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THE LASALLIAN JOURNAL OF MEDICINE AND HEALTH SCIENCES

The Lasallian Journal of Medicine and Health Sciences (TLJMHS) is the official research publication of De La Salle Health Sciences Institute. Its primary focus are articles on various health science fields such as general medicine and clinical epidemiology, integrative and alternative medicine, pharmaceutical science (including drug discovery and development, natural products, and toxicology), nursing and healthcare, rehabilitation science, radiation technology, medical technology, biochemistry and biotechnology, food science and nutrition, health policies, health social sciences and health education research. It is committed to deliver innovative and quality studies that address emerging health concerns in the country. In addition, it gives special attention to works that are included in the National Unified Health Research Agenda (NUHRA) 2011-2016. The publication accepts full length articles reporting on an original work (prioritizing unpublished works), review articles, case reports, case series, communications, technical reports, and commentaries. This journal aims to extend its readership not only among the Philippine Lasallian researchers but also among other non-Lasallian researchers in the medical and health sciences.

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Editorial

In some ways, the traditional paper journal is a relic of the past. Its original role as an asynchronous means of presentation and discussion of original research and a repository of knowledge has largely been supplanted by social media and by the internet. The reason for being of a university paper journal is even more nebulous granted that universities themselves encourage authors to publish in established regional and international journals with higher impact factors. Despite these obvious disincentives, it is still heartening to observe that there are still a few authors who opted to publish with us. That said, it is still our fervent hope that even more faculty and student authors from the DLSMHSI community engage with us and continue to send original research, review articles and opinion pieces our way.

JCP

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Evidence Mapping of Tuberculosis Case Finding Studies Essential for Site-specific Modeling: A Scoping Review

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ABSTRACT

Background: Strides and benefits in finding active TB patients beyond health facilities using Active Case Finding (ACF) strategies have been documented in several countries. The Philippines is in a favorable position to explore strategies and gather insights on modelling cost-effectiveness of ACF in localized settings.

Design/Methods: Scoping review, searched peer-reviewed papers from research databases and hand-searched reference lists. Included studies from 2009 onwards, ACF strategies' systematic reviews, and mathematical modelling of ACF strategies with effectiveness measures, settings at middle- to high-burden countries.

Results: Twelve papers (8 reviews, 3 mathematical modelling, 1 observational) fulfilled the eligibility criteria. Common ACF strategies considered to be cost-effective were contact tracing and targeted screenings. Outcome measures used were: Number Needed to Screen, Additional cases detected, cost-per-case detected, and Incremental Cost-Effectiveness Ratio (ICER). Strategies included in the modelling papers were Passive Case Finding (PCF) with door-to-door screening, and PCF with contact tracings, all compared to PCF alone. Common input parameters used were TB prevalence (by age group, TB type (MDR/DS)), diagnostic accuracies, treatment outcomes' probabilities, health system costs, and patient costs. Three modelling papers considered door-to-door screening combined with PCF strategy cost-effective, with specifying target screening populations important. In the observational study, mass screenings in poor communities and targeted screening in vulnerable groups yielded increased case detection and successful treatment outcomes.

Conclusions: Modelling different ACF strategies is feasible in the Philippines provided that target populations, key parameters and assumptions were identified properly. Availability of localized data on TB epidemiology and target groups of ACF initiatives may pose a challenge. Identifying the information gaps prior to modelling especially at provincial levels will aid modelers to identify cost-effective strategies which subsequently aid policymakers find missing TB cases.

INTRODUCTION

Globally, tuberculosis (TB) is still among the top 10 causes of death as reported by the World Health Organization (WHO) (1). In their report for 2018, the WHO emphasized in a high level meeting in New York that all efforts to meet the goals for eradicating TB must by 2030 must be expedited.

Philippines' DOH Sec. Francisco Duque III, committed that the country will find and treat 2.5 million people with TB by the end of 2022 (2). Part of this commitment is to reduce in half the number of deaths related to TB, reduce the TB incidence rate by 23%, drive the catastrophic cost to 0 for households affected with TB disease, and a 90% patient satisfaction with TB services(3).

In 2017 the Philippines incidence rate for tuberculosis which includes people with HIV and TB was 554 per 100,000 population(4) and is steadily decreasing. Current efforts which resulted in the steady decline is regarded as crucial but might not be enough to meet the 2020 milestones of the End TB Strategy(1).

In 2019 the WHO and the Department of Health (DOH) joined efforts in an all-out-war on TB. The DOH has invested in three primary strategies: 1.) High-level commitments, 2.) massive screening, testing, and treatment, and 3.) mandatory notifications by the private sector(5). The DOH has expanded their reach to screen and test more people and to find and identify presumptive TB patients to diagnose and put them on the correct treatment. Finding these patients is not necessarily a simple task as most of the time, patients present themselves in the health facility upon consultation. This strategy of finding patients leaves the population that does not know that they have active or latent TB unchecked and untreated.

Health workers of the National TB Program-DOH had already made strides to find patients with active TB beyond the walls of their health facilities, an initiative otherwise called as Active Case Finding (ACF) (6),. However, if not well-targeted and implemented, ACF is a costly addition to the passive case finding systems of tuberculosis treatment facilities, which can potentially lead to misallocation and waste of scarce resources. It also poses a risk of false positive diagnosis and providing TB treatment to individuals with no TB, adding to the communities' social and economic burden. These possibilities need to be weighed against the benefit of additional cases identified in the community (7).

Moreover, due to lack of documentation and formalities of ACF systems this inequity is rarely examined and is still a common topic on debates today. WHO recognized the need to find the "missing TB cases" and other countries have already documented their results using their localized strategies for ACF. As one of the countries with a high TB burden, the Philippines is in a favorable position to consider different ACF strategies and its systematic implementation that would mostly benefit the country's health system.

The study aims to perform a scoping review of different papers on ACF from local and international studies, to evaluate and compare characteristics and evidence associated with effective ACF strategies and set grounds for modelling suitable strategies on the local setting. Specifically, to identify relevant factors leading to the formation of efficient ACF strategies applicable to Philippine setting, and to provide insight on proven cost-effective strategies from other countries done through modelling.

METHODS

Overview

This scoping review was guided by Arskey and O'Malley scoping review framework (7). The framework includes the following: identifying the research question, identifying relevant studies, study selection, charting the data, and collating, summarizing and reporting results.

Research questions

We have conducted a scoping review based on the following questions:

- What are the target populations considered in active case finding activities/ interventions in different countries?
- What are the screening and diagnostic tools used and their strategies for using these tests?
- What are some of the key parameters and assumptions that were utilized and will be applicable for modelling inputs?
- What are the outcome measures that were considered, in terms of the actual notification yields and its cost-effectiveness, and others?

Identify relevant studies

We browsed through peer-reviewed papers in electronic open source journals, including PubMed, Science Direct, and EBSCOhost (Academic Search Complete, PsycINFO, Health Sources, CINAHL, and MEDLINE with full text). Then we had hand-searched reference lists from the included articles and reviews.

Mesh terms used in the literature search were the following: 'tuberculosis', 'active case finding', 'screening', 'targeted', mobile screening', 'modelling', 'cost-effectiveness analysis', 'household contacts', community-based', 'urban setting', 'vulnerable populations', and 'high risk groups'.

Eligibility criteria

We have explored studies not older than 2009, due to relevance of data in the current scenario. Studies that were reviewed included those with demographic settings similar with the Philippines – low-middle income countries, middle to high TB burden setting, with a clear definition of systematic screening or active case finding close to the WHO definitions. We have also considered patients of adult populations. Figure 1 details the process for systematically selecting studies for inclusion in this review, loosely adapted from the PRISMA flow diagram.

