the relation between structure, process (as independent variables) and outcome (as dependent variable) of DOTS strategy implementation was explored in each hospital. The pattern found in each case was then compared to the other cases. Finally, the patterns were also compared across the two settings (Yogyakarta and Central Java).

Ethical consideration

The overall study protocol was reviewed on several occasions by the NTP and national partners. Ethical approval was received from the Faculty of Medicine, Gadjah Mada University, Indonesia. Research permission was also obtained from local government. At the end of each visit to hospitals, the research team organised a feedback meeting with the hospital team and DTO in order to confirm findings, discuss problems and identify opportunities for further improvement. The overall findings were presented to the hospitals, TB officers at district, province and national level.

Result

Quality of structure

In 2006, hospital accreditation or quality management system certification had been granted to all hospitals except one in Central Java (hospital 6, Table 1). The ratio of new TB cases per number of trained human resources was lower in Yogyakarta than in Central Java. Both DOTS team and DOTS unit were available in every hospital but two in Central Java, where there was only a team (hospital 7) or a unit (hospital 8). All hospitals had the national TB guidelines available, and all received financial incentives, except hospital 6 which was not aware of this reward.

Quality of process

Commitment

Lack of commitment from the lung or internal medicine specialist was identified in three private hospitals (hospitals 4, 7 and 8). In hospital 4, the core staff in the DOTS team (i.e. the general practitioner as the vice coordinator of the nurses and lab staff) stated that they were committed to DOTS strategy but there was a lack of coordination among them in the case holding process. There were 23% of registered TB cases with missing information on treatment outcome. The director facilitated the DOTS team with the endorsement letter to all

Table 1. Hospital characteristics and structure for DOTS strategy implementation.

Class ^Ω	Yogyakarta Province						Central Java Province					
	H [¶] 1		H 2	H 3	H 4	H 5	H 6	H 7	H 8			
	A	C	C	B	C	A	C	B	C	B	C	
Ownership	Public	Public	Private	Private	Private	Public	Public	Private	Public	Private	Private	
Teaching status	Teaching	Non-teaching	Non-teaching	Non-teaching	Non-teaching	Teaching	Non-teaching	Non-teaching	Teaching	Non-teaching	Non-teaching	
Number of beds	653	124	438	2000	202	783	100	180	2004	2005	97	
Year of initiating DOTS strategy	2002	2005	2000	2002	2002	2004	2005	2005	2005	2005	2006	
Accreditation/certification	✓	✓	✓	✓	✓	✓	NA ^Δ	✓	✓	✓	✓	
Number of new TB cases in outpatient unit (2005) [¶]	144	29	146	509	509	178	220	141	178	220	27	
Number of new TB cases [¶] per trained physician	6	3	24	63	63	178	220	141	178	220	27	
Number of new TB cases [¶] per trained nurse	2	2	5	18	18	178	220	70	178	220	27	
Number of new TB cases [¶] per trained lab staff and pathologist	14	7	49	46	46	89	220	70	89	220	27	
DOTS unit	✓	✓	✓	✓	✓	✓	✓	NA	✓	✓	✓	
DOTS team	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	NA	
TB National guidelines	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Financial incentives from NTP to hospital staff	✓	✓	✓	✓	✓	✓	NA	✓	✓	NA	✓	

^ΩHospital class is determined based on type of services, human resources, equipments and facilities. Class A is the highest while class D is the lowest.

[¶]H = hospital.

[¶]The number of TB cases was based on medical record data from outpatient unit.

^ΔNA = not available.

physicians to diagnose and treat TB patients based on DOTS strategy. However, without the commitment of the senior internal medicine specialist this was not sufficient to adhere to the DOTS strategy. Furthermore the DOTS team coordinator (a junior internal medicine specialist) did not feel confident to use the DOTS treatment guideline during the continuation phase. For example, the lung specialist performed X-ray examination at the end of continuation phase. If the 'TB pattern' still existed on the X-ray, the specialist continued the treatment for another 2–3 months. This situation made it difficult for the core staff in the DOTS team to follow the DOTS strategy. Similar situations occurred in hospitals 7 and 8. The directors and the trained general practitioners in these two private hospitals found it challenging to persuade the specialists, as they perceived that they have less bargaining power. Missing information of the treatment outcome was also identified in 25 and 54.3% of registered TB patients for hospitals 7 and 8, respectively.

For the rest of the hospitals, mostly public hospitals, commitment from lung/internal medicine specialist existed. In hospital 2, there was a policy to give free sputum examination and waiver of the registration fee for consecutive visits for the poor patients. Only about 10 TB patients visited the DOTS unit per month. However, there were complaints over high workload even though there were two nurses involved in the recording routines.

