

Evaluation of Health Professional Training on a Large-Scale Implementation of Chronic Care Model in Primary Care Settings of a Middle-Income Country

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ABSTRACT

Background: The evidence on the effects of the Chronic Care Model (CCM) intervention in low- to middle- income countries is limited. A recent policy initiative in Thailand to improve care for patients with non-communicable disease focuses on strengthening primary care through the allocation of family medicine physician and multidisciplinary primary care training and allocation failed to demonstrate any changes in knowledge and skills of the trainees.

Aim: Our study aims to examine the effects of provider training and local health systems settings on provider perception of implementing CCM for patients with diabetes or hypertension in Thailand.

Methods: We conducted a cross-sectional survey of 1,064 multi-professional providers in 128 primary care units in large and small municipalities from 11 provinces in Thailand using a self-administered questionnaire modified from the Assessment of Chronic Illness Care (ACIC) form. Responses fall within four descriptive levels D, C, B, A of implementation ranging from D "little or none" to A "fully implemented" intervention. Generalized linear models were employed to compare provider perception of implementing CCM between trained pilot PCUs, pilot PCUs, ordinary PCUs, and NCD clinics.

Results: Generalized linear models depicted an independent association between every CCM component and facility type with respondents of trained pilot PCU reporting the highest Estimated Marginal Mean (EMM) scores ($p < 0.001$). Statistically significant differences in the scores between health facilities in small and large municipalities were found in almost all components ($p < 0.01$).

Conclusion: Policymakers might find the training approach promising in context with extensive universal healthcare coverage and relatively strong healthcare infrastructure like Thailand. In addition, modified ACIC in our study might be useful to assess and monitor the progress of the training in primary care settings. Further studies are needed to ascertain the effectiveness of the training using patient assessment and outcomes as indicators.

Keywords: Primary care; Chronic care model; Training effect; Physician; Hypertension

Introduction

Chronic Non-Communicable Diseases (NCD) are the major health burden globally and disproportionately affect Low-and Middle-Income Countries (LMICs) [1]. A recent systematic review found that Self-Management Support is the most frequent Chronic Care Model (CCM) intervention that is associated with statistically significant improvements in patient-level outcomes, predominately for

diabetes and hypertension [2]. The CCM includes developing an organizational culture of quality and safety, support for self-management, planned interactions with the team, guidelines and provider education, follow-up care, and community linkages [3]. It is one of the most widely used models of provision of chronic care in primary care settings [4]. However, most studies on the organization of services to deliver quality chronic care are from high-income countries,

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and frameworks such as the CCM may not be directly applicable to LMICs [5].

In Thailand, some achievement in diabetic care at national scale was demonstrated by Kaewput et al. based on analysis of data sets from a nationwide survey conducted annually from 2010 to 2015 to evaluate the status of medical care in Type-2-Diabetic (T2DM) patients receiving care from public hospitals and clinics contracted to the largest public health insurance program [6]. The study, involving a total of 54,295 elderly T2DM patients, revealed mixed results. On one hand, it observed an increasing trend in the achievement of BP control and the use of antiplatelet medications (p for trend <0.01). Hospital admissions due to dysglycemia decreased over the study period (p for trend <0.001). On the other hand, there was a decreasing trend in the achievement of HbA1c and LDL-C control among elderly T2DM patients (p for trend <0.001).

Apart from focusing exclusively on those conventional targets, evidence suggests achieving generic dichotomous targets (such as an HbA1c level $<7\%$) is increasingly less relevant in contemporary practice [7]. Instead, individualized, patient-centered goals are strongly emphasized [8]. Evidence from a Randomized Controlled Trial (RCT) testing a multicomponent Quality-Improvement (QI) strategy in specialist settings in urban South Asia clearly showed improvement in patient-centered outcomes (Health-Related Quality of Life (HRQL), and treatment satisfaction) in addition to conventional outcomes (HbA1c, BP, LDLc, etc.) over 2.5 years [9]. The multi-component QI strategy comprises non-physician care coordinators and decision-support electronic health records. In agreement with earlier studies in developed country settings [10,11], the RCT study strongly supports the notions that Quality Improvement (QI) interventions directed at patients (for example, counseling), providers (for example, training), and health systems (for example, personal health record) can improve adherence, risk factor control, and patient satisfaction. Whether similar effects would be observed in primary care settings remains to be seen.