Screening, data abstraction and charting

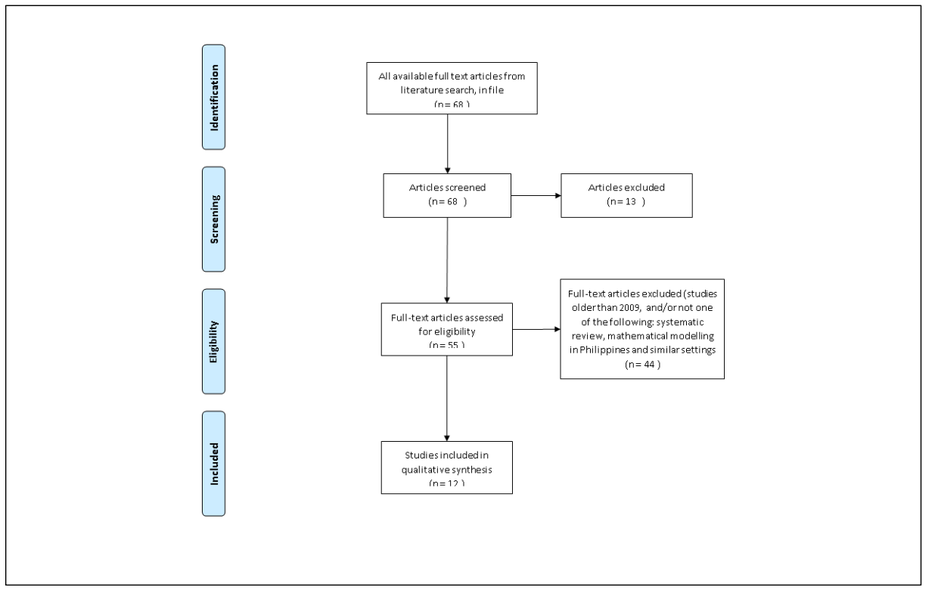
We initially reviewed titles to remove duplicates, and those studies not focusing on active case. Afterwards, we independently reviewed titles and abstracts, and then full-text articles for inclusion. The data charting table was done using Microsoft Excel. Studies were categorized by their study designs (randomized trials, systematic reviews), mathematical modelling methods and/or economic evaluation of different ACF strategies. These tables detail the studies' setting, objective, target population, nature of ACF strategy, screening test used, key results and remarks/interpretations. Differences in data-charting were resolved by discussion including all authors.

RESULTS AND DISCUSSION

Literature search

After screening 68 titles and abstracts and 55 full text articles, 12 unique articles fulfilled our eligibility criteria.

Figure 1. Characteristics of the included articles (n=12)



Reasons for excluding full text articles are provided in Figure 1.

A total of 55 studies were collated that was assessed to be eligible, researchers reviewed the studies and 44 studies were omitted as it does not serve the study's objectives. Focusing on systematic reviews, mathematical modelling, and retrospective papers the study was able to find 12 unique studies. Eight of which were systematic reviews, 3 were mathematical modelling papers, and 1 rare retrospective study was considered because it was done in the Philippines.

Active Case Finding and Passive Case Finding

Within the literature reviews, the definition for both ACF and passive case finding (PCF) varies from study to study, regardless of how different the definition was, a common pattern can be observed. The definition for both ACF and PCF in the reviewed study hinges from the WHO's operational guide for systematic screening which defined ACF as synonymous with systematic screening for active TB, and that ACF is a screening done outside the health facility. It also defined the PCF which is stated as follows "a patient-initiated pathway to TB diagnosis involving: a person with active TB experiencing symptoms that he or she recognizes as serious; the person having access to and seeking care, and presenting spontaneously at an appropriate health facility; a health worker correctly assessing that the person fulfils the criteria for suspected TB; and the successful use of a diagnostic algorithm with sufficient sensitivity and specificity to diagnose TB"(8).

The essence of the definition for ACF is interpreted diversely in the studies reviewed, some find it that it implies

screening through outreach activities outside the health services(9), while some claim that it is an alternative strategy to improve detection and treatment rates in resource-poor high burden countries(11). One of the best summary for the ACF definition was reported as the methods for TB identification that does not rely on patients presenting to the healthcare system of their own accord(11).
ACF has shown to be an effective alternative strategy to PCF in global standpoint. In a report by Ho et al. it was described that prevalence surveys has consistently depicted PCF is inadequate in identifying undiagnosed TB in the community. In the same report, those cases missed by the health system can be identified in a combination of ACF and PCF(11).

Overview of target populations and setting

With the diversity of the studies that were reviewed, it is presented in Table 1 that some subjects on the systematic review were part of the TB REACH initiative, European Union, Americas, Africa, Japan, and Australia(9,11–16). Two of the 3 mathematical modeling studies was done in the city of Kampala, capital of Uganda(10,17) which shares similar demographics to the urban cities of the Philippines, a mathematical modeling study was done using the data on national prevalence surveys from Cambodia, Viet Nam, and the Philippines(18). While 1 local retrospective study was done in Palawan, Philippines (19).

Majority of the systematic review's target population (Table 1), detailed that household contacts are good target population for active case finding strategies in their respective study(9,11–13,16,20). Aside from household contacts other target populations that should be considered for an ACF are High risk groups, among these groups the following People Living with HIV, People Deprived of Liberty, Elderly, Homeless and Drug Users(9,10,14,15).

With regards to the mathematical modeling studies, a paper by Sekandi et al. focused on the population of urban residence of all ages. They noted that each case detection strategy is likely to reach people with different demographics and health seeking characteristics. Household contact investigations mostly finds children below 15 years old, while efforts for community ACF targets adults 15 years and older has shown that there is a high prevalence of undetected adult TB Cases (17), This high prevalence of undetected cases is also similar with study also done also in Kampala, Uganda, where they only focused on residents of Kampala ages ≥ 10 years (10).
Meanwhile a mathematical modelling done by Nobuyuki used the prevalence survey of countries such Viet Nam, Cambodia, and the Philippines to generate results for their online calculator (18).

Screening strategies

ACF is usually done outside the health facility and it matters how the health facility would engage the community in their advocacy to find and treat patients with active TB. Systematic reviews used multiple ways to contact the presumptive patients as presented in Table 2.

Upon determining the target population whether it may be high risk groups or house hold contacts, these communities can be approached through door to door either by a community based health worker, volunteer, or by a clinic staff member(13,16). A study that reviewed door

Table 1. Summary of Reviewed Articles

Author	Year	Article Title	Sample	Phenomenon of Interest	Design	Evaluation	Outcome Measures
Claudia Caroline Dobler	2016	Screening strategies for active tuberculosis: focus on cost-effectiveness	People in the community Household contacts Persons with HIV Immigrants Prisoners Elderly population	This paper summarizes strategies for ACF for TB, examining evidence for TB screening among different target groups based on cost-effectiveness analyses	Systematic review;	>ACF among (close) TB contacts was found to be (highly) cost effective in settings with a low as well as high incidence of TB. > Evidence for cost-effectiveness of screening among HIV-infected persons and TB/DM patients, and is not as strong as for TB contacts. > Chest x-ray screening of patients attending in outpatient clinics was not cost-effective. > Screening of prisoners and jails inmates was cost-effective. > New TB-diagnostics tests impact on the cost-effectiveness of screening on ACF strategies are essential.	> ICER > ICER per DALY averted > Cost per Active TB Detected > Additional Cost per case > ICER expressed as cost per QALY gained
Gregory J. Fox	2012	Comparative Meta-Analysis of Tuberculosis Contact Investigation Interventions in Eleven High Burden Countries	Household/close contact	To systematically review the prevalence of TB and LTBI and the subsequent incidence of TB in contacts of patients with TB in households and non-household settings, in high, middle and low income countries and in various risk groups.	Systematic review and meta-analysis	This meta-analysis study established heterogeneity among all published studies that were assessed. Prevalence of active TB in all contacts, micro biologically proven TB, and latent TB infection, as well as incidences can be used as assumptions in order to generate evidence for policy recommendations of cost-effective strategies.	>Incidence Case per year divided by population at risk > Incidence Rate Ratio
Lucie Blok	2015	Comparative Meta-Analysis of Tuberculosis Contact Investigation Interventions in Eleven High Burden Countries	Household contacts in lower- and middle-income countries	To evaluate and compare household contact investigation interventions and to review the association between context or program-related factors and the yield of cases among contacts.	Systematic review; cross-sectional analysis	This study highlights restrictive criteria of screening in 19 interventions among household contacts, showing great heterogeneity in the percentage yield of microscopy confirmed cases (SS+).	>Number Needed to Screen > Number of SS+ Cases diagnosed through contact investigation divided by total number of SS+ cases notified
Charlotte C Heuvelings	2017	Effectiveness of interventions for diagnosis and treatment of tuberculosis in hard to reach populations in countries of low and medium tuberculosis incidence: a systematic review	Hard-to-reach group > Migrants > Drug users > Homeless > People with HIV > Prisoners > Mixed population	To ascertain which interventions are effective and cost-effective for identifying and managing tuberculosis and raising awareness of tuberculosis among hard-to-reach populations.	Systematic review	> screening by mobile chest X-ray improved screening coverage and tuberculosis identification, reduced diagnostic delay, and was cost effective in some hard to reach populations > Monetary incentive improve tuberculosis identification and management among drug users and homeless people.	>Sensitivity and specificity of chest radiography and symptom base questionnaire >Chest Radiography suggestive of TB > Incremental cost from tax payer perspective > Sensitivity and specificity of mobile chest X-ray > Culture confirmed cases with positive smear > Effectiveness > Follow-up attendance > Sensitivity of TST and QFT in culture confirmed Pulmonary TB Cases > Test agreement QFT G assay, TST, and chest radiography > Smear negative and culture positive cases > Incremental cost per active case prevented > active tuberculosis cases identified per 1000 tested and cost per case

