


Integrated Behavioral Health Care in Viet Nam: Examples from the Hanoi Bach Mai Hospital of Patients with Hypertension

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ABSTRACT

Objectives: Behavioral conditions contribute to poor clinical outcomes and are not routinely addressed in medical settings in Viet Nam. Few studies focus on the level of integrated care in clinics, the provider ratings of the prevalence of behavioral conditions, the need for a behavioral health consultant (BHC), and patient health risk assessments (HRAs) in Viet Nam. To fill these research gaps, this study aims to explore the level of behavioral health integration in primary care clinics, the provider perceived prevalence of behavioral problems, the need for an expert behavioral health consultant on the primary care team, and the health risks for patients in Viet Nam. **Methodology:** This study collected first-hand survey data from two healthcare sites, 41 service providers, and 199 patients in Hanoi, Viet Nam. Regression analyses were conducted to examine the relationship between HRA behavioral conditions and each of the biometric health risk factors. **Results:** The healthcare site and provider survey results showed low levels of integrated health services, provider perceptions of the moderate prevalence of common behavioral conditions, and the need for a BHC to assist in care. In addition, the patient's HRA results showed an elevated risk of sleep apnea, fruit and vegetable intake, tobacco, alcohol use for men, and poor health literacy. **Conclusion:** The level of integrated care services is low in Viet Nam, the need for the providers to have a BHC to assist in treatment is moderate, and the patients reported elevated health risks in several areas. The findings demonstrated a pressing need for the development of integrated behavioral health care services in Viet Nam.

Key words: Integrated Healthcare, health risk assessment, Hypertension, biometric health risks, Vietnam

INTRODUCTION

Non-communicable diseases (NCDs) are increasing globally and account for 82% of NCD-related deaths in low- and middle-income countries¹. Behavioral health risk factors such as physical inactivity, poor nutrition, tobacco use, and excessive alcohol use are the main causes of many NCDs². Economic transitions in Asia have led to a change from low-calorie, high fiber foods to processed foods that are high in fat, salt, and sugar^{3,4}. Changes in the workforce have led to more sedentary time and workplace technological changes contribute to decreasing physical activity levels⁵⁻⁷. *Integrated behavioral health*, the team-based systemic treatment of NCD, lifestyle, and behavioral (psychiatric and substance use disorder) conditions in medical settings such as primary care clinics, is viewed as an urgent need in Asia⁸. Integrated behavioral health interventions are associated with reduced hospital admissions and readmissions, a decreased hospital length of stay, lowered healthcare

costs, enhanced adherence to treatment recommendations, and clinical and quality outcomes^{9,10}. However, there is no feasible and standardized approach to defining and measuring integrated healthcare in practice¹¹, resulting in a lack of consensus among stakeholders on the implementation and funding of integrated care globally¹².

Hypertension and Type 2 Diabetes in Viet Nam

Viet Nam is a low to middle-income country that is epidemiologically transitioning from acute care for communicable diseases to non-communicable chronic care^{13,14}. This epidemiological transition can be attributed to changes in the population, socio-demographic characteristics, and life expectancies^{13,14}. Hypertension has increased from 16.9% in 2001-2002 to 25.1% in 2008 and 33% in 2009¹⁴. A recent meta-analysis found a pooled prevalence of hypertension of 21.9% based on research studies and

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18.4% based on national surveys. This may be more accurate due to the larger sample size¹⁵.

Awareness and Treatment

The patient awareness of having hypertension is 46% to 48.4%, and only 29.6% undertook treatment^{16,17}. In rural districts, the level of awareness decreases to 17%, and only 6% undertook treatment¹⁸. Reasons for lack of awareness and treatment include the inadequate training of community health care workers, ineffective health dialogue, a lack of skills to communicate the diagnosis of hypertension, and poor education on hypertension among the general population¹⁸. Patient education and advocacy are recommended to increase awareness, treatment, and to encourage behavioral changes to improve the outcomes for hypertension¹⁹. A study in rural Northern Viet Nam found a 49.8% adherence to hypertension medication²⁰.

Risk Factors

The risk factors for hypertension in Viet Nam include a sedentary lifestyle, obesity, metabolic syndrome, poor eating habits, family history, undiagnosed hypertension, and a nutrition transition^{19,21,22}. Hypertension in Viet Nam has substantially increased in part due to the accelerated economic improvements, aging population, changes in diet, and urbanization^{14,23}.

Overweight and obesity has increased from 2.3% in 1993 to 15% in 2015²⁴. There is a low level of physical activity, a high consumption of salt, instant noodles, sugar-sweetened beverages, and a low consumption of fruit, vegetables and seafood²⁴.

Research has demonstrated that there is a significant association between an increased time spent in green space in urban areas (e.g., parks, gardens) and physical and mental health²⁵. The beneficial effects of urban green spaces include improved mental health, reduced cardiovascular morbidity and mortality, obesity, and a higher risk of type 2 diabetes²⁵. The underlying causal mechanisms that account for the health benefits of green spaces have been proposed as pathways linking greenspace to improved health including decreased air pollution, air temperature, and noise, increased physical activity, stress reduction, and social cohesion or support²⁵.

