Final Report to Louvain Coopération au Développement Project "Validation of a Screening Tool for Expansion of Mental Health Services in Cambodia"

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Introduction

Mental health was recently recognized as a "global public good" key to sustainable development in all countries (Patel, et al, 2018), however between 76 and 85% of people living with mental disorders in low and middle-income countries (LMICs) receive no treatment for their mental health conditions (Demyttenaere, et al., 2004). The Grand Challenges for Global Mental Health identifies integrating mental health into medical care settings to address this treatment gap (Collins, 2011). There is an enormous need to increase services for mental health in Cambodia (McLaughlin & Wickeri, 2012). Like many LMICs, Cambodia extends minimal resources towards mental health services. It is estimated only 0.02% of the entire Cambodian health budget goes to mental health (Chhit, 2018). Deprived of resources, Cambodia's mental health services remain dwarfed by the scope of the population's unmet mental health needs. Estimates suggest there are approximately 60 psychiatrists in Cambodia to serve 16 million residents (Olofsson & Jegannathan, 2018), placing Cambodia at one of the lowest psychiatrist:patient ratios in the world (Kessler, 2008).

According to experts who identified the Grand Challenges for Global Mental Health and a recent situational analysis in Cambodia, a critical first step is task-shifting is to integrate mental health services into routine primary health care and to develop an efficient triage system based on severity of condition (Patel, et al, 2018). A collaborative care model seeks to utilize patients coming for primary care services to identify patients in need of mental health services. In the US, the PHQ-9 and GAD-7 are widely adopted measures of depression and anxiety with the PHQ-2 used for screening purposes (Spitzer, et al, 1999; Spitzer, et al, 2000). These and other mental health tools have not been validated in Cambodia where mental health features can vary from Western constructs (Haroz, Ritchey, & Bass, 2017). Critical is the need to use measurement tools which have demonstrated cross-cultural equivalence as these tools guide identification of mental distress and disorders and are employed to monitor and evaluate treatment outcomes (Choi & Harachi, 2002; Choi, Mericle, & Harachi, 2006; Harachi, et al, 2006).

Previous qualitative work has identified key mental health constructs in Cambodia (Agger, 2015; Meyer, 2014). In June 2018, a small group of multidisciplinary US and Cambodian experts were convened to participate in a consultancy workshop co-sponsored by the University of Washington/Royal University of Phnom Penh (UW RUPP) Partnership/Partnering For Health and the Ministry of Health Department of Mental Health and Substance Abuse (MoH/DSMHSA). Participants included physicians, psychiatrists, social workers, faculty from departments of psychology and social work, and staff from MoH/DMHSA. All agreed that general practice physicians have limited time and it would be useful to institute a short screening tool to facilitate the identification of individuals who might benefit from a greater assessment of mental health concerns. Participants examined a series of items taken from the PHQ-9, GAD-7, and Cambodian Somatic and Syndrome Inventory (C-SSI) that were translated into Khmer and provided feedback regarding their use as possible screeners. Much of the discussion centered on items from the C-SSI. It was agreed that a study should examine three C-SSI items (neck soreness, dizziness, and thinking too much) along with the PHQ-9 and GAD-7. These items

would be tested against two criterion instruments, the Hopkins Symptom Checklist (H-SCL) for depression and anxiety disorders and the Harvard Trauma Questionnaire (HTQ) for trauma/PTSD, both of which have been found to be reliable and validated with the target population (Derogatis, 1974; Mollica, 1992).

Hence, this validation study sought to test several items including those from the PHQ-9, GAD-7, and a sub-set from the C-SSI as a standard screening tool that could be used in primary care settings within Cambodia. Specifically, our objectives were to a) validate the PHQ-9 and GAD-7 within the Cambodian context; and, b) identify items for a short screening tool for emotional distress.