Table 1. Summary of Reviewed Articles (continued)

Author	Year	Article Title	Sample	Phenomenon of Interest	Design	Evaluation	Outcome Measures
Jennifer Ho	2016	Passive Case Finding for Tuberculosis is not enough	Population evaluated have the following characteristics > Less reported symptoms > Earlier stage of disease > Lower bacillary (MTB) load > Reduce Health Seeking Behavior > May be less likely to accept and complete treatment > More health care access and socioeconomic factors to consider	To compare the additional individual and population-level benefits of ACF with those of PCF, consider pragmatic and economic factors relevant to ACF implementation in resource-limited settings, and highlight future research needs and priorities	Systematic review	>Current passive TB case finding approaches are insufficient to meet TB elimination target. ACF interventions should be designed to begin with easily identifiable high-risk groups then widen their scope of activities as resources allow.	
K. Kranzer	2012	The benefit to communities and individuals of screening for active tuberculosis disease: a systematic review	> among TB Contacts > specific high risk groups >among people seeking care > among people with compatible symptoms with TB	to review the evidence of individual community benefits from active TB screening, focusing on additional TB cases detected, reduction in diagnostic delay, improved treatment outcomes and impact on TB epidemiology.	Systematic review; cluster randomized design	The study suggest that the increase in TB cases and earlier diagnosis through screening could be considered as intermediate outcomes. Moderate evidence have been suggested to (1) screening increases the number of cases in the short term; (2) screening tend to find cases earlier and with less severe disease. Treatment outcomes for those identified through screening or passively were very similar in all studies.	Additional TB cases detected, reduction in diagnostic delay
K. Paquette	2014	Chest radiography for active tuberculosis case finding in the homeless: a systematic review and meta-analysis	Homeless people	Evaluate the use of chest x-ray screening in ACF for TB in homeless populations	Systematic review and meta-analysis	Results of the study point toward CXR screening as a viable ACF strategy for homeless people in low-incidence regions. Prevalences in areas with ACF have tendencies to decrease. Development of new ACF strategies should focus on the utility of various combinations of screening modalities such as symptom screening, sputum sweeps and TST	>Pooled prevalence of active TB
Jacob Creswell	2014	A multi-site evaluation of Innovative Approaches to Increase Tuberculosis Case Notification: Summary Results	> Household Contacts of index cases	Assess if the TB REACH initiatives to increase SS+ cases detected and treated.	Systematic review	Interventions by the TB reach initiatives were associated with large increases in TB notifications; different styles tailored to local realities could be devised.	additional SS+ cases treated, defined as the increase in TB case notification from NTP treatment registers within the reporting area during the intervention period compared t the same area's notifications from the previous year.

Table 1. Summary of Reviewed Articles (continued)

Author	Year	Article Title	Sample	Phenomenon of Interest	Design	Evaluation	Outcome Measures
Nobuyuki Nishikori	2013	Target prioritization and strategy selection for active case-finding of pulmonary tuberculosis: a tool to support country-level project planning	Prevalence survey -Cambodia -Vietnam -Philippines	To develop a model that can be used for county-level project planning	Mathematical Modeling	>Active case finding activities are cost effective only if the tuberculosis prevalence of the target population is high. > Extensive diagnostic methods can be applied only to very high-risk groups such as TB contacts, prisoners, or people living with HIV >basic diagnostic approaches such a symptom screening is always applicable but diagnostic yield is limited.	> Cost per case detected > Number needed to screen > Incremental yields in relation to the total cost incurred
Fukushi Morishita	2017	Bringing state-of-the-art diagnostics to vulnerable populations: The use of a mobile screening unit in active case finding for tuberculosis in Palawan, the Philippines	> Rural Poor > Urban Poor > Prison Inmates > Indigenous Population > High school students	to describe yield of TB diagnosis and treatment outcomes by different target population	Retrospective study	> Highest yield and lowest NNS was found in the prison (6.2%, NNS: 16) > Followed by Indigenous population (2.9%, NNS: 34) > Rural Poor (2.2%, NNS: 45) > Urban Poor (2.1%, NNS: 48) > High school (0.2%, NNS: 495)	> Yield of TB > Treatment outcomes > Number needed to screen
E. Mupere	2013	Effectiveness of active case-finding strategies in tuberculosis control in Kampala, Uganda	Ugandan Residents of Kampala who are ≥ 10 years of age	To determine if ACF is cost-effective strategy for TB case detection in Kampala Uganda compare to PCF	Mathematical Modeling	ACF implemented city-wide would result in additional 1594 TB cases detected in 1 year, 675 deaths averted over a 5-year period, 21,928 LYS, and would cost an additional US$109 per additional QALY.	> Quality Adjusted Life Years
Juliet N. Sekandi	2015	Cost-effectiveness analysis of Community active case finding and household contact investigation for tuberculosis case detection in Urban Africa	> Evaluation focused on a population of urban residents of all ages > ACF targets adult 15 years or older	To determine whether adding ACF or HCI compared with standard PCF alone represent cost-effective alternative TB case detection strategies in urban Africa	Mathematical Modeling	> Passive Case Finding + Household Contact Investigation was Cost - Effective at US$ 443.62 per additional TB case detected > Passive Case Finding + Active Case Finding was not cost-effective at US$ 1432.95 per additional TB case detected. > Sensitivity Analysis showed that PCF+ACF will be cost effective if prevalence of chronic cough in the population increase 10-fold from 4% to 40%.	> Incremental Cost Effectiveness Ratio

to door case finding in Brazil showed an increase in the case finding during the short period of intervention wherein 71% of identified households were enrolled to treatment (9).

Interestingly another way for finding presumptive TB cases in the community is through mass screening, from the finding of Dobler et al, they found that using Mass Miniature Radiography in jail is was not only effective but was also less expensive in former soviet union(12). While reports from Kranzer et al. depicted that Mass Miniature Radiography screening did only as efficient as other screening approaches done in Czechoslovakia (9).

Diagnostic test

Detailed in Table 3 are the diagnostic test/s used in each of the systematic review. In the study of Jennifer Ho et al, they have posed that ACF generally starts with a screening followed by a confirmatory test. The initial screening may be done by symptom screening or by chest x-ray. This is ideal as they also suggested that the screening test should be sensitive

Table 2. Screening Strategies

Author	Year	Screening
Systematic Reviews		
Claudia Caroline Dobler	2016	> Door to Door > Discrete Campaigns > Outreach (Microscopy Camp) > Mass Screening on Targeted Groups (TB Contacts, PLHIV, Prison, Elderly)
Gregory J. Fox	2012	
Lucie Blok	2015	> Door to Door by a Community Based Health Worker > Enables and Incentive (monetary or kind) were used for screening
Charlotte C Heuvelings	2017	> Mobile screening
Jennifer Ho	2016	Population evaluated have the following characteristics > Less reported symptoms > Earlier stage of disease > Lower bacillary (MTB) load > Reduce Health Seeking Behavior > May be less likely to accecpt and complete treatment > More health care access and socioeconomic factors to consider
K. Kranzer	2012	> Mass screening > Door to door > Communty Outreach > Targeted ACF
K. Paquette	2014	> Location based screening (shelters, social services centres)
Jacob Creswell	2014	> Door to Door by a Community Based Health Worker > Enables and Incentive (monetary or kind) were used for screening

to detect low organism load. Detecting these cases earlier will reduce the risk of complications to develop. On the other hand, if a presumptive case was determined as positive to the initial screening, test like the Sputum Smear Microscopy or GeneXpert are viable options for confirmatory tests. Though culture was used in other studies, it only compared the test's sensitivity to other test. Ho et al' recognizes the reliability of the culture tests but raises concerns on it's slow culture time, wherein they propose that the confirmatory test should be rapid, and culture is not known for its ability to produce rapid results (11).

On the topic of symptom screening, a study in Blok's review determined that the restrictive definition of a symptom screening affected the outcome of yield sputum examination of confirmed cases among household contacts(13). They mentioned that the lesser the restrictive definition are (e.g. a contact report any TB related symptom) the less yield is observed, while a more restrictive definition (e.g. cough of two weeks with or without symptom) would yield a higher output compared to the less restrictive.

