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Evaluating the Gap of Integrated Behavioral Health Programs for NCDs in China, Vietnam, Cambodia, and Thailand

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ABSTRACT

The rates of non-communicable diseases (NCD's) such as diabetes and hypertension are reaching epidemic proportions in Asia. Behavioral conditions are frequently comorbid with NCD's, contribute to poor clinical outcomes, and are under detected and untreated in many Asian nations. This article reports the findings of a study examining the level of behavioral and non-behavioral care integration in clinics and hospitals in China, Cambodia, Vietnam, and Thailand. It assessed providers' ratings of patients' prevalence of behavioral conditions, the need for behavioral health consultants, and patients' self-reported health risk assessments (HRA) of their lifestyle and behavioral problems. The results show low levels of available behavioral care in the participating Asian countries in comparison with the United States. The HRA results showed high rates of patients' reported tobacco use, high-risk levels for alcohol use in men, and low levels of healthy foods intake and physical activity for men and women. The provider survey results showed moderate perceived prevalence of lifestyle and behavioral conditions and moderate perceived need for integrated behavioral care. These results suggest a need to develop and evaluate integrated healthcare services in Asia in order to address the epidemic of NCD's.

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Introduction

Evaluating the gap of integrated behavioral health programs for NCDs in China, Vietnam, Cambodia, and Thailand

Non-communicable diseases (NCDs) are a global epidemic. Of 56.9 million global deaths in 2016, 40.5 million, or 71%, were due to NCDs; the four main NCDs are cardiovascular diseases, cancers, diabetes and chronic lung diseases, with over three quarters of NCD deaths occurred in low- and middle-income countries [1]. NCD's are primarily caused by four behavioral health risks; physical inactivity, poor nutrition, tobacco use and excessive alcohol use [2]. In developing countries rapid globalization has led to a change from low calorie, high fiber foods

to processed foods high in fat, salt, and sugar [3]. Technological development has led to decreased physical labor and active transport, which in turn contribute to decreasing levels of physical activity in developing countries [4]. Alcohol use and heavy episodic binge drinking is rising across much of the Asia region, with significant increases in China, Thailand, Timor-Leste and Vietnam [5]. Harmful alcohol use in Asia is associated with the rising burden of NCD's, road traffic accidents and fatalities, suicide and risky sexual behavior, poverty and economic losses [5]. In countries like China, alcohol initiation happens at a very early age with lifelong serious health consequences for these youths [6]. A tobacco smoking epidemic has developed rapidly in Asia for men, with mortality associated with tobacco use

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rising and the proportion of men smoking, starting at an earlier age, and smoking more heavily [7].

Research demonstrates that increased physical activity and improved nutrition can prevent about 1.3 million chronic disease related deaths and about 18 million deaths caused by obesity, cardiovascular disease, and diabetes, respectively [8]. Smoking cessation can result in a 90% reduction in the excess risk of death for those who stop smoking by age 40, and for those who stop smoking by age 30 the mortality risk is similar to non-smokers [9].

Pharmacotherapy is the first and often only line of treatment for NCD's in Asia, neglecting the lifestyle behaviors and behavioral conditions that directly influence disease course and progression [10]. Physician and nurse treatment of a high volume of patients in short duration visits are the norm at hospitals and community health centers. Patients do have access to an assigned or regular family physician resulting in treatments driven by acute presentation and a lack of prevention and disease management [11]. This results in patients being dissatisfied and lacking awareness of diagnosis of Type 2 Diabetes Mellitus (T2DM) or hypertension, poor adherence to prescribed medications, and lack of guidance or feedback on lifestyle medicine such as improved nutrition and physical activity [12].

Integrated behavioral health

Integrated behavioral health is a patient-centered, coordinated, systemic approach to treatment medical, lifestyle and behavioral conditions in one setting with a team-based approach (AHRQ, ND). While there is no current unifying definition of integrated care, the WHO (2014) definition includes: 1) equal access to care; 2) patient-centered, individualized services; 3) coordinated and coordinated services across the continuum of care; 4) a motivated and competent workforce. Integrated behavioral health has become a key component of primary care healthcare reform in the United States [13]. Typically, an expert behavioral health consultant (BHC) is added to the primary care team to provide consultation and behavioral interventions. Interventions include management and prevention of co-morbid medical and behavioral conditions, lifestyle medicine, and team-based consultation and quality improvement [14]. The BHC is specially trained in behavioral interventions such as improved nutrition and physical activity, smoking cessation and reduced harmful alcohol use, is integrated into the primary care clinic or hospital [15]. The BHC consults with the physician, nurses and other clinicians in a team-based approach to coordinate medical and behavioral care [15]. Emerging evidence demonstrates that integrated behavioral health is associated with improved clinical, operational and financial outcome [15].