To improve care for patients with chronic diseases, a recent policy initiative in Thailand

focuses on strengthening primary care with a two-pronged strategy:

- Allocation of a physician with family medicine training and multidisciplinary health professional as a team to primary care settings at subdistrict of a well-defined population of approximately 10,000
- Training of the team to deliver healthcare based on the concept of CCM. In effect, several training programs had taken place to empower primary care practitioners and leaders in Thailand to deliver care for patients with multimorbidity over the past decades [12]

However, none has demonstrated any changes in perception, knowledge, or skills of the trainees pertinent to such training. In high-income countries, several reviews of literature examined the effectiveness and implementation of healthcare team training with mixed and varying results among types of intervention and healthcare settings [13].

Our study aims to examine the effects of provider training and local health systems settings on provider perception of implementing CCM for patients with diabetes or hypertension through a cross-sectional survey.

Material and Methods

■ Ethical approval

The present study was approved by the Institutional Ethical Review Board of the Faculty of Medicine, Ramathibodi Hospital (ID: COA. MURA2019/1018).

■ Policy interventions

In response to a mandate of the current Constitution of Thailand (2017), the Ministry of Public Health (MOPH) adopted the patient-centeredness approach as a strategy to reform primary care. The strategy comprises

- Patient registry and engagement
- Individual care plan
- Personal health record
- Health literacy and self-management support, and
- Care continuity and coordination

Initially, 21 Primary Care Units (PCU) in 13

large (>10,000 residents) and 7 small (under 10,000 residents) municipalities in 11 provinces were chosen voluntarily to pilot test the strategy during the first year (2019) of implementation. From each PCU, the head and 2-3 clinicians attended two consecutive training workshops (1 and a half days each). The first session started with a didactic lecture addressing the concepts of the strategy and tools for translating the concepts into practices i.e., system thinking and design thinking [14,15]. The second session was two small group discussions about experiences and ideas related to the translation of the knowledge tailored to specific settings. Reading materials focusing on WHO's Integrated People-Centered Health Service (IPCHS) and CCM were shared with the participants [16,17]. The second workshop followed one month after the first to explore the feasibility and barriers of implementing the strategy based on the participants' try-outs. Follow up support and encouragement throughout the study period were carried out by two implementation support practitioners. They paid a visit to each team of the participants aiming at activating implementation-relevant knowledge, skills, and attitudes, and to operationalize and apply these in the context of the participants. In doing so, they aimed to trigger both relational and behavioral outcomes. For instance, the application of the concept of risk stratification of the patients was encouraged in order to customized clinical transactions according to the needs of specific patients instead of treating all patients similarly which usually results in superficial provider-patient dialogue and refilling medications over a period of just 3-5 minutes for each patient.

In parallel to the training workshop, MOPH distributed a physician trained in family medicine and new medical equipment (such as ultrasonography, ECG monitor) to each of 50 pilot PCU (those 21 PCUs included). The physician is assigned to provide full-time clinical services of 3-5 days a week to the pilot PCU in addition to outpatient care services in the referral hospital of the PCU. In contrast, patients seeking care at ordinary PCUs have only one day per week to receive care from a physician with or without training in family medicine.

■ Population and samples

We conducted a cross-sectional survey of 1,064 providers in Primary Care Units (PCU) in large

and small municipalities from 11 provinces (76 in total) in Thailand. Each of the 21 PCUs, dubbed trained pilot PCUs, was matched to a pilot PCU and an ordinary PCU in the same district. In addition, in each district, NCD clinic of the referral hospital caring for patients with diabetes or hypertension was also matched to trained pilot PCU since complicated patients from PCUs should be referred to the NCD clinic. All providers caring for patients with diabetes or hypertension in each of these facilities were asked to participate in the survey.