Table 3. Diagnostic Tests

Author	Screening Test Documented
Claudia Caroline Dobler	> Cough Surveys/ Symptom Screening > DSSM > Chest X-ray > GeneXpert
Gregory J. Fox	>AFB (DSSM)
Lucie Blok	> Symptom Screening > DSSM > Chest X-ray > LED > Culture
Charlotte C Heuvelings	> Chest X-ray (Mobile) > Symptomatic Screening > TST > IGRA (QFT-G) > DSSM > Culture
Jennifer Ho	> Symptom reporting > Chest radiography > Smear microscopy > GeneXpert > Culture (only if the facility has a sufficient capacity to follow up patient)
K. Kranzer	> Symptom Screening > DSSM > Culture > Mass Miniature Radiography
K. Paquette	> chest X-ray > Sputum smear > Culture > Symptom Screening > IGRA
Jacob Creswell	> Symptom Screening > DSSM > Chest X-ray > LED > Culture

Modelling Assumptions

Focusing on the Mathematical modelling papers, the 3 papers individually based their models from 3 different structures: a simple deterministic model, a decision tree, and a Markov model was utilized by Nishikiori, Sekandi, and Mupere respectively to design their mathematical model.

The simple deterministic model of Nishikiori provided assumptions for the input of his model, He detailed that in his study the prevalence for high-risk groups were assumed based from the prevalence ratio to the general population or by direct estimate. Another assumption in his model was his proportional yields for TB symptomatic and smear positive, where he did a sensitivity analysis to assume the ranges (0.3-0.5 for the TB symptomatic, and 0.5-0.7 for the smear positive) to have a uniform distribution(18).

For Sekandi's decision tree, they assumed that 57% of potential suspect has access to the public health system based on the detection rate of Uganda. Health care workers screen patients for chronic cough and identify people with cough >= 2 weeks. The same probabilities associated with events in the PCF alon strategy also applies to the PCF + Household contact Investigation strategy. For PCF+ ACF, additional cases can be detected by the ACF path through community door-to-door survey s as a supplement to the PCF strategy(17).

While for Mupere's Markov model, assumes that all patients who are identified with smear positive TB are treated whether the case is detected using ACF or in a health-facility, and non-adherence would be minimal. Sensitivity and Specificity of sputum smear microscopy would be the same regardless of HIV Status. All detected cases by house to house survey was categorized as detected early. Survival and treatment success were assumed to be marginally better among cases detected early compared to those detected at the advance stage. It was assumed that the same treatment was given to both detected by ACF and PCF. Latent TB and those without TB had similar health utilities regardless of HIV status(10).

Cost-effective and Outcome measures

The studies reviewed in this paper used different outcome measures as detailed in Table 4. A common outcome measure in across the studies reviewed is the Incremental Cost Effectiveness Ratio (ICER), Dobler et al. mentions that ICER answers the question "what are the additional benefits gained from a new intervention and how much additional cost?". In the same report Dobler explains that by using the approach promoted by the WHO titled Choosing Interventions that are Cost-Effective (WHO-CHOICE) Project, which uses the GDP as a cost-effectiveness threshold expressed as three times the national annual GDP per capita per DALY avoided is considered cost effective (12).

Nishikiori's model utilized the Number Needed to Screen (NNS) as one of the output parameters of the simple deterministic model. In his study, NNS differed depending on the diagnostic strategy, the NNS is higher on lower yield diagnostic strategies and the NNS is lower on strategies that yielded more cases. It must be noted that Nishikiori mentioned that the relationship between the NNS and the diagnostic cost, a low NNS would not guarantee the feasibility and cost-effectiveness in his study (18).

A local study on the Philippines, which studied the yield of TB diagnosed and

Table 4. Outcome Measures

Author	Year	Study Design	Outcome Measures
Claudia Caroline Dobler	2016	Systematic review	> ICER > ICER per DALY averted > Cost per Active TB Detected > Additional Cost per case > ICER expressed as cost per QALY gained
Gregory J. Fox	2012	Systematic review and meta-analysis	> Incidence Case per year divided by population at risk > Incidence Rate Ratio
Lucie Blok	2015	Systematic review; cross-sectional analysis	> Number Needed to Screen > Number of SS+ Cases diagnosed through contact investigation divided by total number of SS+ cases notified
Charlotte C Heuvelings	2017	Systematic review	> Sensitivity and specificity of chest radiography and symptom base questionnaire > Chest Radiography suggestive of TB > Incremental cost from tax payer perspective > Sensitivity and specificity of mobile chest X-ray > Culture confirmed cases with positive smear > Effectiveness > Follow-up attendance > Sensitivity of TST and QFT in cutture confirmed Pulmonary TB Cases > Test agreement QFT G assay, TST, and chest radiography > Smear negative and culture positive
Jennifer Ho	2016	Systematic review	
K. Kranzer	2012	Systematic review; cluster randomized design	Additional TB cases detected, reduction in diagnostic delay
K. Paquette	2014	Systematic review and meta-analysis	> Pooled prevalence of active TB
Jacob Creswell	2014	Systematic review	Additional SS+ cases treated, defined as the increase in TB case notification from NTP treatment registers within the reporting area during the intervention period compared t the same area's notifications from the previous year.

Table 4. Outcome Measures (continued)

Author	Year	Study Design	Outcome Measures
Nobuyuki Nishikori	2013	Mathematical Modeling	> Cost per case detected > Number needed to screen > Incremental yields in relation to the total cost incurred.
Fukushi Morishita	2017	Retrospective study	> Yield of TB > Treatment outcomes > Number needed to screen
E. Mupere	2013	Mathematical Modeling	> Quality Adjusted Life Years
Juliet N. Sekandi	2015	Mathematical Modeling	> Incremental Cost Effectiveness Ratio

treatment outcomes by different target populations. The study used ACF and targeted 5 vulnerable population: residents in rural poor communities, prison inmates, indigenous population, and high school students. They discovered that the community with the highest yield and lowest NNS was found in the Prison with 6.2% yield and 16 NNS, followed by indigenous population (2.9%, NNS: 34), the rural poor (2.2%, NNS: 45), the urban poor (2.1%, NNS:48), and high school (0.2%, NNS: 495) (18).

CONCLUSIONS

The DOH has programs enacting the ACF strategy, even integrating these initiatives to the current TB diagnostic algorithm. Practical ideas for a tailor-fit strategy with well-thought out plausible frameworks, defined target populations and screening strategies suggest that these will contribute to the additional detection of TB cases. ACF therefore is essential for the DOH's goal towards TB control.

The scoping review had provided evidence that are useful to map out evidences of active case finding strategies and its applicability to the Philippine setting.

This scoping review considered a wide-range of target population and different combination of both screening and diagnostic strategies, key assumptions including diagnostic accuracies and clinical diagnosis, and outcome measures such as ICER and NNS.

Literature reviews are also essential to see ACF strategies with settings similar to that of the Philippines. However, there are some gaps that this review has not been able to consider. These includes the barriers and the potential solutions in implementing ACF programme/intervention and policies within the health system. ACF activities' feasibility, and resource allocation is also best explored for future researches.

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Implementing the TB-FIT Project: Lessons Learned

Lessons Learned on the Assessment of Impact of the Different Diagnostic Algorithms to Detect Pulmonary Tuberculosis in the Philippines

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ABSTRACT

The TB-FIT Project is a 3-year project that focused on the health system model development of new diagnostic tools and algorithms. The study looked into the cost-effectiveness of strategies and determined the most suitable strategy for sites modeled in Cavite. Under the umbrella of this project there has been successful endeavors and fair share of struggles that was overcome. This paper shares the lessons learned from the experiences garnered from the TB-FIT Project.

Keywords: TB-FIT, Modeling, Impact, Lessons Learned

INTRODUCTION

Currently, tuberculosis (TB) is still making its presence known in a global stage. Despite reaching the target of the Stop TB Strategy to reduce dramatically the global mortality and incidence of TB in 2015, no country has ever reported its eradication. Hence, an ambitious End TB strategy target was formulated to achieve a 75% death rate and 50% TB incidence reduction with an accelerated annual decline of TB incidence of 2% in 2015 to 10% annual reduction by 2025 [1]. Strides for progress in reducing the impact of TB in the community is evident, from being the 6th leading cause of death in 2000, down to the 10th in 2016 [2]. As of 2019 the WHO is still reporting TB as one of the top 10 causes of death worldwide [2] in 2019 alone a total of 1.4 million died from the disease globally [3]. The targets conceptualized by the End TB strategy serves as the milestone to achieve the Sustainable Development Goals (SDG) by 2030 and END the TB malady by 2035 [1].