Co-morbid Psychiatric and Substance Use Disorders and Tobacco

A study of depression among elderly diabetic patients found that 79.4% reported depressive symptoms²⁶.

The prevalence of serious depression was 28% for cancer patients²⁷. Among chronic hepatitis B patients, 37.5% experienced symptoms of depression²⁸. A study of industrial workers found that 38.6% reported symptoms of depression²⁹, and a study of male casual laborers found that 25% reported depressive symptoms³⁰. A study of the elderly in an urban area found that 66.9% reported depression³¹, and a study of the elderly in a rural setting showed that 26.4% were positive for depression³². A study of patients in Viet Nam, Cambodia, and Myanmar found that the prevalence for anxiety was 17% while depression was 39.1%³³. Depression was greatest among patients with chronic obstructive pulmonary disease (62.1%), kidney disease (55.5%), Parkinson's disease (53.7%), and cardiovascular disease (52.6%). Anxiety was the greatest among the patients with cancer (7.8%). A related study of alcohol use in these three countries found that 9.3% of the population were problem drinkers, and that diagnoses of liver disease, gout, other musculoskeletal conditions, kidney disease, and dyslipidemia were positively associated with problem drinking³⁴. Tobacco use prevalence was 20.7% for current tobacco smokers or smokeless tobacco users and 4.1% for daily tobacco use and problem drinking.

Alcohol consumption is on a sharp rise in Viet Nam with an increase in alcohol consumption per capita from 2003-2005 from 3.1 liters to 8.3 liters in 2015-2017³⁵. Alcohol use prevalence was 80.3% for males and 11.2% for females aged 24-69 years old, with 44% of the males engaged in heavy episodic drinking³⁵. The WHO reported that 8.9% of males and 0.9% of females have an alcohol use disorder. In addition, 5.9% of males and 0.1% of females are alcohol dependent³⁶.

Treatment of Hypertension in Viet Nam

The use of a pharmacological intervention where there is the use of medication to control blood pressure is typically used to treat hypertension in Viet Nam¹⁴. However, access to medication is problematic, significantly impacting treatment adherence¹⁵. The challenges to medication access include fragmentation and inconsistency when prescribing medication between different healthcare facility levels and short prescription time spans between follow-up visits to primary healthcare facilities¹⁵. Hypertension is poorly managed and treated in Viet Nam^{14,15,37}.

Workforce

Research on hypertension indicates the insufficient training of community health care workers, a lack of knowledge, and the overall impact on the general population¹⁸. As a result, 70% of community

health workers cannot ask the pertinent questions that need to be addressed to the patients with hypertension¹⁸. Furthermore, the barriers that the literature discusses include access to care, diagnosis, treatment, cost, education and management, a lack of knowledge about certain chronic diseases among the lower-tiered health care workers, and a lack of doctors who specialize in NCDs^{14,38–40}.

Integrated Healthcare in Viet Nam

There is a small body of research on integrated behavioral health in Viet Nam. The government has prioritized depression care in primary health-care⁴¹. However, in practice, the responsive activities are limited to referrals and pharmacotherapy only. Access to evidence-based care for depression is still very limited⁴¹. Barriers to integration include the 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 services⁴¹. A collaborative care for depression program in primary care based on integrated behavioral health was found to be effective, feasible, and acceptable by providers and patients in improving depression outcomes⁴². A community-based depression management intervention that included psychoeducation and yoga in primary care was found to significantly improve depression⁴³. The results of a supported self-management intervention for depression in primary care suggested that there was an improvement of depression symptoms⁴⁴. The significant challenges found to implementation and sustainability included a lack of mental health providers, medical providers overburdened with medical cases, low levels of psychological mindedness among patients, and a lack of recognition of depression as a condition amenable to treatment⁴¹.

The Present Study

This review shows that behavioral factors such as poor nutrition, a lack of physical activity, tobacco smoking, alcohol abuse, untreated co-morbid psychiatric disorders, and poor medication adherence largely account for the increase of hypertension in Viet Nam. Screening for behavioral risk factors is poor, and integrated healthcare research is lacking. The current study is designed to address this gap by measuring: 1) the level of behavioral health care integration in hospital and community health centers as measured by the Practice Integration Profile⁴⁵; 2) clinician ratings of the prevalence of common behavioral conditions and perceived need for a BHC in the clinic using a Provider Survey⁴⁶, and 3) a patient self-report

health risk assessment (HRA) for patients diagnosed with hypertension in Hanoi, Viet Nam. This study focused on three research questions: a) What is the level of behavioral health integration in primary care clinics in Viet Nam compared to the United States? b) What are the provider's perceived prevalence of behavioral problems and the 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?