■ Data collection

A self-administered questionnaire was distributed by hands to 1,064 multi-professional providers in the sampled facilities (N=128) by trained fieldworkers (nurse instructors) who described the objectives of the survey and responded to questions from the survey participants related to the questionnaire. For each PCU and NCD clinic, all the providers including the head were invited to participate by the fieldworker. It should be noted that all members of the team (including the head) were involved in patient care due to a relatively heavy workload.

The questionnaire was adapted from the Thai version of the Assessment of Chronic Illness Care (ACIC) developed by the MacColl Institute for Healthcare Innovation in the US [18]. ACIC has been tested in primary care settings of many developed countries such as the Netherlands, Switzerland, and Germany [19,20]. The Thai ACIC questionnaire was tested in primary care settings similar to those in this report with Cronbach's alpha coefficients of 0.846 to 0.972 in each aspect of ACIC [21]. After reviewing the contents of the original ACIC and the Thai version through consultations with field experts in primary care in the study setting, we ended up with the revised questionnaire. There were only 3 sections in the questionnaire: 1) personal information of the respondents; 2) perceptions of the implementation of the strategy, and 3) perceptions of organizational support systems for the implementation. **Table 1** provided details of the modified second and third sections.

Responses fall within four descriptive levels D, C, B, A of implementation ranging from D "little or none" to A "fully implemented" intervention. Within each of the four levels, respondents choose one of three ratings of the

Table 1: Modified ACIC questionnaire.

CCM component	Subcomponent	Rating scale			
		D	C	B	A
	Subscale scoring	0-2	3-5	6-8	9-11
Organization of the healthcare delivery system (part 1)	Improvement strategy for chronic illness care	Is ad hoc and not organized or supported consistently.	Utilizes ad hoc approaches for targeted problems as they emerge.	Utilizes a proven improvement strategy for targeted problems.	Includes a proven improvement strategy and uses it proactively in meeting organizational goals.
Community linkages (part 2)	Partnerships with community organizations	Do not exist.	Are being considered but have not yet been implemented.	Are formed to develop support programs and policies.	Are actively sought to develop formal supportive programs and policies across the entire system.
	Regional health plans	Do not coordinate chronic illness guidelines, measures or care resources at the practice level.	Would consider some degree of coordination of guidelines, measures or care resources at the practice level but have not yet implemented changes.	Currently coordinate chronic illness guidelines, measures, or care resources in one or two chronic illness areas.	Currently coordinate chronic illness guidelines, measures, and resources at the practice level for most chronic illnesses.
Self-management support (part 3a)	Self-management support	Is limited to the distribution of information (pamphlets, booklets).	Is available by referral to self-management classes or educators.	Is provided by trained clinical educators who are designated to do self-management support, affiliated with each practice, and see patients on referral.	Is provided by clinical educators affiliated with each practice, trained in patient empowerment and problem-solving methodologies, and sees most patients with chronic illness.
	Addressing concerns of patients and families	Is not consistently done.	Is provided for specific patients and families through referral.	Is encouraged, and peer support, groups, and mentoring programs are available.	Is an integral part of care and includes systematic assessment and routine involvement in peer support, groups, or mentoring programs.
	Effective behavior change interventions and peer support	Are not available.	Are limited to the distribution of pamphlets, booklets, or other written information.	Are available only by referral to specialized centers staffed by trained personnel.	Are readily available and an integral part of routine care.
Decision support (part 3b)	Involvement of specialists in improving primary care	Is primarily through traditional referral.	Is achieved through specialist leadership to enhance the capacity of the overall system to routinely implement guidelines.	Includes specialist leadership and designated specialists who provide primary care team training.	Includes specialist leadership and specialist involvement in improving the care of primary care patients.

