The Accessibility and Utilization of Mobile Phones among TB Patients: A Feasibility Survey for Short Messaging Service (SMS) as a Strategy to Improve Adherence to TB Services

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ABSTRACT

Objectives: To estimate the proportion of TB patients who have access to mobile phones and to describe mobile phone utilization practices of TB patients.

Methods: Six public and six private TB clinics representing the four districts of Metro Manila and one institution in Cavite were purposively selected for this cross-sectional survey conducted in 2006. Using an interviewer-administered questionnaire, patients suspected to have TB, those newly diagnosed and those currently on treatment under either DOTS or non-DOTS were interviewed.

Results: Of the 337 patients interviewed, 65% (95% CI 60.2 to 70.6) have access to mobile phones (45% currently own a mobile phone and 20% share a mobile phone with a household member). The mean duration of ownership was 1.8 years (SD1.7). Almost all had prepaid subscriptions (99%) and 72% had some credit/load in their mobile phones at the time of interview. Of the three existing networks, subscription to SMART was highest, followed by the Globe network. Most of them use their phones for social purposes and emergency-related communications.
Most of the respondents were male (60%) in the age group of 20-39 (54%) and 40-59 years old (33%). Half of the respondents were from public TB clinics (52%). On multivariable analysis, patients consulting in private clinics [OR 2.25, 95% CI 1.36 to 3.74], belonging to the younger age of <20 [OR 4.54, 95% CI 1.48 to 13.89] and 20 - 39 years old [OR 2.56, 95% CI 1.48 to 4.39], who had college education [OR 4.97, 95% CI 1.84 to 13.43] and currently employed [OR 3.23, 95% CI 1.92 to 5.47] were more likely to have access to mobile phones.

Conclusion: Considering the fair access (65%) to mobile phones of the patients interviewed, it is feasible to conduct a pilot intervention using SMS as a strategy to improve adherence to treatment. The intervention should consider that majority use prepaid subscriptions and that sharing of phones among household members is a common practice.

Keywords: tuberculosis, short-messaging service, survey

Background

Tuberculosis is currently one of the top five national health program priorities in the Philippines because of its significant epidemiological and socio-economic burden on the Filipino people. Tuberculosis is the sixth leading cause of morbidity and mortality in the Philippines.[1] Of the 22 high TB burden countries, the Philippines ranks 9th in the world and 2nd in

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the Western Pacific region in terms of smear positive cases.[2] The estimated burden of TB in the country is 514,300 DALYs or over half a million healthy-life years lost annually due to illness and premature death from TB. Economically, these premature deaths from TB translate to approximately PhP 27 billion pesos ($490 million USD) loss of potential earnings yearly with 60% of the deaths in the productive age group.[3] Furthermore, those in the productive age group, the poor, the elderly and the men are disproportionately affected. Risk of infection was also higher among those living in urban poor communities in Metro Manila, Cebu and Cagayan de Oro.[4]

Despite the availability of effective drugs to cure TB, the challenge of promoting adherence to complete the 6-month short course chemotherapy regimen remains. Observational studies have consistently shown that the risk of treatment failure and drug resistance increases with poor adherence to treatment. Some of the more common reasons why patients fail to adhere to the treatment regimen, as reported in qualitative surveys, include the following: they begin to feel better, they experience adverse effects, they simply forget, and the treatment duration is too long.[5]

The Philippine government has developed a number of policies endorsing the adoption of the WHO-recommended DOTS (Directly Observed Therapy–Short Course) strategy for the treatment and control of TB. However, the DOT component of the DOTS strategy is quite resource-intensive. Moreover, directly-observed therapy is just one of a range of measures aimed at promoting treatment adherence and completion. Other measures include the use of prompts, defaulter actions, health education, cash incentives and contracts. There are ongoing Cochrane reviews evaluating the effectiveness of these prompts or routine reminders in improving adherence to TB treatment.[6,7] One RCT in healthy people found that telephone prompts to return for PPD test reading slightly increased the clinic attendance rate compared to those with no prompts but the difference was not significant.[8] A cluster randomized controlled trial in Senegal demonstrated that an intervention package consisting of improved patient counseling and communication, decentralization of treatment, patient choice of DOT supporter, and reinforcement of supervision activities increased the proportion of patients successfully treated and decreased the proportion of treatment defaulters compared to the usual TB control procedures.[9]