If there is a new TB patient, I have to motivate her/him for the treatment. After that I have to write the DOTS record of the patient and then the DOTS register...It is a lot of work. (The nurse at DOTS unit, hospital 2)

In hospital 6, the internal medicine specialist actively encouraged general practitioners in the area to refer TB cases to the hospital for DOTS treatment. The director of hospital 6 waived the fee for sputum examination. However, the hospital director placed one trained general practitioner and nurse to other units not related to TB service.

The internal medicine specialists in hospitals 1 and 5 were committed to DOTS strategy, but had difficulty in encouraging their senior colleagues from other departments to refer TB cases to the DOTS unit. These two internal medicine specialists advocated for their colleagues compliance by taking the issue to the department representatives in the DOTS team. However, even if there was no specific policy on TB services from the hospital director, the work of specialist at hospital 1 was supported by the committed nurses. In hospital 5, there was a hospital policy to waive the fee for free sputum examination for TB patients who were not covered by insurance. The nurse at the DOTS units (hospital 5) did not express the same level of motivation as the lung specialist.

A unique approach to building commitment to the DOTS strategy was found in hospital 3, which is a private hospital. The medical committee endorsed the DOTS strategy by asking the lung specialist to advocate for the strategy at the medical committee forum. The support from the medical committee was fortified by the encouragement of the hospital director. The lung specialist in this hospital perceived that implementation of DOTS strategy was fully supported and facilitated with a convenient DOTS unit. The nurses in the DOTS unit expressed commitment and minor problem with recording was observed.

Adherence to standard of diagnosis and treatment

Overall adherence to diagnosis standards was low, even in teaching hospitals. For example, only hospital 6 (i.e. a non-teaching hospital) performed at least two sputum tests on all suspected TB cases (Table 2). There were no differences between the public and private hospitals in regard to adherence to standard. Only hospital 6 (public hospital) and hospital 7 (private hospital) performed follow-up sputum examination for all registered TB patients. None of the TB patients in hospital 8 (private hospital) received follow-up sputum microscopy.

Quality of treatment process

The recommended standard of 80% conversion rate continues to be a challenge for the hospitals. Only half of hospitals achieved the desired proportion (Table 2). Fortunately, both teaching hospitals were able to meet the standard. However, no difference was seen between the public and private non-teaching hospitals.

Case holding

Data validation on referred and default cases was carried out through quarterly meetings at the district level in Yogyakarta. All hospitals had telephone contacts of all health centres and DOTS facilities in the province, District TB Officers, Provincial TB officers and members of PDC. When the referred patients did not show up in the designated DOTS unit within two days in the intensive phase and seven days in the continuation phase, the nurse contacted the patient's phone number (if any). In addition, the nurse might communicate with the District TB Officer or sometimes directly with the health centre by telephone or by sending a short message service (SMS) to an officer at the health centre. The District TB Officer later proceeds to the health centre closest to where the patient lived. The main obstacle to doing this was incomplete or invalid patient address. However, this mechanism was not followed intensively in hospital 4. The staff at hospital 4 would usually phone or send short message service to the District TB Officer and would receive the reply by SMS or verbal information during the quarterly district meeting. However, the staff per-

Table 2. Aspects of process.

	Yogyakarta Province				Central Java Province			
	H ¹	H 2	H 3	H 4	H 5	H 6	H 7	H 8
Adherence to standard								
Proportion of suspects having at least two sputum examinations for diagnosis	901/1,248 (72.2%)	191/213 (89.67%)	509/591 (86.13%)	248/298 (83.22%)	596/640 (93.13%)	296/296 (100%)	34/43 (79.07%)	33/41 (80.49%)
Proportion of TB cases with follow-up sputum examination among all registered TB cases	82/106 (77.4%)	17/43 (39.5%)	89/115 (77.4%)	49/74 (66.2%)	86/108 (79.6%)	55/55 (100%)	20/20 (100%)	0/35 (0%)
Quality of treatment process								
Conversion rate	53/56 (94.6%)	10/15 (66.7%)	60/68 (88.2%)	25/35 (71.4%)	58/58 (100%)	45/50 (90%)	1/7 (14.3%)	0/10 (0%)

¹H = hospital.

ceived that they had too much work and could not follow up on the regularity of treatment among the TB patients.

In Central Java, there was no effective linkage between the four hospitals and the respective district or the surrounding health centres. Commonly, the staff at the DOTS unit contacted the District TB Officer if there was a default case. Unfortunately, all hospitals in Central Java perceived that there was poor feedback from the District TB Officer regarding default cases. The quarterly meetings were also not used to confirm the follow-up of the default cases. Hospital 6 was an exception, because the internal medicine specialist initiated collaboration with private practitioners and health centres in the surrounding areas.