	Provider education for chronic illness care	Is provided sporadically.	Is provided systematically through traditional methods.	Is provided using optimal methods (e.g. academic detailing).	Includes training all practice teams in chronic illness care methods such as population-based management, and self-management support.
	Informing patients about guidelines	Is not done.	Happens on request or through system publications.	Is done through specific patient education materials for each guideline.	Includes specific materials developed for patients that describe their role in achieving guideline adherence.
Delivery system design (part 3c)	Planned visits for chronic illness care	Are not used.	Are occasionally used for complicated patients.	Are an option for interested patients.	Are used for all patients and include regular assessment, preventive interventions, and attention to self-management support.
	Continuity of care	Is not a priority.	Depends on written communication between primary care providers and specialists, case managers or disease management companies	Between primary care providers and specialists and other relevant providers is a priority but not implemented systematically	Is a high priority and all chronic disease interventions include active coordination between primary care, specialists and other relevant groups
Clinical information systems (part 3d)	Information about relevant subgroups of patients needing services	Is not available.	Can only be obtained with special efforts or additional programming.	Can be obtained upon request but is not routinely available.	Is provided routinely to providers to help them deliver planned care.
	Patient treatment plans	Are not expected.	Are achieved through a standardized approach.	Are established collaboratively and include self-management as well as clinical goals.	Are established collaborative and include self-management as well as clinical management. Follow-up occurs and guides care at every point of service.

degree to which that description applies. The result is a 0-11 scale, with categories within this defined as follows: 0-2 (little or no support for chronic illness care); 3-5 (basic or intermediate support for chronic illness care); 6-8 (advanced support); and 9-11 (optimal, or comprehensive, integrated care for chronic illness). Subscale scores for the six areas are derived by summing the response. Bonomi et al. presented all six ACIC subscale scores to be responsive to health care quality-improvement efforts [22]. Each team of respondents was encouraged to consult each other in the scoring, hopefully, to reach a consensus since ACIC was developed to help disease-management teams identify areas for

improvement in chronic illness care and evaluate the level and nature of improvements made in their system [22-24]. Using the data from 1,064 respondents, we estimated Cronbach's alpha of 0.92-0.93 in each aspect ($p < 0.05$) to indicate the reliability of the questionnaire.

■ Data analysis

All statistical analyses were performed using Statistical Packages for Social Science (SPSS) version 18.0 (IBM Corporation, New York, NY, USA).

To adjust for over or under-sampling, data were weighted to enable the representation of the target population regarding the facilities.

Scores for subcomponents of Patient-Centered Care (PCC) were considered outcome variables. Professional types were regrouped into a Registered Nurse (RN), Public Health Workers (PHW), physicians, and non-physicians. To test the influence of urbanization on the outcomes, small or large municipality was applied to classify the location of the facilities where the respondents were working. Differences in the outcome variables between the facility type (trained pilot PCU, pilot PCU, ordinary PCU, NCD clinic), professional type, sex, and location of facilities were tested for statistical significance using ANOVA. Pearson's correlation analysis was applied to test the association between the outcomes and age or duration of team membership.

The Estimated Marginal Means (EMM) and SEM of the outcomes in different predictor groups were calculated using the general linear model function. Variables were included as covariates if they met either of the following criteria: substantially modified the predictor-outcome association ($\geq 10\%$) or significantly predicted the outcome.

Results

The majority of the respondents were female (82.9%) with a mean age of 42 years (**Table 2**). RN and PHW constituted over 75% of the professionals. They reported working in large municipalities at a higher proportion (55.6%) than in small municipalities (44.4%). The respondents worked in ordinary PCU at the highest proportion (32.8%).

Univariate analysis (weighted ANOVA) revealed a statistically significant association between facility type and health professional responses to all CCM components (**Table 3**). Similarly, the level of the municipality was also significantly associated with health professional responses to almost all CCM components except the involvement of specialists in improving primary care ($p=0.354$). In contrast, sex and professional type were significantly associated with the responses in a few components. Females gave higher scores to the implementation of informing patients about guidelines than males did ($p=0.041$). But males gave higher scores to the implementation of provider education for chronic illness care than females ($p=0.031$). Physicians gave the highest scores than other

Table 2: Characteristics of respondents at a personal level and local health systems settings (n=1,064).