The use of the short messaging service (SMS) feature of mobile phones is one form of prompt that is a potentially efficient innovation, which can be used in conjunction with the DOTS strategy to improve adherence to treatment. It is one way of maintaining contact between the patient and the TB service provider over the entire course of treatment. For instance, text messages can be used to improve attendance of patients at TB clinics, to remind patients to regularly take their drugs, and/or to monitor treatment progress. A review on the use of SMS in health care identified three types of benefits from SMS applications. These are: 1) efficiency gains in the

delivery of health care, e.g., appointment reminders; 2) direct benefits to patients in terms of better health outcomes and quality of service, e.g., improving adherence to medications, communicating test results, monitoring patients' conditions; and 3) public health benefits, e.g., contact tracing and partner notification for communicable diseases, communicating health information to the public.[10]

There are a few studies describing the use of SMS in TB services. One pilot project in Transkei, South Africa used SMS technology to deliver test results to the doctor or nurse in the rural clinics. This system reduced the time to receive laboratory results from weeks to as little as few hours, resulting in more patients being treated.[11] Another pilot study conducted in Cape Town, South Africa involved a system where in patients were prompted daily through SMS to take their medications. This Cell Phone Prompted Self Administering Therapy (PSAT) system allowed patients to be released from direct observation. There was only one treatment failure out of 138 patients involved in the study. The monthly cost of the SMS service to the local health authority was USD 1.30 per patient. The WHO has cited the project as an example of best practice.[12] However, a number of practical implementation issues limited the effectiveness of the pilot, which must be addressed if the project is to be re-implemented and scaled up.[13] In addition, the pilot study was neither a randomized controlled trial nor a comparative study.

The Philippines is a country where the number of mobile phone users continues to increase. In 2005, there were 34.8 million subscribers, with a 41.1% penetration rate.[14] The National Statistics Office reported that the subscribers increased to 57.3 million, with a 64.8% penetration rate in 2007[15] which was beyond the anticipated increase of 42.5 million subscribers and 50% penetration during that year.[16] Moreover, even poor Filipinos can spend around $2 a month on mobile phone use, according to a survey of telecom use in India, Pakistan, Sri Lanka, the Philippines and Thailand.[17] This growing use of mobile phones has been aided partly by pre-paid options that allow users, including the poor, to control their spending. Currently, there are three major network providers servicing the country, namely Globe, Smart and Sun Cellular Telecommunications.

In relation to health concerns, a nationwide survey on organ donation conducted among 2,140 respondents sampled from the general population showed that 63% from both urban and rural areas had mobile phones.[18] On the other hand, the proportion of TB patients in the Philippines who have access to mobile phones has not been studied. To assess the feasibility of using the SMS feature of mobile phones as a reminder system for TB patients to take their medications or to go to the clinic to submit sputum samples, we conducted a cross sectional survey of TB patients.

In the Philippines where mobile phones are a major form of communication nationwide, the use of the SMS feature of mobile phones is a potentially efficient innovation that can be used as a prompt together with the DOTS strategy to improve adherence to treatment. This study aimed to: (1) estimate the proportion of TB patients who have access to mobile phones categorized according to socio-economic strata and age group; and (2) describe mobile phone utilization practices of TB patients.

Methods
Survey design and population: A cross-sectional survey of TB suspects, newly diagnosed TB patients and TB patients currently receiving treatment either under DOTS or non-DOTS in public and private TB clinics in Metro Manila and Cavite

was conducted for a period of nine weeks from October 2 to December 8, 2006.

Sampling was stratified by public and private clinics. Two to four clinics were selected purposively from each of the four districts of Metro Manila. The clinics surveyed and their respective locations are shown in Table 1. Patients in public clinics generally belong to the lower and lower-middle income class, while patients in private clinics generally belong to the upper- middle to high income class.

Table 1. Number of respondents interviewed per clinic (N=337)

Type of Clinic	Number (%) of Respondents
Public Clinics	
Lung Center DOTS Clinic	30 (8.9)
Dr. Jose Rodriguez Memorial Hospital	30 (8.9)
Philippine General Hospital Infectious Disease Clinic	27 (8.0)
San Isidro Health Center DOTS Clinic	30 (8.9)
San Joaquin Health Center	30 (8.9)
Tunasan Health Center DOTS Clinic	30 (8.9)
Subtotal	177 (52.5%)
Private Clinics	
De La Salle University DOTS Clinic	23 (6.8)
Manila Doctors Hospital DOTS Clinic	30 (8.9)
Philam Care DOTS Clinic	6 (1.8)
San Juan de Dios DOTS Clinic	28 (8.3)
UNILAB DOTS Clinic	30 (8.9)
University of Santo Tomas DOTS Clinic	25 (7.4)
Lung Center Doctors Clinics	18 (5.3)
Subtotal	160 (47.5%)
TOTAL	337