Quality of outcome

Hospital 3 (non-teaching private hospital) had the lowest default rates and the highest treatment success and completion rates (Table 3). Hospital 6 performed satisfied treatment success and treatment completion rates; the default rate was higher than the target in the guideline (5%). Hospital 1 was approaching the targeted treatment success rate of 85% and default rate of 5%. Hospital 3 performed better treatment outcome than hospitals 1 and 6.

When all TB patients with no treatment outcome are considered defaulters, low treatment success and completion rates in hospital 2 (public hospital, non-teaching) are probably influenced by high referral rate during treatment as well as high default rate (Table 3). All defaulters in this hospital were SS (-) cases. Hospitals 7 and 8 (private hospitals, non-teaching) also showed poor treatment success and completion rate with high default rate. Thus, treatment outcomes varied greatly among the hospitals studied.

Not all hospitals had fully implemented DOTS strategy for all TB patients. This was confirmed through FGDs and interviews in all hospitals. The reasons varied from incompatibility of DOTS regimen for special TB cases (such as TB drug-induced hepatitis, TB in Diabetes Mellitus patient, TB in pregnancy) to unwillingness of physicians to use DOTS regimen or to refer TB cases to the DOTS unit. As a consequence, the DOTS strategy was only selectively applied to certain TB patients. A wider practice of DOTS strategy by departments other than the internal medicine/lung department was found in hospitals 1, 5 (public hospitals) and 3 (private hospital).

Relation between structure and outcome

Comparison of patterns among hospitals using cross-case analysis revealed that none of the structure indicators were related to the outcome indicators. The availability of DOTS team, DOTS unit, TB guideline and financial incentive did not lead to better outcomes. Lower TB case load per trained staff did not result in better treatment

Table 3. Aspects of outcome.

	Yogyakarta Province					Central Java Province				
	H ¹	H 2	H 3	H 4	H 5	H 6	H 7	H 8		
Default rate (SS + cases) ^α	4/56 (7.1%)	0/15 (0%)	4/68 (5.9%)	5/35 (14.3%)	0/58 (0%)	0/50 (0%)	3/7 (42.8%)	1/10 (10%)		
Default rate (SS + cases) ^β	4/56 (7.1%)	0/15 (0%)	5/68 (7.3%)	10/35 (28.6%)	11/58 (18.9%)	5/50 (10%)	6/7 (85.7%)	4/10 (40%)		
Default rate (all cases) ^α	10/106 (9.4%)	3/48 (6.25%)	5/115 (4.3%)	10/74 (13.5%)	0/109 (0%)	0/55 (0%)	6/20 (30%)	8/35 (22.8%)		
Default rate (all cases) ^β	10/106 (9.4%)	7/48 (14.6%)	6/115 (5.2%)	27/74 (36.5%)	25/109 (22.9%)	5/55 (9.1%)	11/20 (55%)	27/35 (77.1%)		
Treatment success rate (SS + cases)	46/56 (82.1%)	7/15 (46.7%)	60/68 (88.2%)	21/35 (60%)	43/58 (74%)	45/50 (90%)	1/7 (14.3%)	0/10 (0%)		
Referred cases during treatment (SS + cases)	5/56 (8.9%)	8/15 (53.3%)	0/68 (0%)	0/35 (0%)	1/58 (1.7%)	0/50 (0%)	0/7 (0%)	5/10 (50%)		
Treatment completion rate (all cases)	84/106 (79.2%)	25/48 (52%)	103/115 (89.6%)	38/74 (51.4%)	78/109 (71.6%)	50/55 (90.9%)	6/20 (30%)	1/35 (2.9%)		
Referred cases during treatment (all cases)	9/106 (8.49%)	15/43 (34.9%)	0/115 (0%)	4/74 (5.41%)	2/109 (1.83%)	0/55 (0%)	1/20 (5%)	6/35 (17.14%)		
Coverage of DOTS within hospital	Beyond internal medicine department	Internal medicine department	Beyond lung department	Internal medicine department	Beyond Internal medicine department	Internal medicine department	General practitioner unit	General practitioner unit		

^αTB cases with no information of treatment outcome are defined as missing values.

^βTB cases with no information of treatment outcome are defined as default cases.

^γH = hospital.

outcomes or higher level of DOTS coverage within the hospital.

Relation between process and outcome

Commitment from the lung/internal medicine specialist together with nurses, and strengthened by hospital directors tended to be associated with better treatment outcome indicators (hospital 3 vs. other hospitals). However, it was not always seen in combination with DOTS coverage beyond the department level (hospital 3 vs. hospitals 1 and 5). High adherence to diagnostic and treatment monitoring standards regarding sputum microscopy test was not related to good outcome indicators. On the other hand, higher conversion rates appeared to be associated with higher treatment success and completion rates.