Characteristics of Respondents		
Personal level	n	%
Sex, female	882	82.9
Age, mean, SD (years)	41.56, 10.38	
Duration of team membership, mean, SD (years)	3.60, 4.13	
Professional type		
Registered Nurse (RN)	442	41.5
Public Health Worker (PHW)	380	35.7
Physician	58	5.5
Pharmacist	48	4.5
Dental hygienist	35	3.3
Traditional health practitioner	32	3.0
Physiotherapist	28	2.6
Nutritionist	14	1.3
Head of PCU	14	1.3
Dentist	8	0.8
Laboratory technician	3	0.3
Psychologist	2	0.2
Location of the facilities		
Small municipality (less than 10,000 residents)	433	44.4
Large municipality (10,000 residents or more)	542	55.6
Facility type		
Trained pilot PCU	291	28.31
Pilot PCU	233	22.67
NCD clinic	165	16.05
Ordinary PCU	339	32.98

Table 3: Univariate analysis of the association between predictors and EMM scores (Mean (SD)) of professional responses in terms of implementation of each CCM component.

CCM components	Sex		Professional type				Municipality		Facility type				Age	Duration of team membership
	Female	male	Physician	Non-physician	PHW	RN	small	large	Trained pilot PCU	Pilot PCU	NCD clinic	OPCU		
	850	178	58	165	380	425	433	542	291	233	165	339		
Part 1: Organization of the healthcare delivery system														
Improvement strategy for chronic illness care	6.34 (5.98)	6.36 (4.75)	6.37 (5.74)	6.16 (6.44)	6.41 (5.17)	6.35 (6.04)	6.09 (5.32)	6.45 (6.1)*	7.01 (5.13)	6.52 (6.35)	5.94 (6.3)	5.54 (4.69)**	-0.07*	0.08*
Part 2: Community linkages														
Partnerships with community organizations	6.12 (5.6)	6.06 (4.91)	6.1 (5.33)	5.99 (6.22)	6.2 (5.18)	6.1 (5.47)	5.86 (5.25)	6.3 (5.58)**	6.56 (5.44)	6.07 (5.97)	6.07 (5.61)	5.58 (4.7)**	-0.04	0.08*
Regional health plans	5.15 (6.73)	5.22 (6.06)	5.03 (7.16)	5.45 (7.16)	5.4 (6.1)	4.87 (6.65)**	4.71 (5.71)	5.53 (6.97)**	5.88 (6.7)	4.71 (6.83)	5 (7.39)	4.75 (5.26)**	-0.11**	-0.01
Part 3a: Self-management support														
Self-management support	5.16 (5.86)	5.74 (5.48)	6.54 (6.61)	5.96 (6.48)	6.17 (5.35)	6.21 (5.73)*	4.88 (5.59)	5.41 (5.89)**	5.7 (5.99)	5.02 (5.89)	4.99 (6.25)	4.78 (4.92)**	-0.09*	-0.01
Addressing concerns of patients and families	6.76 (5.6)	6.65 (4.74)	6.69 (7)	6.77 (5.99)	6.68 (4.65)	6.8 (5.46)	6.44 (4.97)	6.89 (5.7)**	7.12 (5.25)	6.89 (6.61)	6.7 (5.57)	6.11 (4.16)	-0.07*	0.02
Effective behavior change interventions and peer support	5.71 (5.96)	6.01 (5.22)	5.54 (6.36)	5.88 (6.67)	5.76 (5.32)	5.66 (5.86)	5.4 (5.18)	5.95 (6.15)**	6.22 (6.06)	5.58 (6.27)	5.87 (5.71)	5.06 (4.83)**	-0.07*	0.03
Part 3b: Decision support														
Involvement of specialists in improving primary care	6.49 (6.04)	6.47 (4.72)	6.52 (5.55)	6.43 (6.36)	6.47 (5.17)	6.52 (6.21)	6.37 (5.53)	6.48 (6.05)	7.06 (5.37)	6.63 (6.21)	6.23 (6.79)	5.75 (4.68)**	-0.11**	0.07*
Provider education for chronic illness care	5.86 (7.59)	6.29 (5.32)*	5.7 (7.91)	5.73 (7.97)	6.19 (5.83)	5.83 (7.98)	5.62 (6.91)	5.99 (7.4)*	6.77 (6.21)	5.95 (8.04)	5.34 (8.38)	5.18 (5.99)**	-0.09*	-0.01
Informing patients about guidelines	6.24 (7.06)	5.84 (6.27)*	6.54 (6.27)	5.96 (7.63)	6.17 (6.39)	6.21 (7.21)	5.64 (6.91)	6.59 (6.68)**	6.72 (6.69)	6.28 (7.05)	5.89 (8.51)	5.54 (5.68)**	-0.01	0.03
Part 3c: Delivery system design														
Planned visits for chronic illness care	5.55 (6.86)	5.57 (6.39)	5.61 (7.62)	5.83 (7.26)	5.58 (6.07)	5.4 (7.04)	5.1 (6.21)	5.9 (6.89)**	6.39 (6.34)	5.16 (7.09)	5.41 (7.85)	4.91 (5.43)**	0.23**	-0.01
Continuity of care	5.74 (6.43)	5.63 (5.68)	6.61 (5.89)	5.75 (6.99)	5.75 (5.82)	5.63 (6.43)*	5.48 (5.78)	6 (6.61)**	6.34 (6.17)	5.84 (6.83)	5.71 (6.78)	4.89 (5.03)**	-0.05	0.06
Part 3d: Clinical information systems														
Information about relevant subgroups of patients needing services	6.65 (5.9)	6.7 (5.49)	6.98 (5.89)	6.48 (6.23)	6.51 (5.32)	6.79 (6.05)*	6.32 (6.01)	6.94 (5.57)**	7.11 (5.44)	6.79 (6.32)	6.44 (6.76)	6.06 (4.8)**	-0.045	0.11**
Note: ANOVA p-value for sex, professional type, level of municipality, facility type; Pearson correlation p-value for age and duration of PCU membership; *p<0.05 (two-tailed); **p<0.001 (two-tailed)														