Integrated behavioral health in Asia

China has promoted integration of mental health care into the general health system through the 'National Mental Health Working Plan (2002-2010)' and with the inception of the '686 Programme' and reiterated in the latest plan for 2015 to 2020 [16]. Yet China's health care system remains fragmented, hospital centered, and treatment dominated [17,18]. The World Bank Group, WHO, and the Chinese government'

joint report recommended a 'People-centered Integrated Care' delivery model where a primary care system would be integrated with large hospitals to provide continuous, cost-effective care and improve outcomes of NCDs and chronic disease management [16,18]. The recently released 'Healthy China Blueprint 2030' and 13th 5-year plan for health reform also made similar suggestions [17]. However, treatment gaps persist for both serious and common mental illnesses and the current workforce is insufficient to provide the needed services [16]. In addition, the urban-rural gap in accessing health care remains, causing major disparities in overall access to basic care and even greater inequities for rural communities in accessing integrated health care [19].

Pilot studies conducted in China demonstrated the effectiveness of integrated care. In rural Henan an integrated care model resulted in improved accessibility, coordination, and continuity of care for older patients with hypertension or diabetes [20]. In Shanxi, cancer patients enrolled in an integrated care program had significantly lower hazards for unfavorable clinical outcomes [21]. In Nanjing, elderly patients participating in an integrated care program showed better adherence to healthy lifestyle benefits [22].

In Thailand there are many examples of research consistent with integrated care. First, Thailand has established universal healthcare coverage with an emphasis on integrated and holistic approaches in primary care [23]. Second, there is a significant body of research on prevention and management of diabetes [24]. The approaches to diabetes management include screening in high-risk populations, identifying and addressing factors associated with poor treatment outcomes, and a monitoring framework to track progress, all consistent with integrated care [24]. Third, community health workers are widely used to compliment the physician and nurse workforce for activities such as patient education, health promotion and disease management [25]. Healthcare providers are increasingly incorporating health technologies, especially telemedicine for rural areas [26] and a smartphone app for patient education [27]. In spite of these approaches and strategies consistent with integrated care, desired outcomes such as well-controlled blood glucose for diabetes patients and related outcomes remain a challenge in need of further improvement [28].

There is also research on treatment of psychiatric and substance use disorders in Thailand. McCann et al. [29] studied the efficacy of a self-help manual to increase resilience for adults with depression. Bolton et al. [30] evaluated a transdiagnostic community-based approach for mental health conditions among Burmese refugees in Thailand. Services for depression and suicide have been implemented and evaluated [31]. Wakabayashi et al. [32] found that alcohol consumption was associated with elevated risk of NCDs, but integrated care interventions for comorbid SUD and NCDs is not available. Research on the integrated care of psychiatric and substance use disorders in primary care in coordination with NCD's is lacking in Thailand. Although Thailand is making progress with disease management approaches to diabetes and other NCD's and with psychiatric and substance use disorders, an integrated healthcare approach to address systematically these comorbid conditions is absent.

There is a small body of research on integrated behavioral health in Vietnam. The government had prioritized depression care in primary healthcare [33]. In practice, however, activities are limited to referrals and pharmacotherapy only, and access to evidence-based care for depression is still very limited with barriers to integration such as low level of knowledge of depression treatment among physicians, low resource availability in primary care, limited mental health training and a primary care system that sets mental health apart from general services [33]. Ngo and colleagues [34] evaluated a collaborative care for depression program in primary care based on integrated behavioral health. They found the program to be effective, feasible and acceptable by providers and patients in improving depression outcomes. Significant challenges to implementation and sustainability included lack of mental health providers, medical providers overburdened with medical cases, low levels of psychological mindedness among patients, and lack of recognition of depression as a condition amenable to treatment [33]. In summary, scant research has been conducted and limited government funding and resources are allocated to promoting integrated behavioral health in Vietnam.

In Vietnam there is broad recognition of the need to integrate psychiatric and substance use disorders into the primary care and hospital system based on estimated high prevalence of behavioral conditions and a high incidence of suicide [35]. Training and resources for behavioral health treatment are very low and access for patients is limited, highlighting the gap between treatment needs and services [35]. Alfredsson et al. [36] conducted a survey of physicians to study attitudes towards mental health and the integration of mental health services into primary care. They found high support for integrated services, with 81.3% of physicians personally interested in the delivery of mental health in their services. Respondents with prior training in mental health had more favorable attitudes towards mentally ill people and those who perceived a high need for mental health services more strongly favored integration [36]. Olofsson et al. [37] studied mental health needs in primary care in rural Cambodia and found very limited mental health services and no budget allocated to them, with a dire need for scaling up mental health services in primary care [37].