Discussion

The main critique of case studies has been on how findings are interpreted and generalised. It is important to remember that the generalisation of the result from a case study is a theoretical generalisation and not a statistical generalisation (24, 26). It means that the result of case study will strengthen the theory related to the findings. The use of a multiple-case study will improve the generalisability with the replication of cases (26).

Overall, in this case study, performance of DOTS hospitals in Yogyakarta was shown to be better than those in Central Java province. It is likely that this result was influenced by the different process of DOTS initiation in hospitals, different resources allocated for training and longer experience in Yogyakarta than Central Java. Through the HDL pilot, a specific referral and tracing system of TB patients was established among the providers (hospital and health centre) under the supervision of PDC (7). In this study, problems of poor recording were found to be more prominent in Central Java than in Yogyakarta. Intensive supervision from District TB Officer together with the PDC was identified as the mechanism by which recording and reporting practices were improved in Yogyakarta (7). In this case study, cross-case analysis between hospital 1 and 3 showed that neither public nor teaching hospital was associated with better quality in process and outcome. This differs from the common findings of poor service quality among private providers (28–33). However, previous studies focused on smaller private providers.

This study revealed the importance of process, particularly commitment and a good system and communication in the case holding process, in achieving good treatment outcome indicators. It also highlighted the necessity of frequent communication in achieving success in case holding (3, 34).

The combined commitment of nurses, the lung/internal medicine specialist and the directors was not related to

high coverage of DOTS. In hospital 3, higher DOTS coverage was mainly influenced by the systemic approach employed by the medical committee. In the case of hospitals 1 and 5 (public and teaching hospital), higher coverage of DOTS was mainly facilitated by the rule of interdepartmental consultation within the teaching hospital. Issue of unsatisfactory coverage of DOTS in hospitals should be addressed for further evaluation.

The commitment from the physicians might be related to their perceptions on the concept of DOTS. A FGD was arranged within the larger study but not included in this case study. The FGD revealed that clinicians perceived that the diagnosis and treatment for TB patients in hospitals should not be standardised by the way it is done in primary health care centres. A study by Watkins et al. (35) also concluded that the physicians perceived that the DOTS strategy did not work in practice.

The role of intermediary party as the interface between the NTP and the hospitals has been shown to be important in previous publications (11, 36, 37). This study also indicates that hospitals cannot achieve quality performance in their DOTS strategy implementation without appropriate networks with other providers such as health centres.

Low adherence to diagnostic and treatment standards by most cases in this study indicates the importance of the role of standards. Recently, the International Standard for Tuberculosis Care has been endorsed by six professional organisations (38). ISTC provides a promising guideline if further translated into standard operational procedures in hospitals. In addition, specialist associations should be encouraged to take an active role in intensive advocacy to specialists, not just provide formal endorsement. Uplekar (39) also states the need of mobilisation of professional organisations to pressure the physicians to implement the standard. This study revealed that regulation might be needed to improve the quality because incentives and the existing quality management system in each hospital are not sufficient. A study by Yao et al. (40) concluded that the provision of financial incentives for doctors to refer and supervise the TB patients was not effective. The results of this study give further evidence that regulation for the implementation of standards should be initiated.

Resource constrains limited the full exploration of cases. In some cases verbatim transcripts of interviews and FDGs were not available and researchers relied on field notes. Although this study intended to capture the complex aspects of quality, not all issues were explored. For instance, patients' perspectives and the practice of prescriptions as an aspect of adherence to treatment guidelines were not investigated. Organisational and individual commitments from DHO and District TB Officer were not fully explored. This study relied on the

available data for patients treated with DOTS strategy. Ideally, data should have been collected from all TB patients managed in the hospital. Finally, the findings of the study are ‘snap shot pictures’ that might change with time or with the change of hospital actors. Time is an important factor for building mutual collaboration among partners in PPM for DOTS (41). However, many issues revealed by the study are relevant to the scaling up of DOTS strategy in hospitals in other places.

Conclusion

In this setting, all hospitals have adequate internal structure to implement DOTS strategy. In the hospitals studied, process variation was shown to have stronger influence in variation of outcome. Level of commitment and case holding process were found to be important components in the process of implementing DOTS strategy. Hospital support for integrating DOTS strategy into the current system of TB service provision is essential in achieving quality DOTS outcomes. Future studies should focus on how commitment on different levels in the health system is created and its influence on the outcome of the DOTS strategy.

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