Survey procedure: We asked permission from the DOTS administrators of the selected clinics to interview their patients. A research assistant did a face-to-face interview of eligible TB suspects, newly diagnosed TB patients and those who were on their first to third month of treatment during the survey period. Patients with missed visits identified by the clinic were also interviewed. Informed consent was obtained before conducting the interviews. Eligible patients were culled from the clinic registry and from the list of patients scheduled for the day. The patients were interviewed as they came until about 20-30 patients were interviewed from each of the abovementioned clinics.

Aside from data on demographic and socio-economic variables, questions focusing on access to mobile phones such as ownership, sharing, type of subscription, presence of credit, network subscription and utilization practices such as monthly usage, reactions to unsolicited messages/advertisements and hotline services were asked.

Sample size: To estimate the proportion of TB patients in Metro Manila with access to mobile phones at 5% level of significance, design effect =2, precision of $\pm$ 10%, 165 patients in the public institutions and another 165 patients in the private institutions needed to be interviewed. This calculation assumed that 63% of the general population owned a mobile phone[17] and the estimated number of the population with chest x-ray findings suggestive of TB in 2006 is 423,250 people based on the 1997 National TB Prevalence Survey estimate of TB suspects in Metro Manila, which is 40/1000.[4]

Data analysis

All responses were encoded using the EPI INFO Version 3.3.2 program. Nominal data were summarized as frequencies and percentages with 95% confidence intervals. Means and standard deviations were calculated for continuous data. The association of mobile phone utilization parameters with key variables – age, educational attainment, monthly income, employment status, land ownership and clinic setting - was determined using chi square test and logistic regression analysis.

Results

A total of 337 patients with pulmonary tuberculosis were interviewed, 52% from public clinics and 48% from clinics in private institutions. Table 1 shows the breakdown of the number of patients interviewed in each of the clinics surveyed.

Most of the respondents were male (60%), belonging to the working age group 20-39 (54%) and 40-59 years old (33%), which is consistent with the epidemiologic profile of TB in the country. Majority (68%) of the patients were undergoing treatment at the time of interview; 18% were undergoing diagnostic work-up; and 14% were consulting for the first time at the clinics surveyed. All patients reported being able to read or understand Pilipino, the national language. Most of them could read or understand English, while half knew other local dialects such as Bisaya, Bicolano and Ilocano. Table 2 summarizes the profile of the respondents.

Table 2. Characteristics of the respondents (N=337)

Characteristics	Frequency (%)
Mean age, in years (SD)	37.4 (13.8)
Sex: Male	204 (60.5)
Female	133 (39.5)
Civil Status	
Single	114 (33.8)
Married or with partner	189 (56.1)
Separated/divorced/widowed	34 (10.0)
Mean household size (SD)	5.1 (2.4)
Place of residence	
Within Metro Manila	285 (84.6)
Outside Metro Manila	52 (15.4)
PhilHealth member	128 (38.1)
Patient classification	
First consultation	46 (13.7)
Ongoing diagnostic work-up	60 (17.8)
Ongoing treatment	231 (68.6)
Duration of treatment (ongoing treatment)	
< 2 months	48.9
> 2 months	51.1
Language/s or dialect/s read and understood	
Pilipino	337 (100.0)
English	264 (78.3)
Other dialects	177 (52.5)

Mobile phone ownership and utilization

Of the 337 patients interviewed 65% (95% CI: 60.2 to70.6) have access to mobile phones; 45% (95% CI 40 to 50.9, n=153) owned a mobile phone at the time of interview and 20% (95% CI 16 to 24.9, n=68) shared a mobile phone with a household member; 8% (28) previously used or owned a mobile phone and 26% (88) had never used a mobile phone. Among those with mobile phones, the mean duration of ownership was 1.8 years (SD 1.7, median – 1 yr). Almost all of the mobile phone owners had a prepaid subscription (99%) and 72% had some credit/load in their mobile phones at the time of interview. Of the three major networks in the country, subscription to Smart was highest (59.5%), followed by the Globe network (27.4%) and a small percentage subscribed to Sun Cellular communications (1.3%). Around 12% of the respondents had multiple subscriptions, i.e., subscription to more than one network. The network subscriptions were mostly personal (94.7%) and only a few were company subscriptions.