Theoretical model for integrated behavioral health

A Lexicon for Behavioral Health and Primary Care Integration [38] introduced a model and common definitions for necessary components of integrated behavioral healthcare comprised of six domains of care delivery; team-based, efficient, patient-centered, evidence-based, incorporates patient-reported outcomes and population health management. The PIP is the only validated measure designed to measure the Lexicon definitions of integrated behavioral health. While the relationship between the PIP and patient outcomes has not been tested, a central tenet of the integrated model is that adding a BHC to primary care will result in improved patient identification, treatment and clinical outcomes. Patient-reported outcomes that are brief, feasible and actionable and include lifestyle behaviors, mental health and substance use disorder problems are needed. An excellent example of a screening tool that addresses these domains is the My Own Health Report (MOHR) that includes 17 health behavior

and psychosocial risk screening questions such as nutrition, physical activity, sleep, anxiety and depression [39]. The MOHR is recommended as a Health Risk Assessment (HRA) to be completed during an annual wellness visit. In summary, measurement of the model of integrated behavioral health requires assessment of the clinical practice domains defined by Peek [38] and patient HRA data that reflect lifestyle and psychosocial risk factors [39]. Peek's [38] lexicon model guided this study.

Problem description

The study was a response to the urgent need for integrating behavioral health into healthcare systems in Asia [40]. The rapidly aging population, increased burden of patients with NCDs, and high prevalence of psychiatric and substance use disorders often comorbid with NCDs demonstrate a clear need for integrated healthcare services. However, throughout Asia efforts to integrate primary care, such as the collaborative care model, are very limited [40]. Tham et al. [40] concluded that key stakeholders need an improved understanding of the demand for integrated care for the high-risk populations and appropriate resources to meet this demand, especially in light of population demographic transitions to less healthy lifestyles and the rapid increase in the aging population in Asia.

Aims and research questions

A set of specific aims guided the current study:

1. To assess the level of behavioral health care integration in hospital and community health centers as measured by the Practice Integration Profile [41].
2. To assess the prevalence of common behavioral conditions and clinicians' perceived need for a BHC in the clinic using a Provider Survey [42], and;
3. To advance knowledge about patients' self-reported health risk using the health risk assessment (HRA) for patients diagnosed with type 2 diabetes and/or hypertension.

A comparative analysis of these measures between countries/sites in China, Vietnam, Cambodia, and Thailand was completed. The study focused on three research questions:

- a) What is the level of behavioral health integration in primary care clinics in Asia?
- b) What is the provider perceived prevalence of behavioral problems and need for an expert behavioral health consultant on the primary care team? and;
- c) What are the results of a health risk assessment for patients?

Based on existing research and Peek's model of integrated health [38], the study proposed three hypotheses:

- a) Level of behavioral health integration as measured by the PIP will be low in Asia,
- b) Provider ratings of prevalence of behavioral problems and need for a BHC will be high as measured by a Provider Survey, and;
- c) The results of a patient Health Risk Assessment will show high levels of lifestyle and behavioral health problems as measured by the MOHR and other screening measures.

Methods

Settings

This research was conducted by graduate students deployed for a 3-4-month study in Asia supported the USAID Global Development Research (GDR) Scholar grant program in 2017 and 2018. Each student was paired with an international host research liaison and community health centers or hospitals in which to complete the study. The hosts included university, Ministry of Health, and hospital partners.

Population

Subjects included healthcare providers (N = 157), clinic leaders (N = 13) and patients (N= 1,203). The providers were physicians, nurses, or community health workers providing care in local hospitals or community health centers. Leaders included hospital or community health center directors or other persons familiar with the range of services offered in the setting. The patients were adults with diagnoses of hypertension and/or type 2 diabetes.

Procedures

The PI completed the university Institute Review Board (IRB) application with assistance from students and hosts. The host preparation included review of the study protocol, identification of student key contacts (e.g., research assistants), translation of study materials, and completion of a local IRB if necessary. Local research assistants (RA's) with English proficiency were assigned to assist the student in meeting with local clinic leadership to review and plan for the study. Students trained the RA in study procedures, confidentiality and informed consent, and HIPAA requirements.

Patient participants: The RA recruited patients as they checked in for a routine medical appointment. The RA provided a brief description of the study, completed consent forms, and then completed the demographic and Health Risk Assessment (HRA) forms. Each patient received a payment of \$3 USD. The RA later collected biometric data (blood pressure, blood sugar and BMI) from the medical record.

Clinic provider/leader participants: The RA contacted staff interested in participating, provided a brief study description and assisted in completion of the consent forms. Participants completed the PIP (clinic leader) or the Provider Survey (physicians and nurses or other clinicians). Participants received an incentive payment of \$10 USD.

Measures

The **Practice Integration Profile (PIP)** measures the degree of behavioral health integration in primary care [41]. The PIP is comprised of 30 questions, completed by managers and clinicians, priding an overall score and 6 domain scores based on the Lexicon [38]. A validation study concluded that the PIP has utility, face, content, and internal validity, and distinguishes practices with known variation in integration [41]. The PIP was reviewed by international partners in Asia who agreed the items appeared face valid and applicable to primary care in Asia.

The **Provider Survey** is a list of 23 behavioral health problems (e.g., headache, depression) to be rated by primary care

clinicians. The clinician rates the prevalence of each symptom in practice, and how often they would request consultation with a behavioral health clinician [42]. The Provider Survey has face validity and a review by our international partners found consensus that it is a useful measure for Asia.