METHODS

Setting

This research was conducted by a doctoral student who deployed a 3-month study in Hanoi, Viet Nam, supported by the USAID Global Development Research (GDR) Scholar grant program in 2019 in partnership with Bach Mai Hospital in Hanoi. Bach Mai hospital was the only hospital in this study because the USAID GDR Scholar program was only focused on this hospital. However, Bach Mai is representative. It is one of the largest hospitals in Viet Nam, providing medical services for more than 900,000 out-patients and 100,000 in-patients each year. The departments identified within the hospital for the study include the Viet Nam National Heart Institute and Endocrinology department. The subjects included healthcare providers (e.g., physicians and nurses), hospital leaders (e.g., departmental heads), and patients diagnosed with hypertension and/or type 2 diabetes at the hospital. This study was approved by the Bach Mai Institute Review Board, and permission was granted to the Vietnamese and United States authors to use this research data for publication.

Subjects

The subjects included healthcare providers, hospital leaders, and the patients at Bach Mai Hospital. The providers were physicians and nurses providing care in the hospital. The leaders included the departmental heads from various departments in the hospital who were familiar with the full range of services offered in each departmental setting. The leaders were from the Viet Nam National Heart Institute and the Department of Endocrinology of Bach Mai Hospital. The patients were adults, both male and female, with diagnoses of hypertension and/or type 2 diabetes from these two departments.

Procedures

The PI's university approved the study's human subject protocols. Trained research assistants (RA) recruited the patients as they checked in for a routine

medical appointment if an out-patient or by inquiring about their interest from those being seen as in-patients. The RA provided a brief description of the study, completed the 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 the patient's biometric data (blood pressure, blood sugar, and BMI) from their medical record. The RA also contacted staff to complete the PIP (clinic leader) or the Provider Survey (physicians and nurses, or other clinicians). The participants received an incentive payment of \$10 USD.

Measures

All measures were translated to Vietnamese and back translated into English. The translations were then reviewed by the Vietnamese team and the USA team. The teams agreed that the items for all measures appeared to be face valid and applicable to the providers and patients in Viet Nam as appropriate. The Practice Integration Profile (PIP) is a 30-item, 6-point Likert scale validated measure of the degree of behavioral health integration in primary care⁴⁵. The Provider Survey is a list of 23 behavioral health problems (e.g., headache, depression) to be rated by the primary care clinicians. The clinician rates the prevalence of each symptom in practice and how often they would request a consultation with a behavioral health clinician⁴⁶. The subscales for mental and behavioral health are reported based on the methodology developed by Wardell⁴⁷. The study's Health Risk Assessment is comprised of the My Own Health Report (MOHR)⁴⁸. The MOHR includes seven domains: nutrition (4 items from Starting the Conversation)⁴⁹, physical activity (2-items from The exercise vital sign⁵⁰, risky alcohol use (1-item)⁵¹, smoking/tobacco use (3-items from the Tobacco use screener)⁵², anxiety and depression as measured by the PHQ-4⁵³, stress (1-item from the distress thermometer⁵⁴, and sleep (3-items from the BRFSS⁵²). The MOHR items were selected from among the validated measures by an expert consensus to screen for the most common symptom presentations in primary care⁴⁸.

This study also included the following measures. The medication adherence visual analog scale (VAS) was validated against the prescription medication refills for chronic disease patients⁵⁵. The Somatic Symptom Scale (SSS) is a validated 8-item version of the PHQ-15 designed to measure somatic symptom disorders⁵⁶. The abbreviated PTSD Civilian Checklist is a validated 2-item version of the PTSD Checklist⁵⁷.

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 status⁵⁸. The patient cardiometabolic health risk measures included systolic and diastolic blood pressure (SBP; DBP), HbA1c, waist circumference (WC), and BMI.

Data Analysis

Descriptive statistics were used to analyze the demographics, including the participants' income, education level, healthcare, and support. Chi-square and ANOVA were utilized to determine whether there were any significant differences between sites for the patient HRA physical health, mental health, and substance use subscales. 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 five⁵⁹. Formal statistical testing cannot be completed for the PIP because most sites had only one observation. Pearson's correlation analysis was conducted for the patient-reported HRA items. Ordinary least squares Regression analyses were conducted to examine the relationship between HRA behavioral conditions and each of the biometric health risk factors (BMI, SBP, DBP, WC) while controlling for the patient demographic variables.

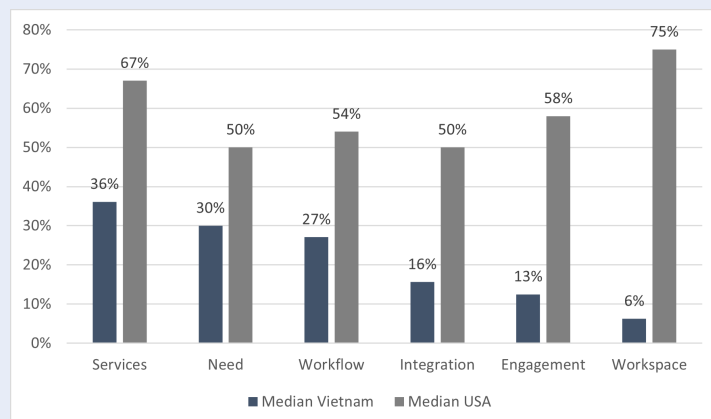


Figure 1: Practice Integration Profile (PIP) Results by Six Domains: Viet Nam vs. USA (n = 2)