The pre-paid subscribers consumed an average of PhP 372.32 per month (SD PhP 510.59, median of P300.00 per month) for pre-paid cards (n=99), while an average of PhP 120.38 per month (SD PhP 167.32, median of P60.00 per month) was spent for electronic loads (n=53). The electronic-load is a variation of the pre-paid subscription wherein the mobile phone owner can buy from a retail store credit/load for as low as PhP 10.00 worth of text messages, which is equivalent to roughly 10 text messages.

Among those with mobile phones, most of them used their phones for social purposes (80.4%) and emergency-related communications (45.1%). Majority would consider the use of a "hot line service" if available that would allow them to ask questions regarding their illness or treatment regimen because it is accessible, convenient and easy to use. On the other hand, most of them did not welcome text messages from companies advertising their products and services. Most of the respondents would ignore these unsolicited messages because it either consumed their credit/load, it was unimportant or it was a nuisance. Table 3 summarizes the utilization practices of the TB patients who own mobile phones.

Table 3. Utilization practices of mobile phone owners (n=153)

Utilization practices	Frequency (%)
Network subscription	
Smart	91 (59.5)
Globe	42 (27.4)
Sun Cellular	2 (1.3)
Any combination of the above 3 networks	18 (11.8)
Type of subscription	
Pre-paid	152 (99.4)
Post-paid	1 (0.6)
Mean consumption per month (SD)	
Pre-paid cards (n=99)	PhP 372.32 (510.59)
Electronic load (n=53)	PhP 120.38 (167.32)
Post-paid (n=1)	PhP 800.00
Purpose of mobile phones	
Social communications	76 (49.7)
Emergency	17 (11.1)
Work-related	8 (5.2)
Social and emergency	47 (30.7)
Work and emergency	5 (3.3)
Received messages from companies advertising their products and services	121 (79.1)
Most common reactions towards unsolicited text messages from companies*	
Ignore	82 (53.6)
Irritated	24 (15.7)
"Okay"	32 (20.9)
Attitudes towards a "hot line service"	
Will use hot line service	127 (83.0)

*multiple answers allowed

On bivariate analysis, ownership of a mobile phone was significantly associated with age, educational attainment, employment status, monthly income and land ownership, i.e., those belonging to the younger age groups, who attained higher educational level, currently employed and with a monthly income of > PhP 5,000 (>USD100) and those who own or rent the land where they were residing were more likely to own mobile phones. Likewise, patients consulting in the private clinics were more likely to own a unit.

Further analysis using logistic regression showed that patients consulting in private clinics, belonging to the younger age groups (< 39 years old), who reached high school or higher and with occupation were more likely to own mobile phone units (Table 4). Other socio-economic variables such as income and residential land ownership were not significantly associated with mobile phone ownership.

Table 4. Factors significantly associated with mobile phone ownership using logistic regression analysis

	With mobile phone n=153	Without mobile phone n=184	Adjusted OR	95% CI
Age (years)				
< 20	10 (55.6)	8 (44.4)	4.54	1.48, 13.89
20 - 39	103 (56.9)	78 (43.1)	2.56	1.48, 4.39
40 – 59	39 (34.8)	73 (65.2)		
> 60	1 (3.8)	25 (96.2)		
Educational attainment				
Elementary	6 (13.0)	40 (87.0)	2.07	0.76, 5.64
High School	52 (36.9)	89 (63.1)	4.97	1.84, 13.43
College	95 (63.3)	55 (36.7)		
Occupation				
With occupation	93 (64.6)	51 (35.4)	3.23	1.92, 5.47
Without occupation	60 (31.1)	133 (68.9)		
Type of TB Clinic				
Private	98 (61.2)	122 (68.9)	2.25	1.36, 3.74
Public	55 (31.1)	62 (38.8)		

Sources of information regarding health and disease

The major sources of information of the study patients regarding health and disease were their doctor, nurses, friends and family members. Information was also obtained through mass media, specifically by means of television (70%), radio (26%), magazine (18%) and newspaper (18%). See Table 5.

Discussion

Considering the fairly good access (65%) to mobile phones of the sample of TB patients interviewed in Metro Manila and Cavite, it may be worth doing a pilot intervention to test the effectiveness of SMS as a tool to augment reminder systems in TB clinics.