The study **Health Risk Assessment** is comprised in part on items from the **My Own Health Report (MOHR)** [39]. The MOHR is comprised of short versions of validated measures of health behaviors relevant to primary care. The MOHR domains included for this study are: **nutrition** (4 items from Starting the Conversation, Paxton et al. [43]); **physical activity** (2-items from the exercise vital sign, Sallis [44]); **risky alcohol use** (1-item from Smith et al. [45]); **smoking/tobacco use** (3-items from the Tobacco use screener from CDCP [46]); **anxiety and depression** as measured by the PHQ-4, from Smith et al. [45]); **stress** (1-item from the distress thermometer (Roth et al. [47]), and; **sleep** (3-items from the BRFSS). The MOHR items were selected from validated measures by expert consensus to screen for the most common symptom presentations in primary care [39].

In addition, the following screening measures are included: The **medication adherence visual analog scale (VAS)**, self-report measure of adherence, has been validated against prescription medication refills for chronic disease patients [48]. It is endorsed by the World Health Organization (WHO) [49] and has been used in Asia [50]. It was selected given the high rates of medication nonadherence in Asia. The **Somatic Symptom Scale (SSS)** is a validated, 8-item version of the PHQ-15 designed to measure somatic symptom disorder [51] and used in Asia [52]. It was selected due to the high prevalence of somatic symptoms in primary care patients in Asia. The **Abbreviated PTSD Civilian Checklist** is a validated, 2-item version of the PTSD Checklist that has been validated [53]. The full scale has been used in Asia. It was selected due to the high prevalence of trauma in Asia. A **Green Health** exposure screen developed by the PI was included based on research that greater exposure to green places (e.g., parks, gardens) is associated with improved cardio-metabolic and psychological health status [54]. Patient **cardiomatabolic health risk** measures included, systolic and diastolic blood pressure, HbA1c, waist circumference and BMI.

Data collection

Each participant's name was linked to an identifier number, recorded on a separate form and stored securely. All participant data entry will utilize the identifier number only. To further ensure confidentiality, all important information about participants including their assessment results will be kept safe and in a locked filing cabinet in the host university or hospital. The data will be stored in the host site for a period of 5 years.

Data analysis

Descriptive statistics were calculated for demographics, including participants' income, education level, healthcare and support. Chi-square and ANOVA were utilized to determine if there were any significant differences between sites for physical health, mental health and substance use. The provider survey was analyzed utilizing Chi-Square tests with Monte Carlo simulations (n = 10,000 simulations) in cases where there were cell counts less than five [55]. The PIP was compared to the

median per domain in the United States [41]. Formal statistical testing cannot be completed because most sites had only one observation for the PIP.

Results

On the patient HRA most are married or widowed except for the 2017 Thailand site which has a high proportion (37.3%) of single and divorced participants. There is significant variation in employment status across sites. Some sites have significant proportions of retired and disabled participants while some have high proportions of employed participants and homemakers. Most participants across sites lived in households with 3 to 5 people. Most participants across sites have public health insurance except for Cambodia, which has 89% uninsured. Across sites participants generally have a primary or secondary education with very few completing a college degree (Table 1).

The PIP measures six different domains (Table 2). Results show that Thailand, particularly Yu Chareon has the highest level of integration of the sites studied. Vietnam reported low workflow and services. China scored low on all six domains suggesting that their behavioral health integration may be less mature

than other sites. Poochaosamingprai scored above 50% in all domains except for services, Chiang Mai exhibited a significant difference between the two years, suggesting the different site attributes may be driving the disparities in the level of integration. Cambodia reported lower workspace integration.

The Provider Survey results include individual item and mean scores for ratings of prevalence of behavioral problems and ratings of perceived need for a Behavioral Health Consultant (BHC) to assist in treatment for each problem (Table 3). The average ratings were between 2 (rarely) and 3 (sometimes) on the four-point scale. There were many statistically significant between-group differences for both types of data that will be explored in subsequent publications from this group. The site averages for ratings of prevalence ranged from 2.0 to 2.7 and for need for a BHC from 2.0 to 2.6. The most common conditions reported across sites for perceived need for a BHC were coping with stress, chronic pain and mental health disorders (i.e., depression, anxiety and panic disorder). Chiang Mai reported unhealthy alcohol use as a primary concern across both years and Vietnam reported a need for help with patients not wanting to quit smoking. Providers are rather consistent across countries and sites regarding the conditions that they need behavioral health providers to assist with.

Table 1: Demographics by social determinants of health.