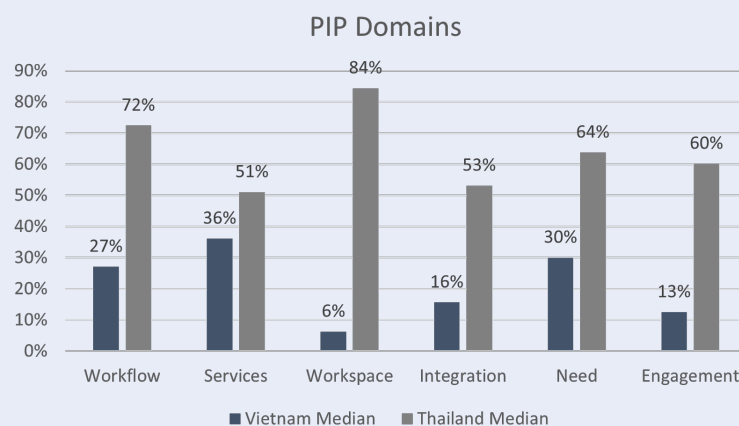


Figure 2: Practice Integration Profile (PIP) Results by Six Domains: Viet Nam vs. Thailand (n = 5)

Table 1: Provider Survey Reported Prevalence and Needs for BHC by Subscales (n = 41)

Subscale	# items per subscale	Mean	SD	t	p
Prevalence				-0.713	0.4839
Mental Health	12	2.53	0.96		
Health Behaviors	11	2.81	0.92		
Needs for BHC				-0.408	0.6876
Mental Health	12	2.70	0.94		
Health Behaviors	11	2.86	0.94		

Response scale; 1 = Never, 2 = Rarely, 3 = Sometimes, 4 = Often

Table 2: Patient Demographic Statistics (N = 199)

	Frequency (n)	Percentage
Gender		
Male	106	53%
Female	93	47%
Age		
< 50	30	15%
50 - 60	40	20%
60 - 70	73	37%
70 +	56	28%
Marital Status		
Married	152	76%
Single	11	7%
Widowed	36	18%
Employment Status		
Employed	64	32%
Homemaker	19	10%
Retired	96	48%
Unemployed	20	10%
Household Number		
1 – 2	54	27%
3 – 4	58	29%
5 – 6	70	35%
7 – 10	17	9%
Education Status		
Less than primary school	11	6%
Primary school graduate	17	9%
Secondary school graduate	129	65%
Some College or higher	41	21%
Insurance Status		
Have insurance	194	97%
No insurance	5	3%

Table 3: Medical Record biometrics and Patient Health Risk Assessment Descriptive Results (N = 199)

	Mean/%	Risk Level
Medical Record Biometrics		
Systolic Blood Pressure (SBP)		
Male	127	130-139 stage 1
Female	126	120-129 elevated
Diastolic Blood Pressure (DBP)		
Male	75	<80 normal
Female	74	<80 normal
BMI		
Male	26	23 – 24.9 overweight
Female	22	>25 obese
Patient Health Risk Assessment (HRA)		
Physical Health		
Sleep Apnea – Snoring (Average)	0.6	60% Responded Yes
Daytime Sleepiness (Weekly Average)	0.5	Low Risk on Scale (0 – 4)
Somatic Symptoms (Average)	7.9	Low Risk on Scale (0 – 32)
Medication Compliance (%)	90%	% Compliance
Weekly Fast Food (Average Servings)	0.4	Low Risk (< 1)
Daily Fruit and Veggies (Average Servings)	1.5	High Risk (< 2)
Weekly Exercise (Average Minutes)	176.7	>150 minutes/week = low risk
Green Space Days (Weekly Average)	3.0	NA
Green Space Access (Average)	8.1	On a scale of 1 – 10, 10 highest
Green Space Quality (Average)	7.5	On a scale of 1 – 10, 10 highest
Comfort with Medical Forms (Average)	1.5	Proficient Literacy (< 2) on Scale 0 – 4
Mental Health		
		Risk Level
PHQ-4 total	2.4	No Risk on Scale (0 – 12)
Stress Level	4.2	Medium Risk on Scale (0 – 10)
PTSD	1.2	Low Risk on Scale
Substance Use		
Binge Drinking		
Male (% > 1 day per year)	7%	High risk > 1 day per year
Female (% > 1 day per year)	3%	
Smoking Cigarettes		
Male (% responding yes)	13%	High risk if responding yes
Female (% responding yes)	10%	
Chewing Tobacco		
Male (% responding yes)	3%	High risk if responding yes
Female (% responding yes)	3%	

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Table 4: Pearson's Correlation among Key Behavioral Conditions Variables