Using the SMS component of mobile phones has been shown in uncontrolled studies[11,12] to improve patient attendance in TB clinics, adherence in taking drugs, communication of tests results, monitoring of treatment progress, monitoring of patient conditions and patient outcomes. In one study, a system named as Cell Phone Prompted Self Administering Therapy (PSAT) was able to release patients from direct observation with only one treatment failure out of 138 patients.[12]

Factors to consider in designing an SMS intervention

Three major findings emerged from this survey that needs to be considered in designing an SMS intervention for TB patients.

Table 5. Various sources of information regarding health and disease (N=337)

Source of Information	Frequency (%)
Interpersonal sources	
Doctor	263 (78.0)
Nurse	82 (24.3)
Friend	40 (11.9)
Family member (in general)	36 (10.7)
Parents	28 (8.3)
Barangay health worker	22 (6.5)
Midwife	12 (3.6)
Health worker (in general)	12 (3.6)
Neighbors	7 (2.1)
Self	7 (2.1)
Teacher	6 (1.8)
Mass Media	
Television	236 (70.0)
Radio	87 (25.8)
Magazine	61 (18.1)
News	59 (17.5)
Books	55 (16.3)
Internet	48 (14.2)
Poster	32 (9.5)
Advertisement	27 (8.0)
Pamphlets/Flyers/Seminar	6 (1.8)

* multiple responses allowed

First, majority have prepaid subscriptions. This observation is similar to the preference of the general population where at least 90% subscribed to prepaid plans (Smart 99%, Globe 90% and Sun Cellular 90%). Market research showed that people in the economic Class C[a] or lower were primarily prepaid subscribers, while those belonging to Class A and B had postpaid subscriptions [Personal communication, Alo BA 2005]. The preference for prepaid subscription may be due to its low cost requirement, that is, a minimum of PhP10, which is affordable to the lower economic class including those without income. With a very low maintenance requirement, the patients would likely be able to afford and sustain their subscriptions at least throughout the duration of treatment. Our survey also showed that the average duration of mobile phone ownership was much longer than the six month-treatment period, which may help ensure receipt of reminder messages via SMS by the patients.

Maintaining contact during the entire course of treatment between patients and their TB service providers is a challenge that needs to be addressed among prepaid subscribers. Patients holding prepaid plans may change phone numbers anytime during the treatment period. To maintain contact with these patients, a strategy that provides incentives (such as free load) for updating their health service provider about current contact information should be explored. Another strategy would be through games or a quiz show where TB patients can join and respond via text message. Filipinos have patronized TV game shows for several years now, with increasingly more people participating in various games via SMS.

Sharing of mobile phones with other household members is a second significant finding of this survey. This circumstance could be put to advantage by assigning the household member with whom the patient is sharing a mobile phone as

a treatment partner in the TB program.

Third, the survey showed that patients do not have available credit all the time. However, given that the load can be obtained at a minimal cost, it is still likely that the patient will have available credit during some days of the week if not daily. This lack of available credit at all times should not be a major obstacle especially if frequent reminders will be sent at no cost.

Factors that may influence the success of the SMS intervention

This survey also showed that the patients would tend to ignore unsolicited messages but would welcome messages that are important to their health. They are likely to use hotline services that allow them to ask questions about their disease and other health related concerns. Offering such information services at no or low cost would further increase utilization. Delivery of reminder messages that do not require the patients to respond back is also desirable.

There is flexibility in using either Pilipino or English in relaying information through SMS since majority could read and understand both languages. Additionally, the patients' doctors and mass media, specifically TV, which are the major sources of health information identified in the survey, may be utilized to promote patients' participation in the SMS intervention.

Enrollment of a patient in TB DOTS clinics provides an opportunity to create a social network or groups where patients can receive social support. SMS intervention may reinforce this network and facilitate adherence to TB treatment since majority of the patients utilized mobile phones for social purposes.

The multivariable analysis showed that providing TB reminders and other TB related information through SMS would likely succeed among younger TB patients, patients who reached high school or higher, those who are employed and those consulting in private clinics. On the other hand, if patients in the lower economic class are to be better targeted through an SMS reminder system, enablers such as low-cost phone rentals and/or free mobile phone credits would need to be considered.

Lastly, since most of the respondents subscribed to Smart and Globe Telecommunications, tapping these two major networks for sponsorship, specifically in the delivery of educational and reminder messages to patients is a strategy that can be explored.

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