Factor	Ho Chi Minh City, Vietnam		Chiang Mai, Thailand		Beijing, China		Poochaos- Amingprai, Thailand	Yu Chareon, Thailand	Phnom Penh, Cambodia
	2017	2018	2017	2018	2017	2018	2018	2018	
N	152	157	134	2.1	157	100	100	98	
Male (%)	46.3	45.9	41.0	39.8	49.8	36.0	23.0	55.1	
Age	64.5	56.7	63.4	62.7	60.2	65.4	64.0	49.3	
Marital Status (%)									
Married	79.6	83.4	62.7	63.4	93.3	52.5	48.0	89.6	
Single	3.9	2.5	19.4	5.0	2.4	8.1	7.0	3.1	
Divorced	0	0.6	17.9	7.4	0.8	5.1	5.0	3.1	
Widowed	16.4	12.7	0	24.3	3.1	29.3	33	4.2	
Other	0	0.6	0	0	0.4	5.1	7.0	0	
Household Size (%)									
1 to 2	15.1	26.5	32.1	30.5	40.5	22.0	11.0	7.4	
3 to 5	54.7	58.7	55.7	55.6	55.6	54.0	66.0	52.1	
6 to 10	29.1	14.2	12.2	13.9	3.9	22.0	23.0	37.2	
> 10	1.2	0.6	0	0	0	2.0	0	3.2	
Employment Status (%)									
Employed	39.5	56.4	29.8	9.1	31.1	24.1	13.0	47.4	
Disabled	0.7	0	26.4	34.8	0.8	22.9	44.0	45.3	
Retired	44.1	0.0	15.7	35.6	25.6	10.8	2.0	4.2	
Unemployed	1.3	19.9	22.3	0.8	3.5	0	0	2.1	
Student	0	0.6	0	7.6	0.4	15.7	10.0	0	
Homemaker	14.5	23.1	5.8	12.1	38.6	26.5	31.0	1.1	
Health Coverage (%)									
Public Health Ins.	83.6	72.0	51.2	99.0	92.0	97.0	90.0	7.2	
Private Insurance	4.6	0	6.5	0	0.4	0	0	0	
No Insurance	11.8	0	39.8	0	3.2	0	0	88.7	
Other	0	28.0	2.4	1.0	4.4	3.0	10.0	4.1	
Education Status (%)									
Primary School	51.0	69.3	85.5	84.8	42.5	78.4	80.0	61.1	
Secondary School	41.7	19.0	7.6	10.1	22.8	12.4	8.0	30.0	
Some College	2.0	10.9	6.9	3.0	27.6	6.2	3.0	3.3	
4-Year Degree	5.3	0.7	0	2.0	6.7	2.1	1.0	2.2	
Graduate School	0	0	0	0	0.4	0	1.0	2.2	
Other	0	0	0	0	0	1.0	7.0	1.1	

Table 2: Practice integration profile.

	Beijing, China	Ho Chi Minh City, Vietnam	Chiang Mai, Thailand		Poochaosamingprai, Thailand	Yu Charoen, Thailand	Phnom Penh, Cambodia	USA Median [41]
Year	2017	2018	2017	2018	2018	2018	2018	
N	1	1	7	1	1	1	1	
Domain								
Workflow	17%	25%	65%	46%	67%	63%	38%	54%
Services	25%	22%	58%	25%	14%	69%	50%	67%
Workspace	38%	63%	80%	100%	88%	63%	25%	75%
Integration	13%	50%	49%	38%	69%	75%	44%	50%
Need	15%	55%	76%	35%	40%	75%	50%	50%
Engagement	19%	56%	70%	19%	44%	75%	38%	50%
Average	21%	45%	66%	44%	53%	70%	41%	58%

Table 3: Provider survey prevalence and need for behavioral health consultation (n = 157). Note: Response scale; 1 = Never, 2 = Rarely, 3 = Sometimes, 4 = Often.* Only aggregated data available, unable to calculate SD.

	Subscale					
	Mental Health			Behavioral Health		
Provider Reported Prevalence	Mean	SD	Mean	SD		
2017						
Beijing, China	2.49	0.92	2.78	0.94		
Ho Chi Minh City, Vietnam	2.09	*	2.47	*		
Chiang Mai, Thailand	2.50	0.90	2.90	0.90		
2018						
Chiang Mai, Thailand	2.15	0.92	2.29	0.98		
Poochaosamingprai, Thailand	2.37	0.93	2.66	0.98		
Yu Charoen, Thailand	1.94	0.98	2.10	1.02		
Phnom Penh, Cambodia	2.49	0.97	2.59	0.97		
Need for Behavioral Health Consultation						
	2.32	1.09	2.19	1.04		
Ho Chi Minh City, Vietnam	2.56	*	2.74	*		
Chiang Mai, Thailand	2.51	0.96	2.71	0.93		
2018						
Chiang Mai, Thailand	2.17	0.95	2.16	0.91		
Poochaosamingprai, Thailand	2.26	0.84	2.36	0.86		
Yu Charoen, Thailand	1.92	0.96	2.12	1.02		
Phnom Penh, Cambodia	2.44	0.99	2.30	0.99		

Table 4: Health risk assessment.