	Physical Health												Mental Health			Substance Use		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1.Sleep Apnea – Snoring	1.00																	
2.Daytime Sleepiness	0.11	1.00																
3.Somatic Symptoms	-0.06	0.05	1.00															
4.Medication Adherence	-0.08	0.02	0.06	1.00														
5.Weekly Fast Food	0.03	0.01	-0.02	-0.02	1.00													
6.Daily Fruit	-0.06	0.04	0.11	0.10	-0.06	1.00												
7.Daily Vegetables	-0.07	-0.01	-0.04	0.00	-0.08	0.20*	1.00											
8.Weekly Exercise	0.06	-0.12	-0.04	0.02	0.12	0.01	-0.11	1.00										
9.Green Space Days	0.16*	-0.22*	0.00	0.03	0.18*	-0.19*	0.01	0.33*	1.00									
10.Green Space Access	-0.01	-0.03	-0.02	-0.05	-0.02	-0.09	-0.03	-0.01	0.40*	1.00								
11.Green Space Quality	0.02	-0.10	-0.03	0.06	0.05	-0.04	0.01	0.19*	0.49*	0.53*	1.00							
12.Health Literacy	0.03	0.20*	0.05	-0.06	0.07	0.10	0.00	-0.11	-0.16*	0.04	-0.07	1.00						
13.PHQ-4	0.00	-0.01	0.38*	0.01	0.03	0.07	-0.01	0.04	-0.01	0.00	-0.07	-0.02	1.00					
14.PTSD	-0.03	0.06	0.29*	-0.13	-0.02	0.08	-0.02	0.04	-0.06	0.07	-0.04	0.04	0.386*	1.00				

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Table 4 continued

15.Stress	-0.02	-0.06	0.36*	-0.04	0.06	0.08	-0.01	0.03	0.07	-0.04	0.07	0.18*	0.52*	0.28*	1.00	
16.Binge Drinking	-0.05	-0.03	-0.10	0.05	0.02	0.03	0.04	0.20*	0.03	0.09	0.03	0.04	0.03	0.076	0.03	1.00
17.Smoking	0.00	-0.01	-0.05	0.04	0.03	0.00	-0.03	0.03	0.08	0.10	0.06	0.12	0.05	-0.07	-0.03	0.42* 1.00
18.Smokeless Tobacco	-0.07	-0.12	-0.01	-0.04	0.15*	-0.09	0.04	-0.04	0.16*	0.06	0.14	0.02	-0.02	-0.01	-0.03	0.09 0.49* 1.00

*** p < 0.001, ** p < 0.01, * p < 0.05

Table 5: Regression Results of HRA Behavioral Conditions on Biometric Health Risk Factors

Variables	(1) BMI Coef. [95% CI]	(2) Systolic BP Coef. [95% CI]	(3) Diastolic BP Coef. [95% CI]	(4) Waist Circum Coef. [95% CI]
Demographic variables				
Gender (1=female; 0 = male)	0.64 [-0.36 – 1.62]	-2.61 [-7.68 – 2.45]	-1.32 [-4.68 – 2.03]	-1.86 [-5.07 – 1.36]
Number of Household residents	-0.16 [-0.42 – 0.10]	-0.32 [-1.65 – 1.01]	-0.49 [-1.38 – 0.39]	0.56 [-0.29 – 1.41]
Age	-0.07* [-0.12 – -0.02]	0.22 [-0.05 – 0.48]	-0.09 [-0.26 – 0.09]	-0.16 [-0.32 – 0.01]
Marriage status (Ref. = Married)				
Single	2.34 [-0.17 – 4.84]	-9.81 [-22.7 – 3.08]	-5.81 [-14.32 – 2.71]	3.05 [-5.10 – 11.20]
Widowed	0.76 [-0.58 – 2.10]	4.97 [-2.13 – 12.07]	3.49 [-1.24 – 8.22]	2.01 [-2.52 – 6.54]
Having health insurance (1 = Yes; 0 = No)	0.81 [-3.58 – 5.20]	-29.95* [-52.7 – -7.23]	-19.45* [-34.44 – -4.47]	-5.29 [-19.63 – 9.05]
Education level (Ref. = High School)				
Less than primary school	1.03 [-1.00 – 3.06]	5.32 [-5.10 – 15.73]	-0.25 [-7.13 – 6.62]	3.35 [-3.23 – 9.93]
Primary school graduate	-0.20 [-2.05 – 1.66]	2.13 [-7.42 – 11.68]	1.76 [-4.56 – 8.08]	0.72 [-5.30 – 6.75]
Some college or higher	-0.59 [-1.78 – 0.61]	-2.75 [-8.91 – 3.42]	-1.09 [-5.19 – 3.02]	1.68 [-2.26 – 5.61]
Employment Status (Ref. = Full Time)				
Homemaker	1.22 [-0.78 – 3.22]	-3.52 [-13.73 – 6.69]	-0.42 [-7.16 – 6.32]	-0.27 [-6.73 – 6.20]
Retired	1.75* [0.34 – 3.15]	-1.77 [-8.92 – 5.39]	0.86 [-3.89 – 5.60]	4.91* [0.38 – 9.44]
Unemployed	-0.19 [-2.05 – 1.66]	7.72 [-1.82 – 19.26]	6.34* [0.04 – 12.64]	1.49 [-4.54 – 7.52]
Patient Health Risk Assessment (HRA)				
Physical Health				
Sleep Apnea – Snoring	1.43** [0.45 – 2.41]	-1.05 [-6.06 – 3.95]	1.03 [-2.30 – 4.37]	3.27* [0.08 – 6.46]
Daytime Sleepiness (Weekly Average)	0.09 [-0.30 – 0.48]	-0.87 [-2.90 – 1.15]	-0.56 [-1.91 – 0.78]	1.27 [-0.01 – 2.55]
Somatic Symptoms (Average)	0.02 [-0.09 – 0.14]	0.25 [-0.33 – 0.84]	0.005 [-0.38 – 0.39]	0.24 [-0.15 – 0.62]
Medication Adherence (%)	-0.01 [-0.03 – 0.01]	0.09 [-0.01 – 0.20]	0.025 [-0.43 – 0.09]	-0.02 [-0.08 – 0.05]