In the Philippines' 2016 National TB Program Prevalence Survey, an estimated of nearly 1,200 bacteriologically confirmed TB cases per 100,000 of the population, and it seems that the prevalence rates are not getting lower [4]. The increasing of TB cases is also evident in the WHO Global TB report for the Philippines, which details that the TB incidence rate in the Philippines is consistently around 554 per 100,000 of

the population for three years straight starting from 2016 [5–7]. Though the presence of the disease is still clear in the community, this puts the country in a very pivotal position to focus on developing new technologies. A robust call for funding support in achieving these targets was disseminated.

The Newton Fund was set up by UK government in 2014 to build research and innovation partnerships with 16 partner countries including the Philippines. An initial fund of €38,000,000 were accumulated to support collaborative research partnerships that would help to fulfil the development needs of identified partnering countries [8]. Newton Fund-Agham Initiative established a collaborative research effort between Medical Research Center of the UK Government and the Philippine Center for Health Research and Development (PCHRD) to support important innovative research with knowledge and technology transfer to produce long-term sustainable projects. The second cycle of Newton Fund-Agham call for innovative research proposals was disseminated to launch the UK-Philippine partnership to support the envisioned success of the END TB strategy.

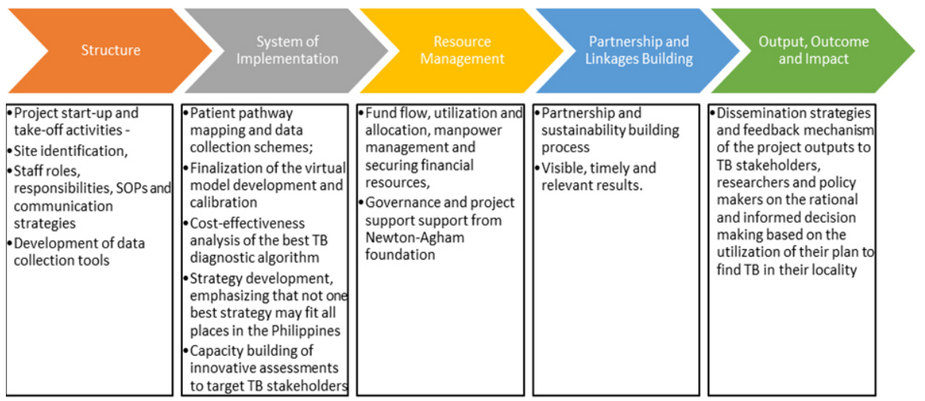
Pursuing its vision to become the renowned world-class research hub, a core group of De La Salle Health Sciences TB-researchers led by Dr. Charles Y. Yu was awarded a financial support for the project initiative entitled "Impact assessment of diagnostic algorithms and tools for multi-drug resistant (MDR-TB) and drug sensitive tuberculosis (TB) in the Philippines (TB-FIT Project)" – a joint project with De La Salle Medical and Health Sciences Institute and the Liverpool School of Tropical Medicine. With its three years of project implementation, it is hoped that TB-FIT would rekindle the flame of the institution's partnership with local and international TB stakeholders. All these partnerships are necessary to achieve the goal of training and equipping Filipino researchers with the Impact assessment approach that can be used to project the impact of new diagnostic tools and algorithms for MDR-TB and TB. Likewise, TB-FIT also aimed to help make researchers and policy makers have rational and informed decisions on the scale-up of new diagnostic tools in the Philippine setting. Beyond the technical and scientific publications, this provides a summary of the "behind-the-scenes" that would help future project implementors to streamline their collaborative efforts both for cross-country and local partners. Though the project has ended in 2019, this paper came into being to discuss the best lessons learned from this project through the lens of a retrospective modified forcefield analysis.

METHODS

In efforts to share the lessons learned of the TB-FIT 1 project implementation, a review of the project activities and outcomes throughout the project life of the 3 years was conducted. Information that was used to formulate lessons learned are simplified by classifying each activity in the project process flow, as seen in figure 1.

Key to this documentation process was a review of the project progress reports which were routinely submitted to the monitoring agency Philippine Council for Health Research and Development (PCHRD) on a quarterly basis. Equally important was the data reviews as required by the model development that accumulated during the study's duration as well as the research paper outputs published by the project team.

Figure 1. TB Fit Process Workflow



RESULTS

The ACTION Framework, as displayed by Figure 2, describes the project process including certain events or objects of interest that took place in the project duration that contributed to the progress or objective of the project, and notable encounters to the project that has proved challenging or has curbed certain process or objectives that the project is attempting to accomplish. Table 1 defines the overall

Figure 2. Action framework at a glance

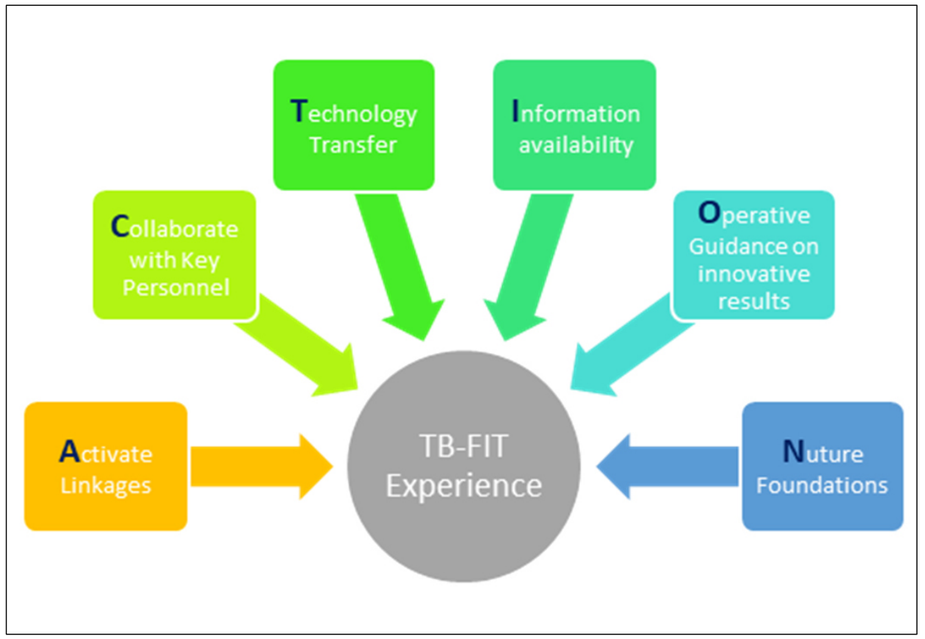


Table 1. TB-FIT project experience context

TB-FIT Experience	
Activate linkages	Activate linkages through identified sites' key personnel by informant interviews, focus group discussions and high-yield stakeholder meetings
Collaborate with key personnel within and outside core team members	Collaboration with well-established rapport and open communication with team members and consultants (locally and internationally)
Transfer of technology and innovative trainings	Research and data results generated are useful to the subnational level (city/municipal and regional level results). Technology transfer enabled project partners and participants of the training to do model testing and runs on their own, to understand and interpret the impact of the results of the model.
Information availability and synthesis	Routine forms and reporting systems are not enough to get primary data required for modelling. Moreover, synthesizing various experts' opinion in different aspects of TB diagnostic & treatment outcomes, patient and health system expenditure. -makers and other stakeholders which require coordination
Operative guidance on innovative results	Translate modelling/project's objectives and results and its complicated technical jargon to local decision and cooperation with guidance among different experts in various fields
Nurture foundations	Modelling results strengthened capacity building activities, enabled regions to seek consult asked help in what diagnostic strategies is best for their area.

DISCUSSION

The TB-FIT Project's objective was to equip Filipino researchers with a tested impact assessment approach that can be used to project the impact of new diagnostic tools and algorithms for MDR-TB and TB and enable policy makers to make rational and appropriate decision on the scale-up of new diagnostic tools in the Philippines. Equally important are the project's specific goals which is to develop a computer model, collate the data, and to build sustainability among Filipino stakeholders and researchers alike.