Factor	Gender	Ho Chi Minh City, Vietnam		Chiang Mai, Thailand		Beijing, China	Poochaosamingprai, Thailand	Yu Charoen, Thailand	Phnom Penh, Cambodia	P
		2017	2018	2017	2018	2017	2018	2018	2018	
N		152	157	137	202	257	100	100	98	
Physical Health										
HbA1c	M	7.3	N/C	N/C	8.1	N/C	7.4	8.0	7.8	0.691
	F	8.4	N/C	N/C	8.3	N/C	8.3	7.8	10.2	0.006
Systolic BP	M	141	135	N/C	131	N/C	136	142	143	0.003
	F	131	137	N/C	126	N/C	137	137	140	0.000
Diastolic BP	M	86	84	N/C	70	N/C	81	79	85	0.000
	F	78	82	N/C	70	N/C	78	76	82	0.000
BMI	M	26.1	24.7	25.1	24.6	26.0	25.3	32.6	26.2	0.035
	F	25.9	23.7	24.8	25.1	26.0	25.8	29.6	24.2	0.541
Substance Abuse (%)										
Binge Drinking	M	37	54	40	16	21	17	22	33	0.000
	F	1	1	10	5	3	5	5	5	0.492
Cigarette Smoking	M	40	32	7	8	34	17	30	17	0.000
	F	3	0	1	2	5	2	6	0	0.000
Chewing Tobacco	M	4	1	5	9	4	3	9	15	0.440
	F	5	0	1	2	2	0	6	9	0.566
Physical Health (%)										

Sleep Apnea	N/C	0.5	N/C	0.8	N/C	0.4	0.3	0.5	0.000
Day Sleepiness	N/C	3.2	N/C	1.8	N/C	1.8	1.9	1.4	0.000
Somatic Symptoms	15.3	13.9	8.5	6.0	7.4	6.5	6.7	10.5	0.000
Meds Compliance	N/C	90	74	N/C	89	91	82	N/A	0.000
Fast Food / Week	1.4	1.4	0.6	0.1	0.4	0.3	0.2	0.7	0.000
Daily Fruit and Vegetables	3.1	2.9	2.6	.05	1.7	3.1	3.0	0.8	0.000
Weekly Exercise (min)	175	189	100	157	178	87	69	97	0.000
PHQ-4	6.1	5.6	2.0	0.4	1.8	0.9	1.4	3.7	0.000
Stress Level	2.9	2.5	2.8	1.3	1.9	1.8	2.4	3.9	0.013
PTSD	3.2	3.1	3.8	0.2	1.5	0.7	0.9	2.5	0.000

Note: N/A: data not available; N/C: data not collected.

Subscales for mental and behavioral health are reported based on the methodology developed by Wardell [56]. Behavioral health conditions are reported to be more prevalent than mental health conditions at all sites. The prevalence of mental health conditions ranges from 1.94 to 2.50 and the prevalence of behavioral health conditions range from 2.10 to 2.90 (Table 3). This is consistent with the need for integrated behavioral health services. The perceived need for a behavioral health clinician is not as consistent across behavioral and mental health conditions as the prevalence demonstrated. This suggests that additional workforce training, on the benefits of a BHC, may be needed.

Health risk assessment results

The HRA results were divided into three categories (i.e., physical health, mental health and substance use) for analysis. Generally, systolic blood pressure (SBP) and HbA1c levels were clinically significant, consistent with the sample based on patients diagnosed with T2DM and hypertension. Most BMI scores fell in the overweight category, except for Vietnam in 2018 and two of the four readings for Chiang Mai in 2017 and 2018, falling into the normal category. Systolic and diastolic blood pressure, for both men and women, were lowest in Chiang Mai 2018 and the highest systolic readings in Phnom Penh, Cambodia.

Sleep apnea and daytime sleepiness were generally very low. Somatic symptom scores were low (4-7) for three of the four Thailand sites and medium (8-11) to high severity (12-15) for the remaining sites. Medication compliance was not consistently measured in the study due to formatting errors in the HRA, but where recorded it is consistently high ranging from 74% to 91%, with 80% generally considered good compliance [57]. Daily fruits and vegetable portions were uniformly low, as was fast food intake. Weekly exercise exceeded the recommended target of 150 minutes per week in China, Vietnam and one of four Thailand sites, but was relatively low in the remaining sites. Average days and minutes spent near green spaces varied between sites, and satisfaction with access to green spaces was moderate to high. Health literacy was greater than the cut-off of 2 or higher for all sites except for Chiang Mai 2017. PHQ-4 scores ranged from none (0-2) for China and three of the four Thailand sites to low (4-7) to mild (3-5) for Cambodia, low (4-7) for Vietnam. All sites fell below the cut off of 4 on the distress thermometer and PTSD scale.