Continued on next page

Table 5 continued

Weekly Fast Food (Average Servings)	0.13 [-0.72 – 0.99]	-2.34 [-6.92 – 2.25]	-0.93 [-3.96 – 2.10]	-1.39 [-4.30 – 1.52]
Daily Fruit (Average Servings)	0.28 [-0.43 – 1.00]	1.31 [-2.40 – 5.03]	0.09 [-2.38 – 2.55]	-0.74 [-3.11 – 1.63]
Daily Veggies (Average Servings)	-0.48 [-1.21 – 0.23]	-1.41 [-5.11 – 2.29]	-0.32 [-2.77 – 2.13]	-3.17** [-5.53 – -0.81]
Weekly Exercise (in minutes)	-0.00 [-0.002 – 0.002]	-0.003 [-0.01 – 0.01]	-0.00 [-0.01 – 0.01]	0.003 [-0.003 – 0.01]
Green Space Days (Weekly Average)	0.22* [0.03 – 0.41]	0.69 [-0.30 – 1.69]	0.204 [-0.46 – 0.87]	0.19 [-0.45 – 0.82]
Green Space Access (Average)	-0.12 [-0.31 – 0.07]	-0.60 [-1.59 – 0.39]	-0.58 [-1.24 – 0.08]	-0.39 [-1.03 – 0.25]
Green Space Quality (Average)	-0.12 [-0.35 – 0.11]	0.58 [-0.59 – 1.75]	0.58 [-0.19 – 1.35]	0.30 [-0.46 – 1.74]
Health literacy (Average)	0.11 [-0.29 – 0.50]	-0.60 [-2.62 – 1.42]	-0.70 [-2.04 – 0.64]	0.46 [-0.83 – 1.74]
Mental Health				
PHQ-4 total	0.08 [-0.13 – 0.28]	0.06 [-1.01 – 1.13]	-0.16 [-0.89 – 0.56]	1.08** [0.40 – 1.76]
Stress Level	-0.23* [-0.44 – -0.02]	-0.09 [-1.17 – 0.98]	0.77* [0.06 – 1.48]	-1.01** [-1.70 – 0.32]
PTSD	-0.23 [-0.49 – 0.03]	0.89 [-1.21 – 1.39]	0.11 [-0.76 – 0.97]	-0.58 [-1.41 – 0.25]
Substance Abuse				
Binge Drinking Risk	0.90 [-1.75 – 3.54]	5.85 [-7.78 – 19.49]	3.80 [-5.20 – 12.80]	2.36 [-6.27 – 10.98]
Smoking risk	-2.12* [-4.04 – -0.21]	3.24 [-6.63 – 13.12]	1.91 [-4.61 – 8.43]	-5.49 [-11.73 – 0.75]
Smokless tobacco	0.10 [-3.42 – 3.62]	18.27* [0.12 – 36.43]	10.29 [-1.68 – 22.27]	1.84 [-9.61 – 13.30]
Constant	-0.40 [-3.92 – 3.13]	135*** [105 – 165]	97.4*** [77.5 – 117.3]	96.6*** [77.6 – 115.6]
Observations	177	177	175	174
R-squared	0.31	0.27	0.27	0.29

Note: 95% CI in brackets; *** p < 0.001, ** p < 0.01, * p < 0.05

RESULTS

Level of Integrated Care

To determine the overview of the integrated care level in Viet Nam, the median of each of the six domains of the PIP survey was reported and compared to the United States. In all of the six domains measured, Bach Mai Hospital scored significantly lower than the median from the United States. The domains Services (36%), Need (30%), and Workflow (27%) were the highest, and Integration (16%), Engagement (13%), and Workspace (6%) were the lowest (see **Figure 1**). In addition, we compared the PIP median scores for each domain between Viet Nam and the comparable PIP data collected from Thailand⁶⁰ (**Figure 2**). The Viet Nam scores were all lower than the Thailand scores. One possible reason for this is that Thailand has many community health workers and psychiatric nursing staff working in their clinics, and Viet Nam does not.

Clinician ratings of the prevalence of behavioral conditions and the need for a BHC

The provider survey ($n = 41$) results further showed the prevalence of mental health and health behaviors in Viet Nam and the need for BHC. The results found that the top five conditions that they want behavioral health assistance with are: a) mental health disorders (50%), b) chronic insomnia (40%), c) medication non-compliance (40%), d) chronic and terminal illnesses (40%), and e) emotional symptoms (31%). The Provider Survey mean for the prevalence of mental health symptoms was 2.53 and it was 2.81 for health behavior symptoms. The mean reported that the need for a BHC was 2.70 for mental health symptoms and 2.86 for health behavior symptoms on a 4-point Likert scale, indicating a moderate need. The statistical analysis showed there to be no significant differences between the mental health and health behavior subscales (see **Table 1**).