A well-rounded computer model requires a substantial number of variables to run, and acquiring the necessary information is crucial to the model development. Most of the information needed are from records that the health facility keeps, for at the time of the study the information needed for the modelling were retrieved from paper-based records. These information are fed to the model to produce expected projections for alternative TB diagnostic algorithms. The computer model is not only just a loop of scheduled activities that is repeated to produce a projection, and that its parts can produce certain nuances in the simulation to replicate a certain degree of reality. These parts require assumptions from experts, or real-life experiences that are not readily available in any recorded form, but can be acquired through focus group discussions, interviews, or expert opinions. Such data were gathered in the sites across Cavite (Dasmarinas, Imus, Silang, Tagaytay, Tanza, and Trece Martirez) firstly. When the project expanded outside of the Region IV,

the study also collated information from Davao City, Bulacan, and Regions III, V, VII, XI, XII, and XIII.

Information through connection

Data collation and verification serves as the first core project activity. This part of the study would have not been available without the support of the linkages that were established and developed over the course of time. The study has invested a significant amount of effort setting-up good connections and fast communication to the local health units of identified areas. Primary data such as patient interviews, and secondary data collation in the form of records review facilities' logbooks has provided a sense of immersion on the study team and granted a certain level of rapport with the study sites. The same rapport was used to bridge the gap on missing information not seen in the records review, and differences of opinion among experts and key personnel alike. The experiences of health care staffs and anecdotal commentaries of patients has provided useful insights which were also used in the model development, specifically in the part of the model that provides nuances to reflect what is field realities.

National-level linkages to the DOH-NTP allowed the study to expand their investigations, and as recommended, Davao City and Bulacan Province. The project team ensured that its growth is not confined in a small circle of connections, some of the most valuable inputs from the project came from newly acquainted individuals introduced serendipitously. The investment on the study's linkages has paid off in the long run and was able to expand in terms of variety of information deemed essential but not previously encountered in Cavite data collation activities. Diverse set of reports for modeling have discussed in-depth results for model outputs.

Walk the Talk

The expansion through other sites as well as the local sites has provided an abundant avenue for collaboration, in addition to the current collaboration with LSTM. This collaboration has positioned the study in an advantageous point of view to share the information needed back and forth for the model development. The project team conducted focus group discussions to set a stage for open collaboration between stakeholders. FGDs always provided important insights to project every time it was conducted, the same FGDs were so effective that it even helped form new linkages that was beneficial to the study.

The collaboration also shared a certain level of eagerness from the study sites and stakeholders on the study developments which always helps in accomplishing the study's objectives.

Tips and Tricks

Collaboration with international institution has provided a torrent of new information and technical improvements to the project team. One of the main purposes of the project was to capacitate Filipino research with the necessary technologies and training in order to use the developed computer model.

All sites and stakeholders from the project were given the WITNESS program. This is the same computer program used by the model developers and was developed by the Lanner corporation to create and run visual computer models of health systems. In tandem with the program was the user friendly excel file, where the model users

can change the variables and key settings of the model with ease, and is then translated to the witness to run the developed model. The developed model can produce and project statistics that was configured in the model. With such a complex computer model, this would require a substantial amount of data to best represent what was happening in the field

Inevitably in the aim to conduct proper technology transfer, the international partners has provided and displayed their prowess in the field and guided the local team on addressing issues that would relate to feasibility of data availability. Going beyond the definition of technology transfer.

Science and Policy

The TB-FIT Project produced several papers that was aimed to contribute to the scientific community as well as targeted to impact the decision makers. An example of this paper is the Use of the GeneXpert on Clinically Diagnosed smear negative TB patients. One of its key finding was that an Expert Panel reviewing a smear negative chest X-ray can reduce significantly the number of overdiagnosis [8]. The study was intended to only measure the accuracy of the GeneXpert machine among smear negative patient, instead this has produced valuable insight that intrigue not only our stakeholders but also the scientific community.

Another example is the Patient Cost Survey Analysis, key findings of which is there is a large number cost attributed to patients undertaking TB Treatment in Cavite. These costs are even considered to be underestimated due to patient recollection [9].

Guidance and Relevance

As much as the accomplishments of the TB-Project is concerned, majority of the game breaking decisions on where to direct the project was not decided by the project team alone but rather was advised and guided accordingly by the DOH – National and Regional Office, PCHRD, LSTM, and Local Government Units. The modeling results of the project has supported the DOH's move to deploy new diagnostic tools such as GeneXpert in a strategic way in various factors such as: geographic location, positivity rate and prevalence.

The DOH NTP along with the LGUs guided us to the areas that were in immediate need of attention relating to the matter of the project, the PCHRD offered avenues in the form of platforms in where the project presented the relevant findings to the scientific community. LSTM our international partner has always been supportive with the endeavors of the project team. As independent as the project team were, they always draw guidance from multiple sources in order to be well informed in any future decision.

Take it with a Grain of Salt

Not all endeavors of the project went exactly as planned, some challenges were observed and overcome in its lifetime. For example, one of these hurdles was establishing connections logistical challenges were observed and was almost always present in every step of the way. The project combated this challenge with impressive coordination and swift correspondence to assure that all involved parties are attended for properly. Consistent follow ups were done to ensure that the project has done its part to do what is necessary to accomplish each tasks.

Collaborations were not always perfect, main challenges in establishing strong collaborations were communication barriers. Especially with international collaboration, unreliability of the internet connection played a significant role in disrupting scheduled meetings. Bridging

the gap between the project and its collaborators was important, face to face meetings were always beneficial to progress.

Having realistic expectations on the availability of the data helped. An example was the records review and patient interview which has provided significant contribution in the model development, but ascertaining such information was considered a challenge as most of the information was not readily available. In one instance some of the paper based recording was incomplete and the aforementioned information was irretrievable. Some master lists that was key to the records review existed but was destroyed by unfortunate natural events.

Once the information has been refined and prepared for publication, a huge gap has presented itself to the project team in the nature of translating the scientific findings produced by local and international collaboration to simple easy to digest information to present key stakeholders and contributors.

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The Effect of Gallbladder Wall Thickness on Intraoperative Adverse Events during Laparoscopic Cholecystectomy

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ABSTRACT

Objective: This study aims to determine whether the different degrees of gallbladder wall thickness determined by ultrasound affect the rate of complications during laparoscopic cholecystectomy.

Method: The medical records of the patients who underwent laparoscopic cholecystectomy from January 2012 until September 2013 were reviewed. The data gathered included the patient demographics, gallbladder wall thickness based on ultrasound , intraoperative events and post operative complications, conversion to open cholecystectomy, gallbladder wall thickness (in centimeters) on histopathology, and hospital stay. The patients were classified based on gallbladder wall thickness and a multinomial logistic regression analysis for the intraoperative events and post-operative complications with the degree of gallbladder wall thickness was subsequently conducted.

Results: There were 359 patients who underwent laparoscopic cholecystectomy from January 2012 until September 2013 whose age ranged from 12-92 (median 52 years). There were 226 females (63%) and 133 males (37%). The average operating time was 82.87 ± 33.87 minutes with a range of 25-225 minutes. There was only one reported case of conversion to open cholecystectomy due to difficulty in defining the anatomy. Intraoperative events included intentional gallbladder perforation (0.3%) and non intentional gallbladder perforation (4.5%), bleeding (5.8%), cystic duct injury (0.3%) and bowel injury (0.3%). Post operative complication included 5 (1.4%) cases of surgical site infection and one case of retained stone (0.3%). Majority of the patients had gallbladder wall thickness ranging from 1-2 mm.

Conclusion: There is no enough evidence to show that the degree of gallbladder wall thickness will affect the occurrence of intraoperative and post operative complications during laparoscopic cholecystectomy.

Keywords: laparoscopic cholecystectomy, acute cholecystitis, gallbladder wall thickness, bile duct injury, sonology of gallbladder

INTRODUCTION

Cholelithiasis and gallbladder polyps are common gallbladder diseases requiring surgical intervention. In line with this, laparoscopic cholecystectomy is now considered to be the gold standard for the surgical management of symptomatic gallstone disease, supplanting open cholecystectomy because it offers better outcome in terms of post operative pain, hospital stay, return to work and cosmesis [1,2,3]. Albeit there is widespread use of this procedure, a significant proportion of patients still experiences complications from the procedure which increases morbidity and subsequently prolongs hospital stay [4,5]. Therefore, the ability to better predict the likelihood of a complication during the preoperative evaluation helps manage the expectations of both the patient and the surgeon. Several studies have identified factors that are predictive of postoperative complications or conversion to open cholecystectomy [6-8]. Among these factors is gallbladder wall thickness, which has been shown to be associated with increased risk of postoperative complications [9-11]. However, most of these studies did not elaborate on determining the relationship of the degree of wall thickness to intraoperative adverse events during laparoscopic cholecystectomy. Therefore, this study aims to determine whether the different degrees of gallbladder wall thickness gathered by sonology, normal (1-2mm); mildly thickened (3-4mm); moderately thickened (5-6mm); severely thickened (7mm and above), have an impact on the rate of complications related to laparoscopic cholecystectomy in patients undergoing the said procedure

METHODS

After approval of an ethics review board, a retrospective review of all patients who underwent laparoscopic cholecystectomy in De La Salle University Medical Center over a period of 3 years between January 2010 and September 2013 was conducted. Data collated included patient demographics, gallbladder wall thickness on ultrasound, operating time, intraoperative events and complications, conversion to open cholecystectomy, gallbladder wall thickness (in centimeters)

on histopathology, and hospital stay. The patients were divided into four groups based on their gallbladder wall thickness measured by ultrasound: normal (1-2mm); mildly thickened (3-4mm); moderately thickened (5-6mm); severely thickened (7mm and above).