professionals in response to the implementation of information about relevant subgroups of patients needing services (p=0.046), self-

management support (p=0.014), and continuity of care (p=0.002). Non-physician responded with the highest scores to the question about

the implementation of the regional health plans ($p=0.001$). Finally, the Pearson correlation coefficient revealed a statistically significant association between age and the personnel responses to the implementation of several components. Whereas the duration of PCU team membership was linked to fewer components

Using weighted generalized linear models with age and duration of PCU team membership as covariates in the models, we found facility type significantly affected responses to all components of CCM measures ($p<0.001$) in an order of highest to lowest scores as follows (Table 4);

trained pilot PCU, NCD clinics, Pilot PCU and ordinary PCU. Sex, professional types, and level of municipality showed inconsistent effects on the responses across the components. Sex significantly affected responses to the implementation of informing patients about guidelines with higher scores for females. Professional types significantly affected responses to the implementation of information about relevant subgroups of patients needing services with the highest scores for RN. PHW responded with the highest score to implementation of self-management support, improvement strategy

Table 4: Weighted generalized linear models for predictors and EMM scores (SEM) of professional responses to the implementation of each CCM component adjusted for age, sex, and duration of team membership.

CCM components	Facility type				Municipality		Professional type			
	Trained pilot PCU	Pilot PCU	NCD clinic	OPCU	Small	large	Physician	Non-physician	PHW	RN
Part 1: Organization of the healthcare delivery system										
Improvement strategy for chronic illness care	6.89 (0.12)	6.4 (0.16)	5.9 (0.17)	5.33 (0.14)**	6.16 (0.1)	6.1 (0.13)	5.95 (0.24)	5.94 (0.17)	6.4 (0.11)	6.23 (0.13)*
Part 2: Community linkages										
Partnerships with community organizations	6.35 (0.12)	5.9 (0.15)	5.96 (0.16)	5.33 (0.14)**	6.01 (0.09)	5.76 (0.14)*	5.78 (0.21)	5.73 (0.17)	6.14 (0.11)	5.9 (0.13)
Regional health plans	5.73 (0.15)	4.64 (0.17)	4.96 (0.2)	4.54 (0.16)**	4.98 (0.12)	4.95 (0.16)	4.65 (0.3)	5.16 (0.2)	5.3 (0.13)	4.76 (0.15)**
Part 3a: Self-management support										
Self-management support	5.53 (0.14)	4.86 (0.15)	4.92 (0.18)	4.41 (0.15)**	5.02 (0.11)	4.84 (0.14)	4.36 (0.28)	4.93 (0.18)	5.37 (0.12)	5.06 (0.13)**
Addressing concerns of patients and families	7.03 (0.13)	6.81 (0.17)	6.55 (0.17)	5.99 (0.14)**	6.63 (0.11)	6.56 (0.14)	6.45 (0.3)	6.57 (0.17)	6.66 (0.11)	6.69 (0.13)