Patient Demographics and Health Risk Assessment

This study also collected data from the patients to present a systematic insight into integrated behavioral health care in Viet Nam. The majority of participants were over 50 years old (85%), and most were married (76%). Nearly half of the population was retired, about one-third were fully employed, and 10% were homemakers. Most participants (65%) had graduated from high school, with only 21% having college experience. The average number of persons per household was evenly distributed. Most people had health

insurance (97%), with only 3% being uninsured (see **Table 2**).

Table 3 shows the medical record biometrics and patient HRA descriptive results. The biometric data collected from the patient medical record showed elevated systolic and normal diastolic blood pressure for men and women and a mean BMI that falls into the obese category for men but normal weight for women. The results of the HRA for physical health items were mixed. Somatic symptoms and daytime sleepiness were in the low-risk range, but 60% of patients reported snoring. Physical activity was 176.7 minutes/week, above the target of 150 minutes/week. Weekly fast food fell into low risk, but fruit and vegetable consumption fell into high risk. Medication adherence was high (90%), and health literacy was poor. The green space ratings showed no risk for the time spent in green places, as well as the good reported access to and quality of the green spaces. The mental health measures showed no risk of depression/anxiety, a low risk of PTSD symptoms, and medium severity for stress. Binge drinking was 7% for men and 3% for women, smoking tobacco was 13% for men and 10% for women, and chewing tobacco was 3% for men and women.

Correlations among the Key Behavioral Conditions Variables

This study further explored the correlations among the key behavioral conditions variables of physical health, mental health, and substance use. The Pearson correlations showed there to be significant positive correlations between physical symptoms and all three mental health items (PHQ-4, PTSD, stress). Poor health literacy was associated with greater daytime sleepiness. Green space days were positively associated with sleep apnea, exercise, smokeless tobacco, and fast food and negatively associated with daytime sleepiness, fruit consumption, and health literacy. Green space quality was positively associated with physical activity. Binge drinking was positively associated with physical activity and tobacco smoking. Smokeless tobacco use was positively associated with fast food intake. Health literacy was positively associated with daytime sleepiness. There were significant positive correlations between most of the green space variables, between the mental health variables, and between smoking and smokeless tobacco (see **Table 4**).

Relationship Between HRA Behavioral Conditions and Biometric Health Risk Factors

The regression analysis of patient-reported demographic and HRA behavioral condition variables on

biometric health risks (BMI, SBP, DBP, WC) showed that the significant predictors of age were BMI, having health insurance and SBP and DBP (negative), being retired, and BMI and WC, and being unemployed and DBP. The HRA variables showed that the significant predictors for sleep apnea were BMI and WC, daily vegetables and WC (negative), green space days and BMI, depression and WC, stress and BMI (negative), DBP and WC (negative), smoking and BMI (negative), smokeless tobacco and SBP (See **Table 5**).

DISCUSSIONS AND IMPLICATIONS

The results of this study are consistent with the study hypotheses, namely that the level of integrated care services is low in Viet Nam compared to the United States, that the perceived need by providers for a Behavioral Health Consultant to assist in treatment is moderate, and that the self-reported HRA shows that patients reported elevated health risks in areas such as fruit and vegetable intake, stress, alcohol, tobacco use, and poor health literacy. The results of the biometrics show an elevated systolic blood pressure for men and BMI in the obese range for men and normal for women. Most of the HRA psychological variables (e.g., depression, anxiety) were not in the high-risk category, which was unexpected. Taken together, the results support the need for integrated behavioral healthcare services in Viet Nam.

The results of the PIP show that the level of behavioral healthcare integration is very low in Viet Nam compared to the United States and Thailand. This is consistent with the research that notes a lack of training in Viet Nam for the large physician and nursing workforce on integrated healthcare and the lack of primary care-based BHC workforces such as social workers or psychologists as has emerged in the United States⁴¹. The PIP subscales Integration, Engagement, and Workspace appear to reflect the lack of BHC's in primary care to assist physicians and nurses with services such as lifestyle medicine and behavioral interventions for psychiatric and substance use disorders⁴².

The results of the Provider Survey show that physicians and nurses recognize that lifestyle, psychiatric and substance use disorders are common in practice and that there is a need for BHC's to assist in team-based integrated healthcare. These findings indicate that healthcare providers could benefit from formal training in NCD prevention and management and integrated care interventions such as motivational interviewing and nutrition counseling, as well as the development of a new BHC workforce.