Study Methods

The validation study was originally to be administered by a local NGO with experience conducting mental health research including use of the target instruments and had translated versions. They provided a translated codebook and then needed to withdraw from the collaboration. Fortunately, the Department of Social Work (DSW) at the Royal University of Phnom Penh convened a small team to continue with administration of the project and subsequently made revisions to the translation along with input from the project officer at Louvain Cooperation. An ethics application was submitted to the Cambodia Ministry of Health Ethics Board as well as to the University of Washington and approval was granted by both institutional review systems.

Procedures and Sample
The DSW designed a Google form that captured the translated codebook and a Google electronic template in which to compile completed interviews. The DSW recruited social work students and recent graduates to be research assistants for data collection. Training was conducted which covered gaining rapport with participants, consent gathering, strategies to collect quality data via an in person interview, and entering responses into a wifi-connected tablet. While interviewers were trained on procedures to alert the in-country research coordinator if the patient became distressed and refer participants to the on-site social worker, this situation did not occur. There were no negative incidents to report.

Given the interest to develop a tool useful within health care settings, patients coming to the Preah Kossamak National Diabetes Center and Mental Health (MH) Unit were recruited as participants for the study. Patients in both the Diabetes Center and MH Unit generally come before opening hours and wait in the lobby. The trained interviewers sought out patients in the lobby and invited them to participate. Participants were given a nominal cash ($2) thank you for consenting and proceeding with the interview. The consent rate was 89.9% affected by a minor number of refusals; a few consenting patients were not able to complete the interview given their available time and were not included hence the final sample is N=498.

Measures

See Table 1 for a list of items included in the interview which included potential screeners - the PHQ-9, GAD-7, and Cambodian Somatic and Syndrome Inventory (C-SSI). Table 2 lists the criterion instruments - Hopkins Symptom Checklist (HSCL-25) and Harvard Trauma Questionnaire (HTQ). Within our study sample, the alpha reliability for the two criterion instruments were 0.94 for the HTQ and 0.93 for the H-SCL, which are similar to those reported in other studies (Sonis, et al. 2009).

Findings

Demographics

Participants in the study ranged in age from 17 to 86 years ($\bar{x}$ = 51 years) and 51.4% (N=256) were male. The majority of respondents reported being married (74.4%); 13.1% were widowed, 10.3% single, and 2.2% separated or divorced.

When asked whether they had ever sought mental health services in the past, 18.9% reported affirmatively. Women were significantly more likely to have reported seeking services (64 out of 242 or 26.4%) in contrast to men (11.7%).

Descriptive Information on Potential Screening Items

See Table 1 for descriptive statistics for each of the individual items that were potential screening items. The PHQ-9 items with the highest means were "Trouble falling, staying asleep or sleeping too much" and "Feeling tired or having little energy," while the GAD-7 items with highest means were "Becoming easily annoyed or irritable" and "Worrying too much about different things." "Thinking lots" was highest among the C-SSI items. Of note, 11.2% of the sample reported some suicidal thoughts. The research assistants offered these patients a referral to the on-site social worker.

"Thoughts that you would be better off dead or of hurting yourself in someways"

		Frequency	Percent	Valid Percent
Valid	Not at all	441	88.6	88.7
	Several days	38	7.6	7.6
	More than half the days of the 2 week period	13	2.6	2.6
	Nearly every day	5	1.0	1.0
	Total	497	99.8	100.0
Missing		1	.2	
Total		498	100.0	

<u>Objective A. Validate the PHQ-9 and GAD-7 within the Cambodian context</u>

Relationship of PHQ-9 and GAD-7 to Criterion Instruments
Primary care providers typically use the first two items in the PHQ-9 for screening (called the PHQ-2). Scores of 3 or greater warrant implementation of the other seven items to capture a total depression score. Within our study sample, 100 patients or 20.2% would have warranted further assessment based on their PHQ-2 score. Looking at the full study sample, the following illustrates how many in the sample would be categorized as having different clinical levels of symptoms based on standard cut-offs of the PHQ-9.