Binge drinking and smoking tobacco were much higher among men than women. Binge drinking for men varied significantly between sites, but all indicated significant problems for men

with a low of 17% in one Thailand site to a high of 54% in one Vietnam site. Tobacco smoking ranged from a low of 7% in one Thailand site to 40% in one Vietnam site. ANOVA results show that HbA1c was significantly different between sites for women ($p < 0.01$) but not for men ($p = 0.691$). Systolic and diastolic blood pressure were both significantly different by site for both men and women ($p < 0.01$). BMI was significantly different across sites for men ($p < 0.05$) but not for women ($p = 0.541$). Both mental health measures, the PHQ-4 total score and a measure of PTSD were significantly different across sites ($p < 0.001$). Binge drinking was significantly different across sites for men ($p < 0.001$) but not women ($p = 0.492$). Cigarette smoking was significantly different across sites for both men and women ($p < 0.001$), but smokeless tobacco was not significant for either gender ($p = 0.440$ and 0.566 respectively).

Self-reported HRA measures for physical health, based on Chi-square tests, were all significantly different between sites ($p < 0.001$). Ho Chi Minh City, Vietnam and Phnom Penh, Cambodia both had much higher levels of somatic symptoms than the other sites. These statistically significant differences will be explored in follow-up publications on this research (Table 4).

Discussion

This is the initial summary of descriptive data for this project. Additional papers will be completed with results for each site and across all sites. Consistent with study hypothesis the level of integrated care services is relatively low in all sites except in one of the two Bangkok sites and the Chiang Mai 2017 site. The individual domain and overall average percentages for the remaining sites are generally lower than the United States average. It is notable that the United States aggregate data reflect clinics with varied levels of integration and reflect the current state of integration with about 50% of sites integrated, except for domains "services" and "workspace".

The provider survey reported prevalence of behavioral problems/conditions and need for a BHC to assist in treatment is moderate, ranging between "rarely" (2) and "sometimes" (3). There were significant differences between sites on many of the individual items, but no specific trends were noted. Comparison of the top five conditions found problems endorsed by multiple sites; difficulty coping with stress (3), mental health disorders (3), chronic pain (3), overweight/ obesity (2), child behavior problems (2) and unhealthy alcohol use (2). Only one site noted that tobacco smoking was a top five problem.

Patient HRA results were mixed. Somatic symptoms were significantly elevated in the high range for China, Cambodia and one Chiang Mai site, and very high for Vietnam. Medication

compliance was uniformly high (>80%) in all sites except Chiang Mai 2017 (74%). Self-reported nutrition showed low consumption of fruit and vegetables and low frequency of eating fast food across sites. Self-reported weekly rigorous physical activity was greater than recommended levels (150 minutes/week) in China and Vietnam and one Chiang Mai site, and much lower in the remaining sites. The PHQ-4 screen for depression and anxiety was in the mild to moderate range for Vietnam and Cambodia, and minimal in other sites. The PTSD screen was between 3.1 and 3.8 for Vietnam and one Chiang Mai site, 2.5 for Cambodia, and low for remaining sites (cut off score is 4 for positive PTSD screen). Risky alcohol use was significant for males for most sites (range 21% to 54%) with lower rates in two Thailand sites (16-17%). Smoking tobacco use was uniformly low for women and in the 30% to 40% range for men in Vietnam, China, and one site in Bangkok, 17% in the other Bangkok site and Cambodia, and 7% - 8% in Chiang Mai. Chewing tobacco use for women was low between 0% and 6% in all sites except Cambodia at 9% and for men was between 1% and 5% except for Cambodia (15%) and one Bangkok site (9%). The average number of days in green spaces, access to and quality of green spaces was variable with the lowest days, access, and quality in Cambodia and one Bangkok site. Health literacy was above the cut-off (≥ 2) in all sites except Chiang Mai in 2017, indicating consistent difficulty completing medical forms.

The results of the biometrics show elevated cardio metabolic risks for HbA1c, systolic blood pressure and BMI, which is not surprising given the inclusion criteria of a diagnosis of hypertension or diabetes in the study. Notably, women in Phnom Pehn, Cambodia had an average HbA1c of 10.2 which is nearly two points higher than any other site studied (range 7.3 - 8.4), even when accounting for gender differences. While BMI measurements generally indicated the populations were overweight, only Yu Chareon, Thailand males were in the obese category and both genders in Ho Chi Minh City (2018) and Chiang Mai, Thailand (2017 and 2018) were at or below normal BMI scores. It is notable that HbA1c was uncontrolled for all sites, systolic blood pressure was uncontrolled (≥ 130) for all but one site, and diastolic blood pressure was uncontrolled (≥ 80) for 50% of the sites, based on current definitions for hypertension [58]. It is also notable uncontrolled HbA1c, and blood pressure occurred in patients that routinely attend clinics and report medication adherence that is uniformly high ($\geq 80\%$). These results support the need for integrated health interventions to address lifestyle (nutrition, physical activity) and behavioral conditions (depression) in order to effectively improve clinical outcomes for these patients. Medication as a first and only treatment for T2DM and hypertension does not seem sufficient to achieve control of HbA1c and hypertension, pointing to the need for integrated care in Asia.