Intraoperative adverse events measured were non-intentional GB perforation, intentional GB perforation, bowel injury, bile duct injury, cystic artery bleed, liver bed bleed and cystic duct leak.

A previous study showed that complication occurring after laparoscopic cholecystectomy was at 2%. The probability to have a complication in a participant who had a mildly, moderately and severely thickened gallbladder wall was 7%, 9% and 13% respectively. From here the sample size was computed at 95% confidence interval with a power of 80%. Since there are 3 categories for the exposed group, the 0.05 chance of error was divided into 3 which would give a p value of 0.0167 to be significant. Statistical analysis for gallbladder wall thickness (either by sonology or by histopath) to the occurrence of a complication would be analyzed using multiple regression analysis. Using the STATA software, the sample size was computed for each exposed group. This gave off a sample of 318, 585 and 1116 for the mild, moderate and severely thickened group. For feasibility for the sample size we chose that of the mildly thickened group, 318 subjects.

RESULTS

There were 359 patients who underwent laparoscopic cholecystectomy from January 2012 up to September 2013, 359 patients underwent laparoscopic cholecystectomy. The age range was 12-92 years old (median 52). There were 226 females (63%) and 133 males (37%). The average operating time was 82.87 ± 33.87 minutes with a range of 25-225 minutes. Only 1 (0.3%) procedure was converted to an open procedure due to difficulty in identifying the anatomy. However, the gallbladder of this patient was 2mm on ultrasound but 3mm on histopathology. Table 1 shows the demographic data of the subjects included in the study.

Table 1. Demographic data

Total number of patients	359
GENDER (Male : female ratio)	133 : 226 (37% : 63%)
AGE (Range, mean ± SD (in years))	12-92, 45.46 ± 14.909
Conversion to open procedure	1 (0.3%)
Operating time (in minutes)	25-225,
Range, mean ± SD	82.87 ± 33.871

Table 2 illustrates the various intraoperative events observed in the course of the surgery. Of the 359 patients, 319 of the laparoscopic cholecystectomies performed were unremarkable. The other intraoperative adverse effects observed are as follows: 16 (4.5%) had non intentional GB perforation, 21 (5.8%) bleeding, 1 (0.3%) case of bowel injury, 1 (0.3%) case of intentional GB perforation for GB decompression, and 1 (0.3%) bile duct injury.

Table 2. Frequency and Percentage of Intraoperative Adverse Events.

Non intentional GB perforation	16 (4.5%)
Bleeding	21 (5.8%)
Bowel injury	1 (0.3%)
Intentional GB perforation	1 (0.3%)
Bile duct injury	1 (0.3%)
None	319 (88.9%)
Total number of patients	359

The frequency of the different categories of the patients based on the gallbladder wall thickness on ultrasound was exhibited in table 3.

Post-operative complication included 5 (1.4%) cases of surgical site infection and one case of retained stone (0.3%).

Table 3. Frequency per GB wall thickness category

Normal	175 (48.7%)
Mildly thickened (2-4mm)	144 (40.1%)
Moderately thickened (5-6mm)	30 (8.4%)
Severely thickened (>7mm)	10 (2.8%)
Total number of patients	359

DISCUSSION

Laparoscopic cholecystectomy is a common surgical procedure performed to address various diseases of the gallbladder. However, even if this is now the gold standard in treatment of symptomatic gallstone disease, it comes with its own risks. Several studies have investigated the correlation between preoperative gallbladder thickness and associated conversion to open procedure. However, limited studies have stratified the degree of wall thickness and correlated it with the associated complications arising from laparoscopic cholecystectomy. Such complications include conversion to an open procedure, bleeding, gallbladder perforation, bowel injury and bile duct injury. This study can serve as baseline information on the association between the degree of gallbladder wall thickness and

laparoscopic cholecystectomy complications as mentioned. Results of the study can also help surgeons anticipate perioperative complications and this will enable them to prepare and advise their patients well.

Using ultrasonography as a preoperative tool in assessing difficult laparoscopic cholecystectomy has been done by Pawan et. al. [12] Preoperative ultrasonography was performed prior to surgery and 4 parameters were correlated to findings of difficult laparoscopic cholecystectomy which were eventually converted to an open procedure. These parameters included gallbladder wall thickness (>4mm gallbladder wall), gallstone mobility, gallbladder size and common bile duct diameter. Data showed that 90% of patients with thickened gallbladder walls were found to be difficult on surgery and 70% were eventually converted to open procedure.

In another prospective study done to determine factors that contribute to a difficult laparoscopic cholecystectomy, gallbladder wall thickness, presence of adhesions, liver size and gallbladder size were found to be significant predictors of surgical outcome. Surgical complications that were used to identify difficult surgeries included duration of surgery, bleeding, dissection of gallbladder wall, adhesions, spillage of bile, spillage of stones and difficulty of gallbladder extraction [13].

Multiple studies have also assessed the use of preoperative sonography in predicting difficult cases of laparoscopic cholecystectomy [14-16]. Common among their findings include a positive correlation between the thickness of gallbladder wall and a difficult laparoscopic cholecystectomy including conversion to open procedures.

In a similar study done by Raman et al. [1] patients were categorized according to their preoperative gallbladder wall thickness measured by ultrasound which were: normal (1-2mm), mildly thickened (3-4mm), moderately thickened (5-6mm) and severely thickened (>7mm). After statistical analysis of their data, the researchers found that the incidence of complications were 1.8, 6.7, 9.1 and 13.1% (p=0.001) [1] among the different groups. It is notable that there is an increasing incidence of complications as gallbladder wall thickens. They therefore concluded that classifying patients according to their gallbladder wall thickness provides a more accurate surgical risk assessment.

Having established that gallbladder wall thickness correlates with difficulty of surgery and subsequent occurrence of intraoperative adverse events and post-operative complications, this study would like to further evaluate the degree of gallbladder wall thickness as to the occurrence of these complications.

This study included 359 patients who underwent laparoscopic cholecystectomy and were evaluated for the presence of intraoperative events which included bleeding, bile duct injury, bowel injury and gallbladder perforation as well as post-operative complications which included retained stone in the common bile duct and surgical site infection. The patients were also categorized according to their gallbladder wall thickness on ultrasound. However, after doing a multilogistic regression analysis on the effect of the degree of gallbladder wall thickness to the intraoperative events, there was no statistically significant difference in the degree of gallbladder wall thickness and intraoperative events.

CONCLUSION

There is not enough evidence to show that the degree of gallbladder wall thickness impacts the occurrence of intra-operative and post-operative complications during laparoscopic cholecystectomy.

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Association of the Health Status with the Academic Performance of First Year Medical Students of De La Salle Medical and Health Sciences Institute

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ABSTRACT

This cross-sectional study, aims to determine the association between the overall health status of medical students and their academic performance in AY 2016-2017 and 2017-2018. Of 606 first year medical students of DLSMHSI, 432 participated in the study but only 304 had complete data. Overall health status(OHS) refers to risk factor according to clinical profile(BMI, past medical and family history) and health factor according to medical examinations (CBC, chest x-ray and Anti-Hbs). Academic performance refers to grade point average at the end of the academic year. Statistical analyses used were frequency and percentages for risk and health factors and x^2 test for the association of the two variables. RESULTS: In clinical profile, majority had normal BMI(55.9%), unremarkable past medical (55.6%) and family history(35.2%). Of 135 students with significant past medical history, 77% had allergic conditions. Of 197 students, 41% had cardiovascular diseases in their family. Majority had nonreactive Anti-Hbs(52.3%), unremarkable CBC and chest-xray. OHS had 4 categories: "healthy and no risk","healthy but with risk", "unhealthy but no risk"and "unhealthy and with risk". Statistically, there was no significant association between overall health status and academic performance, $X^2(9, N=304)=13.99$, $p<0.05$. Majority were unhealthy and at risk of having other health condition(47.4%) due to medical examination as the only criteria in health factor and was used as a screening tool, not for diagnostic purposes.