Distribution of PHQ-9 Categories based on Total Score

	Frequency (%)
No reported symptoms	218 (44.6%)
Mild symptoms (score 5-9)	178 (36.4%)
Moderate (10-14)	64 (13.1%)
Moderately severe (15-19)	24 (4.9%)
Severe (20+)	5 (1%)
Total	489

When we compared the subset who had a score of 3+ on the PHQ-2 and would have warranted further assessment with these categories, we noted that the PHQ-2 as a screening tool with this sample would have missed a small number of patients who might benefit with further assessment if the PHQ2 was relied on.

Cross Tabulation of PHQ2 Score by Full PHQ-9 Score

	PHQ2 Score < 3 No Further Assessment	PHQ2 Score 3+ Warrants Assessment
No reported symptoms	215 (55.1%)	3 (3.0%)
Mild symptoms (score 5-9)	142 (36.4%)	36 (36.4%)
Moderate (10-14)	29 (7.4%)	35 (35.4%)
Moderately severe (15-19)	4 (1.0%)	20 (20.2%)
Severe (20+)	0 (%)	5 (5.0%)
Total	390	99

In terms of the GAD-7 and using standard cut-offs, results indicated that 13% warranted possible follow-up and treatment.

Distribution of GAD-7 Categories Based on Total Score

	Frequency (%)
No reported symptoms	265 (53.8%)
Mild symptoms (score 5-9)	164 (33.3%)
Moderate (10-14)	43 (8.7%)

| Severe (15+) | 21 (4.3%) |
| Total | 493 |

The relationship between the total PHQ-9 score and GAD-7 total score in our study was quite strong (r=0.798, p < .001). In terms of how well the PHQ-2, PHQ-9, and GAD-7 total scores were associated with the two criterion instruments, the correlations were all highly significant (p < .001). With the HSCL-25, the correlations were 0.577 with the PHQ-2, 0.799 with the PHQ-9, and 0.831 with the GAD-7. With the HTQ, the correlations were 0.544 with the PHQ-2, 0.766 with the PHQ-9, and 0.813 with the GAD-7. Table 3 displays the correlation matrix.

Objective B. Identify Items for a Short Screening Tool for Emotional Distress.

Identifying Screening Candidates
The recommended threshold used with the HTQ is a score of trauma symptoms greater than or equal to 2.0 (Mollica, 2004; Seponski, et al 2019). With the study sample, 9 (1.8%) respondents met this threshold. Using the recommended threshold of 1.75 for the H-SCL (Winokur et al., 1984), 21 (4.2%) of the respondents met this threshold. Since this study was interested in a general emotional distress rather than symptoms of a specific disorder, e.g., depression, respondents who met either threshold for the HTQ or HSCL-25 were recoded into a new combined emotional distress variable. Twenty one (4.2%) of the respondents were coded "1" to indicate clinically significant emotional distress, and the remainder coded "0" to indicate no emotional distress.

Given the large set of possible screening item candidates, a forward stepwise logistic regression is a reasonable approach for a variable selection process to identify screening items that are significantly related to being emotional distressed. Hence, the combined distress variable was entered as an outcome and a set of 17 screening items were included as possible screeners. Two of the 19 screening items were excluded from the variable selection process. The PHQ-9 item "Thoughts that you would be better off dead or of hurting yourself in some ways…" was not included as the goal was to identify a broad screen for distress, plus from a practice point of view asking about suicidal thoughts within an initial assessment was too invasive. The GAD-7 item "Being so restless that it is hard to sit still" was also excluded to reduce issues related to multicollinearity with other screening items. Table 4a and 4b provides the model summary tests for each step within the regression and highlights which variables were entered with each of the steps. These six sets of screening items were then used in our subsequent k-fold cross validation analyses.

Testing the Accuracy of the Screening Candidates
An important feature of predictive modelling is the ability of a model to generalize to new cases. Evaluating the predictive performance (Area Under the Curve, or AUC) of a set of screening items using all cases from the original analysis sample can yield too optimistic an estimate of predictive performance. K-fold cross-validation is used to generate a more realistic

estimate of predictive performance. This method for cross-validation is also recommended when the number of observations is not very large.