The results of the HRA showed that some of the expected lifestyle problems such as daily fruits and vegetables, tobacco use, binge drinking, stress, and snoring were moderate. The low health literacy scores show the need for improved education on hypertension risks and behavioral interventions. It was surprising that the mental health measures of depression, anxiety, and PTSD were in the moderate or low-risk categories, given the research showing that these problems are significant in Viet Nam^{28,32}. It is possible that the use of the PHQ-4, which is comprised of two items each from the full PHQ-9 for depression and GAD-7 for anxiety, resulted in the loss of sensitivity. The finding that physical symptoms were significantly correlated with the mental health variables is consistent with the research showing that emotional distress is expressed through physical symptoms in Asia⁶¹. The average number of days spent in green spaces (3) was low, yet satisfaction with access and quality was high. Green space days and quality was associated with less daytime sleepiness and increased physical activity, suggesting that prescribed increased time in green spaces⁵⁸ may be needed in Viet Nam. However, green space days are associated with fast food consumption, smokeless tobacco use, and lower fruit consumption, the opposite of the expected direction⁵⁸.

Medication adherence is very high, consistent with the evidence that medication as a first-line treatment of type 2 diabetes is limited without integrated health treatment for lifestyle and behavioral problems. In addition, the findings that males were obese indicates a need for lifestyle medicine interventions to improve nutrition and physical activity⁸.

Regression diagnostics including residual analysis, multicollinearity tests, the Ramsey test to determine omitted predictors, and the Breusch-Pagan / Cook-Weisberg test for heteroskedasticity were performed on all multivariate analyses regressions. The only diagnostic test that failed was the test for heteroskedasticity when using waist circumference as the dependent variable. Several transformations were attempted to normalize the data in a way that would correct the non-constant variance without success. There was no commonly seen pattern in the residuals to help the authors determine the appropriate transformation.

The regression results suggest that there are only a couple of consistent drivers based on the small sample size. Insurance status, sleep apnea, being retired, and stress levels were significant predictors in more than one model. The demographic variables age, health

insurance, being a retiree, or being unemployed predicted greater BMI, SBP, BMI and WC, and DBP, respectively, all consistent with the research on aging and employment on health status². Other significant predictors were sleep apnea for BMI and WC, vegetables and WC (negative), depression, and WC. However, the predictions of green space days with WC (negative) and stress with BMI (negative) were unexpected.

Limitations

There are several limitations to this study. First, the PIP, Provider Survey, and most HRA screening measures have not been validated in Viet Nam. The PIP and HRA measures have been validated in the US, while the Provider Survey has not. There are no widely used measures of integration or provider ratings on prevalence and the need for behavioral health problems in Viet Nam, and only a few HRA screening measures have been used and validated. A review of the questionnaires with the stakeholders in Viet Nam indicated that all of the measures had good face validity. However, some items on the PIP contained terms that were not familiar to the providers. Second, this study only investigated one hospital with a small sample size, therefore the findings cannot represent other cities of Viet Nam. Another limitation is that this is a descriptive study with one sample of data collected per site. Therefore, this study cannot address changes among physicians and patients over time in a longitudinal study. Lastly, this study was a convenience sample and did not include randomization or a more rigorous research design.

Recommendations for future study include an evaluation of the translation quality and validity, and a look at the 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 Viet Nam will be completed by this research team. This study will include focus groups of leaders and clinicians to review the measures to identify clear translations versus unclear ones, and what is in need of revision or replacement.

Implications for Behavioral Health

The PIP leadership survey, clinician Provider Survey, patient self-reported Health Risk Assessment, and medical record biometrics combined provide a complete estimate of the need for integrated behavioral health care in Viet Nam based on the key stakeholders of the leadership, clinicians, and patients. These

measures appear to be well-suited for applied research in resource-poor settings that require brief measures that produce actionable data. This study demonstrates the need for integrated behavioral health care in Viet Nam based on the generally low levels of integration.

ABBREVIATIONS

BHC: Behavioral health consultant, **BMI:** Body mass index, **BRFSS:** Behavioral Risk Factor Surveillance System, **DBP:** diastolic blood pressure, **GAD:** Generalized anxiety disorder, **HbA1c:** Hemoglobin A1C, **HRA:** Health risk assessment, **MOHR:** My Own Health Report, **NCDs:** Noncommunicable diseases, **PHQ:** Patient Health Questionnaire, **PIP:** Practice Integration Profile, **PTSD:** Post-traumatic stress disorder, **SBP:** Systolic blood pressure, **SSS:** Somatic Symptom Scale, **USAID:** United States Agency for International Development, **VAS:** visual analog scale, **WC:** waist circumference

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AUTHOR'S CONTRIBUTIONS

S.W., J.R. and R.O. contributed to the conceptualization and design of the study, analysis and interpretation of data. C.C., A.S., T.V.D., T.M.B., T.H.G.N., T.L.A.N., T.T.H.P. and T.T.H.P. helped data collection. S.W., J.R. and R.O. were for drafting the article and revising the article critically for important intellectual content. All authors read and approved the final manuscript.

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AVAILABILITY OF DATA AND MATERIALS

Data and materials used and/or analyzed during the current study are available from the corresponding author on reasonable request.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This study was conducted in accordance with the amended Declaration of Helsinki. The institutional review board approved the study, and all participants provided written informed consent.

CONSENT FOR PUBLICATION

Not applicable.

COMPETING INTERESTS

The authors declare that they have no competing interests.

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