3a: Effective behavior change interventions and peer support	6.05 (0.14)	5.39 (0.16)	5.72 (0.17)	4.84 (0.15)**	5.61 (0.1)	5.4 (0.15)	5.15 (0.27)	5.55 (0.19)	5.77 (0.12)	5.54 (0.13)
Part 3b: Decision support										
Involvement of specialists in improving primary care	6.94 (0.12)	6.56 (0.15)	6.18 (0.18)	5.58 (0.14)**	6.32 (0.1)	6.3 (0.13)	6.18 (0.24)	6.24 (0.17)	6.43 (0.11)	6.4 (0.13)
Provider Education for chronic illness care	6.64 (.142)	5.92 (.194)	5.34 (.222)	4.91 (.183)**	5.79 (0.12)	5.61 (0.17)	5.25 (0.31)	5.58 (0.21)	6.1 (0.13)	5.88 (0.16)*
Informing patients about guidelines	6.43 (0.15)	5.99 (0.18)	5.69 (0.22)	5.24 (0.18)**	5.98 (0.12)	5.69 (0.17)*	5.95 (0.29)	5.54 (0.21)	5.98 (0.14)	5.87 (0.16)
Delivery system design										
Planned visits for chronic illness care	6.28 (0.15)	5.14 (0.19)	5.38 (0.22)	4.8 (0.17)**	5.38 (0.12)	5.42 (0.17)	5.21 (0.32)	5.55 (0.2)	5.53 (0.14)	5.31 (0.15)
Continuity of care	6.29 (0.13)	5.94 (0.17)	5.81 (0.19)	4.95 (0.15)**	5.96 (0.11)	5.54 (0.15)**	6.22 (0.25)	5.46 (0.19)	5.76 (0.12)	5.56 (0.14)*
Clinical information systems										
Information about relevant subgroups of patients needing services	6.94 (0.14)	6.73 (0.16)	6.37 (0.19)	6.06 (0.16)**	6.76 (0.11)	6.29 (0.16)**	6.65 (0.27)	6.28 (0.19)	6.45 (0.12)	6.71 (0.14)*
Patient treatment plans	6.31 (0.13)	5.47 (0.19)	5.69 (0.19)	4.87 (0.15)**	5.62 (0.12)	5.55 (0.15)	5.59 (0.3)	5.63 (0.18)	5.59 (0.13)	5.53 (0.14)

* $p<0.05$ (two-tailed); ** $p<0.001$ (two-tailed)

for chronic illness care, and provider education for chronic illness care. Regarding the effects of the level of municipality, health professionals in smaller municipality gave a higher score for implementation of information about relevant subgroups of patients needing services, informing patients about guidelines, continuity of care, and partnerships with community organizations.

Discussion

In this study, we reported evidence for responses of the interprofessional team of primary care providers to a policy initiative aimed at promoting CCM practices in different settings hence enabled across group comparisons. Generalized linear models depicted an independent association between every CCM component and facility type with respondents of trained pilot PCU reporting the highest EMM scores (Table 4). This indicates the possible effects of the training on providers' reporting implementation of CCM strategy. Earlier systematic reviews of randomized trials support our findings of the possible training effects. Based on the systematic review, Dwamena F et al. concluded that interventions to promote PCC within clinical consultations are effective across studies in transferring patient-centered skills to providers [25]. Incongruent with the training described in our study, the systematic review also found short-term training (less than 10 hours) is as successful as longer training [25].