Receiver operating characteristic (ROC) analysis is used for comparing predictive models and is often used in clinical medicine and social science to assess the trade-off between model sensitivity and specificity. After fitting the binary logistic regression model with a set of independent variables, the predictive performance of this set of variables - as assessed by the area under the curve (AUC) is estimated for a sample (the 'test' sample) that is independent of the sample used to predict the dependent variable (the 'training' sample).

AUCs range from 0 to 1, with higher AUCs indicating that each set of screening items is better able to distinguish between patients with mental health disorders and those without. Based on our k-fold cross-validation, Step 7 (five screening items) had the highest AUC of 0.988 (Table 4b). The next best set of screening items is Step 4 which has a similar AUC of 0.985. Four items is more feasible for a brief screening instrument for emotional distress and yields a predictive accuracy of mental health disorder (clinically significant depression, anxiety, and/or trauma/PTSD) that is very close to the accuracy yielded by asking seven screening items. Other possible sets of screening items include Step 5 – in which 3 of the 4 items from Step 4 had an AUC of 0.980 - and Step 6, which had an AUC of 0.982 and includes the second item of the PHQ-2 (depressed mood) but removes the first item of the GAD-7 (being nervous or on edge). The later item was the leading item candidate in Step 1 and present in 3 other steps.

We also ran the k-fold cross validation for the PHQ-2 as this is a commonly used screening measure for depression. The AUC was 0.916, suggesting that combination of screening items identified and tested in this study are stronger screeners of emotional distress than relying on the PHQ-2 within our study sample.

Identifying Thresholds or Cut Points For Proposed Screening Items
It is recommended that a score of 3+ on the PHQ2 is the threshold or cut point suggestive of clinically significant depression. Looking at the three possible screeners in this study, the distribution of total scores for Step 4 (4 items) is 0-12 ($\bar{x}$ = 2.58, SD = 2.25), for Step 5 (3 items) is 0-9 ($\bar{x}$ = 2.04, SD = 1.74), and Step 6 (4 items) is 0-12 ($\bar{x}$ = 2.74, SD = 2.33). ROC analyses with the full sample provided the following sensitivity (probability that the screener will indicate distress with positive case) and specificity (probability of the screener to correctly generate a negative result for those who don't have distress) results.

	Score	Sensitivity	1 – Specificity	Suggested Cut Point
Step 4 – 4 items	5.5	1.0	0.07	6+
Step 5 – 3 items	3.5	1.0	0.14	4+
Step 6 – 4 items	6.5	1.0	0.04	7+

Conclusion

Our study brought together key Cambodian stakeholders from the research, policy and practice sectors to validate existing mental health screening and assessment instruments and to identify and test a brief screener of general emotional distress. This research is essential for closing the mental health treatment gap by improving the recognition of clinically significant mental health disorders in primary care and care for non-communicable diseases. This is the first step to connecting persons suffering from untreated depression, anxiety and PTSD to quality mental health care.

The PHQ-9 and GAD-7 were valid in the Cambodian context and can continued to be used as assessment instruments for depression and anxiety. The PHQ-2 did not perform as well as other sets of items as screeners for broad emotional distress. Several items were identified and accurate as a brief screener of emotional distress. Combinations of items identified in Step 4, 5, or 6 would make appropriate brief screening tools and of these, however, we would recommend Step 4 which includes 3 PHQ-9 items and 1 GAD-7 item. A threshold score of 6 or greater would warrant additional assessment using the remaining PHQ-9 and GAD-7 items.