CONCLUSION: *Medical students can achieve a passing academic performance regardless of their overall health status.*

INTRODUCTION

A healthy body and mind are needed to endure the stresses brought about by the adjustment in studying and new environment. Health may affect their mental capabilities such as learning and memory [1,2]. There are times when the main purpose of the school entry medical examination is taken for granted. The students or the parents sometimes forget to follow-up the results of the school entry medical examination. In some cases, the results will only be recognized at the end of the academic year from which the students need a clearance. Parental support is helpful in achieving a healthy body among students. If a student receives parental resources, they also perceive health resources to be available. In cases that health is neglected by their families, the school physician takes over in the responsibility of reminding about the importance of health[3]. The study mainly aims to determine the association of overall health status and academic performance of first year medical students of DLSMHSI. The study also aims to determine the risk factor, health factor and overall health status of first year medical students of DLSMHSI.

MATERIALS AND METHODS

This is a cross-sectional study, conducted at De La Salle Medical and Health Sciences Institute(DLSMHSI) and was approved by the Institutional ethics committee. Of 606 first year medical students of DLSMHSI, 432 participated in the study but only 304 had complete data. Data collection was done at the school clinic and registrar of DLSMHSI. The records of first year medical students from academic year 2016-2017 and 2017-2018 were collected and analyzed. The clinical profile, medical examination results and academic performance of the first year medical students were assessed in the study. The data gathering commenced from June to August 2018. All gathered records were collected from the school clinic and registrar after getting the informed consent of the students. The data were treated with utmost confidentiality.

Overall health status (OHS) refers to risk factor according to clinical profile and health factor according to medical examinations. The risk factor of having other health condition is based on the clinical profile such as body mass index, past medical and family history of the respondents. Identification of at least one health condition in either past medical history, family history and having a remarkable BMI result, was considered to have remarkable clinical profile and was "at risk" of having other health conditions. Meanwhile, the health factor is based on the medical examinations such as complete blood count, chest x-ray and Anti-Hbs. The medical students were identified as healthy or unhealthy based on the medical examination result. If there is at least 1 remarkable medical examination result, the student is considered unhealthy. The criterion for overall health status (Table 1) was based on the risk factor and health status. On the other hand, academic performance refers to grade point average at the end of the academic year that followed the grade point average interpretation as seen in Table 2. Statistical analyses used were frequency and percentages for risk and health factors and x^2 test for the association of overall health status and academic performance.

Table 1. Overall health status criteria

Overall health status	Criteria
Healthy but at risk of having other health condition	Has normal medical examination result with remarkable clinical profile
Unhealthy and at risk of having other health condition	At least one remarkable medical examination result and clinical profile
Healthy and not at risk of having other health condition	Normal medical examination result and unremarkable clinical profile
Unhealthy but not at risk of having other health condition	At least one remarkable medical examination result with unremarkable clinical profile

Table 2. Academic performance

Grade point average	Interpretation
93.6 to 100.0	Excellent
87.1 to 93.5	Good
80.6 to 87.0	Average
75.0 to 80.5	Fair
74.9 and below	Poor

RESULTS AND DISCUSSION

Risk factor in terms of clinical profile

Majority of the first-year medical students had normal BMI (55.9%), unremarkable past medical (55.6%) and family history (35.2%) as presented in Table 3. Of 135 students with significant past medical history, 77% had allergic conditions. Of 197 students, 41% had cardiovascular diseases in their family. Environmental exposure plays an important role in the development of the immune system and ultimately may affect the risk of developing allergic diseases [4]. Additionally, the effect of allergic conditions on the quality of life such as the reason for being absent from work and socioeconomic aspects of a person has been recognized [5]. Meanwhile, strong evidence exists that hypertension and diabetes mostly coexist and may exacerbate each other [6].

Health factor in terms of medical examination

There were 52.3% of first year medical student with nonreactive Anti-Hbs while most of them have unremarkable CBC and chest-xray (Table 4). Hepatitis B immunization is being given during infancy nowadays. However, the protection against Hepatitis B virus as a result of previous immunization wanes at 18 years old and above [7]. This only means that most of the medical students are expected to have nonreactive Anti-Hbs. Tuberculosis

Table 3. First year medical students' risk factor according to clinical profile

Clinical Profile	Frequency	%
BODY MASS INDEX (BMI)		
Normal	170	55.9
Overweight	64	21.1
Underweight	32	10.5
Obese I	22	7.2
Obese II	16	5.3
PAST MEDICAL HISTORY		
No known health condition	169	55.6
Immune system	104	34.2
Others	8	2.6
Musculoskeletal	6	1.97
Gastrointestinal	6	1.97
Pulmonary	4	1.32
Endocrine	3	1
Urinary tract	2	0.67
Reproductive	2	0.67
FAMILY MEDICAL HISTORY		
No known health condition	107	35.2
Cardiovascular	81	26.6
Endocrine	57	18.8
Immune system	28	9.21
Others	24	7.89
Pulmonary	7	2.3

*The term "others" includes the surgical, psychological, cancer-related and infectious conditions in Past medical history while in Family history, it refers to cancer and reproductive health condition

transmission is enhanced by poor living conditions [8,9]. This finding may be associated to the economic status of the respondents, whereas most if not all medical students in DLSMHSI belong to middle to upper income class of society. Hence, most have normal Chest x-ray result.

Overall health status

Most of the respondents are categorized as "unhealthy and at risk of having other health condition" with 47.4% while 38.8% were found to be "healthy but at risk of having other health condition" (Table 5).

Table 4. First year medical students' Health factor in terms of medical examination interpretation

Medical Examination Interpretation	Frequency	%
COMPLETE BLOOD COUNT		
Normal	280	92.1
Probable Iron-deficiency anemia	24	7.9
ANTI-HBS		
Non-reactive	159	52.3
Reactive	145	47.7
CHEST-XRAY		
Normal	295	97
Probable Tuberculosis	9	3

Table 5. The Overall health status of first year medical students of De La Salle Medical and Health Sciences Institute

Overall Health Status	Frequency	%
Healthy and not at risk of having other health condition	16	5.3
Healthy but at risk of having other health condition	118	38.8
Unhealthy but not at risk of having other condition	26	8.6
Unhealthy and at risk of having other health condition	144	47.4

The physical inactivity, diet, smoking and drinking alcohol contributes in the development of health condition [10]. Filipinos had the highest levels of family history of chronic illness such as diabetes and heart disease [11].

Association of overall health status with academic performance

There was no significant association between overall health status and academic performance, $X^2(9, N=304) = 13.99$, $p<0.05$ as presented in Table 6. There is no association between overall health status and academic performance since there is variability in the overall health status when compared per academic performance. This result contradicts other studies due to differences in the variables used. The health status can affect the school performance based on the

Ability of the student to cope with the academic requirements, anxiety and stress are important factors in the school performance [12]. Lifestyle behavior such as meal consumption, physical activity and sleep quality may also affect academic

Table 6. Association of Overall health status and Academic performance

Overall health status	Academic performance				
	Good 87.1-93.5	Average 80.6-87.0	Fair 75-80.5	Poor 74.9 and below	Total
Healthy and not at risk of having other health condition	3 1.79 0.82	4 7.63 1.73	9 6.53 0.94	0 0.05 0.05	16
Healthy but at risk of having other health condition	16 13.2 0.6	56 56.28 0	45 48.13 0.2	1 0.39 0.96	118
Unhealthy but not at risk of having other health condition	0 2.91 2.91	19 12.4 3.51	7 10.61 1.23	0 0.09 0.09	26
Unhealthy and at risk of having other health condition	15 16.11 0.08	66 68.68 0.1	63 58.74 0.31	0 0.47 0.47	144
Total	34	145	124	1	304

*X2=13.99 df=9 X2/df=1.56 p-value= 0.1225

performance [13]. Others relate good academic performance with physical and psychological aspect [2, 14]. This study mainly focused on health as the only variable assessed for its association with academic performance. Being healthy or unhealthy is only based on the medical examination results and not on the actual presentation of the medical student. Hence, it is still possible that a person who is unhealthy may achieve a good and average academic performance.

CONCLUSION

Medical students can achieve a passing academic performance regardless of their overall health status. Medical students can achieve passing academic performances regardless if healthy or unhealthy since medical examination results were the only basis for the health factor.

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