If the training effect is possible, it seems like the training affects most on the perception of freedom to address concerns of patients and families (Table 4). Given the varying degree of complexity among patients with chronic conditions, care management intensity should be tailored to reflect on the complex needs. A major challenge for this is the time constraints which is the most often cited barrier for implementing shared decision-making in clinical practice across many different cultural and organizational contexts [26]. In this regard, the team should be encouraged to use their discretionary judgment. This was, actually, a component of the training to prepare the (trained pilot PCU) team at the workshops and the follow-up visits. Apart from knowledge and skills relevant to care management, leadership support is equally important for the team to translate such knowledge and skills into actions [27]. With a realization of this leadership

contribution, heads of trained pilot PCUs were included in the training.

Apart from exploring the training effects, our study also fills the gap of knowledge identified by earlier studies i.e., the influence of organizational and inter-organizational factors on CCM practices of providers. Our study demonstrated providers of trained pilot PCU reported the highest scores for every component pertaining to organization support systems: involvement of specialists in improving primary care, improvement strategy for chronic illness care, provider education for chronic illness care, and addressing concerns of patients and families. Again, these findings might be attributed to the effects of having heads of trained pilot PCUs as a trainee. Furthermore, the possible training effects on the component of organization support systems might be attributed to the inclusion of system thinking and design thinking into the training workshops. Currently, there is a paucity of evidence supporting the effectiveness of design thinking on enhancing innovation, efficiency, and effectiveness by increasing focus on the patient and provider needs [28,29].

In general, providers working in a small municipality usually face lower workload due to smaller populations as compared to those working in a large municipality. This notion helps explain our findings (Table 4) which depict reports of bigger scores from respondents in small municipality than those from respondents in a large municipality in almost every CCM component with a statistical significance: information about relevant subgroups of patients needing services, continuity of care, and partnerships with community organizations. In effect, the literature indicates that health workers are more likely to fall into traditional hierarchical practice behavior when there is a high workload.

Score differences across professional types were found to be statistically significant for many subcomponents such as regional health plans, information about relevant subgroups of patients needing services, continuity of care, etc. It is noteworthy that higher scores came from RN or PHW rather than physicians and non-physicians. To understand this manifestation, there is a need to realize that: a) under the MOPH systems the latter two groups are more likely affiliated to hospitals hosting the NCD clinics while RN and PHW to primary care units; b) the ACIC

tools was designed to capture a team practice instead of individual practice. In this regard, RN and PHW with a stronger sense of a PCU team member would be more likely to respond with a higher score than physicians and non-physicians.

Conclusion

Assessing providers' perception, our study fills the gaps of knowledge related to large-scale implementation of CCM in primary care settings of middle-income countries in terms of possible training effects on health professionals as well as varying responses to CCM components across professional type and size of the municipality. Policymakers might find the training approach promising in context with extensive universal healthcare coverage and relatively strong healthcare infrastructure. In addition, modified ACIC in our study might be useful to assess and monitor the progress of the training in primary care settings. Nonetheless, further studies are needed to ascertain the effectiveness of the training using patient assessment and outcomes as indicators.

Limitations

Our study has several limitations. First, we relied

on self-report, and teams likely interpreted their performances differently. We attempted to minimize these differences through group discussion of each result. It is possible that team members did not reach consensus in determining their survey responses, allowing more assertive team members to dominate decisions. We did not take into account patient assessment of chronic care and patient outcomes. However, using modified ACIC to compare patient and provider assessment, Carryer J et al. reported a relatively high agreement between patients and providers regarding the level of self-management support received and provided. Finally, we could not compare the characteristics of the respondents with those of the target population due to the unavailability of the data. Hence representativeness of the findings might not be sufficiently addressed despite the attempt to adjust for over or under-sampling by data weighting.

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