Table 1. Mean and standard deviation of potential screening items and source

Source	Item	Min	Max	x̄	SD	N
PHQ-2/PHQ-9	Little interest or pleasure in doing things	0	3	0.64	0.83	495
PHQ-2/PHQ-9	Feeling down, depressed, or hopeless	0	3	0.70	0.91	497
PHQ-9	Trouble falling, staying asleep, or sleeping too much	0	3	1.01	1.05	498
PHQ-9	Feeling tired or having little energy	0	3	1.12	0.82	497
PHQ-9	Poor appetite or overeating	0	3	0.78	0.91	498
PHQ-9	Feeling bad about oneself or that you are a failure or make yourself or down your family	0	3	0.47	0.79	497
PHQ-9	Trouble concentrating on things, such as reading the newspaper or watching television	0	3	0.53	0.80	497
PHQ-9	Moving or speaking so slowly that other people could have noticed? Or the opposite being so fidgety or restless that you have been moving around a lot more than usual..	0	3	0.46	0.80	495
PHQ-9	Thoughts that you would be better off dead or of hurting yourself in someways…	0	3	0.16	0.50	497
GAD-7	Feeling nervous or on edge	0	3	0.54	0.76	496
GAD-7	Not being able to stop or control worrying	0	3	0.65	0.82	496
GAD-7	Worrying too much about different things	0	3	1.06	0.99	496
GAD-7	Trouble relaxing	0	3	0.62	0.79	498
GAD-7	Being so restless that it is hard to sit still	0	3	0.57	0.79	498
GAD-7	Becoming easily annoyed or irritable	0	3	1.25	0.94	497
GAD-7	Feeling afraid as if something awful might happen	0	3	0.40	0.75	498
C-SSI	Thinking lots	0	3	1.26	1.10	497
C-SSI	Dizziness	0	3	0.60	0.85	497
C-SSI	Neck soreness	0	3	0.60	0.86	497

Table 2. List of items within criterion instruments, H-SCL D/A and HTQ

Source	Item
H-SCL D	Please carefully decide how much these things bothered you in the PAST WEEK…… Feeling low in energy, slowed down.
H-SCL D	Blaming yourself for things.
H-SCL D	Crying easily.
H-SCL D	Loss of sexual interest or pleasure.
H-SCL D	Poor appetite.
H-SCL D	Difficulty falling asleep, staying asleep.
H-SCL D	Feeling hopeless about the future.
H-SCL D	Feeling sad.
H-SCL D	Feeling lonely.
H-SCL D	Thoughts of ending your life.
H-SCL D	Feeling of being trapped or caught.
H-SCL D	Worrying too much about things.
H-SCL D	Feeling no interest in things.
H-SCL D	Feeling everything is an effort.
H-SCL D	Feelings of worthlessness.
H-SCL A	Faintness, dizzyness, or weakness.
H-SCL A	Feeling fearful.
H-SCL A	Feeling restless, can't sit still.
H-SCL A	Feeling tense or keyed up.
H-SCL A	Headaches.
H-SCL A	Heart pounding or racing.
H-SCL A	Nervousness or shakiness inside.
H-SCL A	Spells of terror or panic.
H-SCL A	Suddenly scared for no reason.
H-SCL A	Trembling.
HTQ-Section IV	Please carefully decide how much these things bothered you in the PAST WEEK….recurring thoughts or memories of the most hurtful or terrifying events.
HTQ-Section IV	Feeling that you have no one to rely on.
HTQ-Section IV	Feeling as though the hurtful or terrifying event is happening again.
HTQ-Section IV	Finding out or being told by other people that you have done something that you cannot remember.
HTQ-Section IV	Recurrent nightmares.
HTQ-Section IV	Feeling as if you are split into two people and one of you is watching what the other is doing.
HTQ-Section IV	Feeling detached or withdrawn from people.
HTQ-Section IV	Feeling someone you trusted betrayed you.
HTQ-Section IV	Unable to feel emotions.
HTQ-Section IV	Feeling jumpy or easily startled.