The results of the PIP show that level of integration is generally low in Asia, except for two sites in Thailand. A review of the Thailand data with the hosts indicates that one reason for this finding is a robust nurse-led diabetes treatment program with monthly visits. In addition, these sites utilize community health workers to compliment the nursing workforce. The community health workers appear to lack formal training in NCD prevention and management and integrated care interventions such as motivational interviewing or nutrition counseling. In summary,

the results of the PIP show that the level of integrated care in Asian countries and sites is lower than in the United States [41].

The results of the Provider Survey showed consistency between sites on concerns with stress and anxiety, lifestyle problems such as obesity, child behavior problems. The Provider Survey results did not show the expected high ratings of prevalence and need for a Behavioral Health Consultant. However, this is likely due to the low awareness of these problems by clinicians. Studies in Asia consistently show that behavioral conditions are underdiagnosed and that clinicians fail to recognize conditions such as depression and anxiety [33,34]. This is consistent with the finding that patient HRA results show high levels of tobacco smoking and harmful alcohol use in men but these items were not rated as highly prevalent or in need of behavioral health consultation by providers. In summary, while the reported prevalence and need for a BHC was not elevated, the results of this study combined with other research suggest that clinicians lack awareness of actual prevalence, fail to identify, assess, and treat behavioral problems in practice.

Limitations

There are several limitations to this study. First, the PIP, Provider Survey, and most of the HRA screening measures have not been validated in the countries in this study. The PIP and HRA measures have been validated in the US, the Provider Survey has not. There are no widely used measures of integration or provider ratings of prevalence and need for behavioral health problems in Asia. Only a few of the HRA screening measures have been used and validated in China or SE Asia. However, this is the first study to study brief measures of integration, provider ratings, and HRA data in multiple countries in Asia, and reflects the need for brief measures that are feasible for applied research in busy settings. Review of the questionnaires with stakeholders in each country indicated that all of the measures had good face validity. A second limitation is translation for the PIP. Each site used professional translators and included reverse translation. Discussions with site hosts during planning and implementation showed some problems with translating the terms used in the PIP. Another limitation is that this is a descriptive study with one sample of data collected per site. We are not able to address changes that may occur among physicians and patients over time in a longitudinal study. Lastly, this study was based on a convenience sample and did not include randomization or other more rigorous research design.

Strengths and innovations

This appears to be the first study to utilize a multidimensional approach to measure integrated care in multiple countries in Asia. The preparation for the study included education and training seminars on integrated healthcare for university and hospital leaders and clinicians that appeared to raise awareness of the need for integrated healthcare in Asia. Many of the students provided additional training on topics such as motivational interviewing, mindfulness-based stress management, and depression screening and treatment. Anecdotal reports from community health workers who administered and reviewed the patient HRA indicated that the workforce had not used these types of screening measures

and found them valuable both for identification of behavioral issues and as a point of discussion with patients. Each site held closing meetings to review the initial results of the study that often-included representatives of local Ministry of Health departments that oversee funding. Several of the sites have entered into formal collaboration with Arizona State University to apply for international grant funding to support continued and expanded scope in the study of integrated care in Asia. The ultimate goal for this research group is the development of sustainable integrated behavioral health programs throughout Southeast Asia that will result in improved prevention and management of NCD's achieve the Triple Aim of improved patient experience of care, population health and reduced costs.

Conclusion

The PIP leadership survey, clinician Provider Survey, patient self-reported Health Risk Assessment and medical record biometrics combined provide a more complete estimate of the presence and need for integrated health care in Asia based on key stakeholders, leadership, clinicians, and patients. These measures appear well-suited for applied research in resource-poor settings that require brief measures that produce actionable data. The results of this study demonstrate the need for integrated care in Asia based on generally low levels of integration. The findings of poor control for HbA1c and blood pressure in spite of high medication adherence also point to the need for integrated health to address lifestyle problems underlying poor outcomes for NCD's and behavioral conditions associated with adverse outcomes for NCD's. The relatively low provider ratings of prevalence and need for a BHC likely reflect a lack of provider education and awareness of these problems and the need for a BHC to address lifestyle and behavioral conditions that contribute to poor outcomes. From a consensus Lexicon model perspective [38]; more work is needed before reaching an effective communication and concerted action among clinicians in the participating sites. Differences among sites were noted and the sites showing more promising practices can serve as a model for the others. Comparisons within Southeast Asian countries appear to be more relevant than comparisons between emerging economies and the rich north. More research is needed to identify and highlight exemplary practices within resource poor contexts.

Recommendations for future study include an evaluation of the translation quality and validity and reliability of the study measures in each country. A detailed review of the study findings in each country with key stakeholders will be completed in order to identify additional strengths and areas of improvement in this project. A validation study of the PIP in Thailand, Vietnam and Cambodia will be completed by this research team. This research has resulted in improved recognition of the need for integrated care in Asia, with strong interest in developing pilot integrated healthcare programs.

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