HTQ-Section IV	Difficulty concentrating.
HTQ-Section IV	Trouble sleeping.
HTQ-Section IV	Feeling on guard.
HTQ-Section IV	Feeling irritable or having outburst of anger.
HTQ-Section IV	Avoiding activities that remind you of the traumatic or hurtful event.
HTQ-Section IV	Inability to remember parts of the most traumatic or hurtful events.
HTQ-Section IV	Less interest in daily activities.
HTQ-Section IV	Feeling as if you don't have a future.
HTQ-Section IV	Avoiding thoughts or feelings associated with the traumatic or hurtful events.
HTQ-Section IV	Sudden emotional or physical reaction when reminded of the most hurtful or traumatic events.
HTQ-Section IV	Feeling that people do not understand what happened to you.
HTQ-Section IV	Difficulty performing work or daily tasks.
HTQ-Section IV	Blaming yourself for things that have happened.
HTQ-Section IV	Feeling guilty for having survived.
HTQ-Section IV	Feeling hopelessness.
HTQ-Section IV	Feeling ashamed of the hurtful or traumatic events that have happened to you.
HTQ-Section IV	Spending time thinking about why these things happened to you.
HTQ-Section IV	Feeling as if you are going crazy.
HTQ-Section IV	Feeling that you are the only one who suffered these events.
HTQ-Section IV	Feeling others are hostile toward you.

Table 3. Correlations between the criterion instruments and the GAD-7, PHQ-9, and PHQ-2

		HTQ	H-SCL	GAD7	PhQ9	PhQ2
HTQ	Pearson Correlation	1	.889	.813	.760	.544
	Sig. (2-tailed)		.000	.000	.000	.000
	N		455	451	447	451
H-SCL	Pearson Correlation		1	.831	.799	.557
	Sig. (2-tailed)			.000	.000	.000
	N			485	481	486
GAD-7	Pearson Correlation			1	.798	.610
	Sig. (2-tailed)				.000	.000
	N				485	489
PHQ-9	Pearson Correlation				1	.766
	Sig. (2-tailed)					.000
	N					489
PHQ-2	Pearson Correlation					1
	Sig. (2-tailed)					
	N					

Table 4a. Model summary and items Identified in the forward stepwise logistic regression

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	97.809[a]	.132	.455
2	75.248[b]	.172	.591
3	62.829[c]	.193	.663
4	54.799[c]	.206	.708
5	56.649[c]	.203	.698
6	51.360[c]	.212	.728
7	46.455[d]	.220	.755

a. Estimation terminated at iteration number 7 because parameter estimates changed by less than .001.
b. Estimation terminated at iteration number 8 because parameter estimates changed by less than .001.
c. Estimation terminated at iteration number 9 because parameter estimates changed by less than .001.
d. Estimation terminated at iteration number 10 because parameter estimates changed by less than .001.

Table 4b. Items identified in the logistic regression and accuracy of each set of screening items (AUCs)

Source	Item	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7
PHQ-2	Little interest or pleasure in doing things							
PHQ-2	**Feeling down, depressed, or hopeless**						**6**	**7**
PHQ-9	**Trouble falling, staying asleep, or sleeping too much**							**7**
PHQ-9	**Feeling tired or having little energy**				**4**	**5**	**6**	**7**
PHQ-9	Poor appetite or overeating							
PHQ-9	**Feeling bad about oneself or that you are a failure or make yourself or down your family**			**3**	**4**	**5**	**6**	**7**
PHQ-9	Trouble concentrating on things, such as reading the newspaper or watching television							
PHQ-9	**Moving or speaking so slowly that other people could have noticed? Or the opposite being so fidgety or restless that you have been moving around a lot more than usual..**		**2**	**3**	**4**	**5**	**6**	**7**
PHQ-9 (not included)	Thoughts that you would be better off dead or of hurting yourself in someways…							
GAD-7	**Feeling nervous or on edge**	**1**	**2**	**3**	**4**			
GAD-7	Not being able to stop or control worrying							
GAD-7	Worrying too much about different things							
GAD-7	Trouble relaxing							
GAD-7 (not included)	Being so restless that it is hard to sit still							
GAD-7	Becoming easily annoyed or irritable							
GAD-7	Feeling afraid as if something awful might happen							
C-SSI	thinking lots							
C-SSI	dizziness							
C-SSI	neck soreness							
	AUCs	**0.962**	**0.968**	**0.972**	**0.985**	**0.980**	**0.982**	**0.988**

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