

Development and psychometric evaluation of the Primary Health Care Engagement (PHCE) Scale: a pilot survey of rural and remote nurses

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Aim: To report the development and psychometric evaluation of a scale to measure rural and remote (rural/remote) nurses' perceptions of the engagement of their workplaces in key dimensions of primary health care (PHC). **Background:** Amidst ongoing PHC reforms, a comprehensive instrument is needed to evaluate the degree to which rural/remote health care settings are involved in the key dimensions that characterize PHC delivery, particularly from the perspective of professionals delivering care. **Methods:** This study followed a three-phase process of instrument development and psychometric evaluation. A literature review and expert consultation informed instrument development in the first phase, followed by an iterative process of content evaluation in the second phase. In the final phase, a pilot survey was undertaken and item discrimination analysis employed to evaluate the internal consistency reliability of each subscale in the preliminary 60-item Primary Health Care Engagement (PHCE) Scale. The 60-item scale was subsequently refined to a 40-item instrument. **Findings:** The pilot survey sample included 89 nurses in current practice who had experience in rural/remote practice settings. Participants completed either a web-based or paper survey from September to December, 2013. Following item discrimination analysis, the 60-item instrument was refined to a 40-item PHCE Scale consisting of 10 subscales, each including three to five items. Alpha estimates of the 10 refined subscales ranged from 0.61 to 0.83, with seven of the subscales demonstrating acceptable reliability ($\alpha \geq 0.70$). The refined 40-item instrument exhibited good internal consistency reliability ($\alpha = 0.91$). The 40-item PHCE Scale may be considered for use in future studies regardless of locale, to measure the extent to which health care professionals perceive their workplaces to be engaged in key dimensions of PHC.

Key words: instrument development; nurses; primary health care; psychometric evaluation; rural nursing; survey

*Received 9 August 2014; revised 2 February 2015; accepted 15 February 2015;
first published online 19 March 2015*

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Introduction

The central premise of health equity that propelled the primary health care (PHC) movement initiated by the Declaration of Alma-Ata has resulted in health system reforms across many countries in the last few decades [World Health Organization (WHO), 2008]. The WHO proposed four key social values underpinning PHC, namely health equity, people-centred care, reliable health authorities, and promotion and protection of health within communities (WHO, 2008).

‘Primary health care’ encompasses delivery of ‘basic medical and curative care at the first level’, that is, ‘primary care’, and further includes activities related to health promotion, illness prevention, and determinants of health (eg, social, behavioural, and environmental; Canadian Nurses Association, 2005). Although primary care and PHC are often used to refer to the same concept, PHC is a holistic approach that involves multiple disciplines focused on the numerous factors associated with health, whereas primary care focuses mainly on basic medical and health maintenance services (Saskatchewan Ministry of Health, 2002). The Canadian Institutes of Health Research, Canada’s federal health research funding agency, recently introduced the term ‘community-based primary health care’ to refer to a continuum from primary prevention and health promotion to home care and palliative care, delivered in a range of locales [Canadian Institutes of Health Research (CIHR), 2014]. Interprofessional and interdisciplinary in nature, community-based PHC is coordinated across settings (eg, schools, homes, clinics, workplaces) and health care professionals (eg, nurses, pharmacists, social workers, physicians). This conceptualization of community-based PHC guided the present study.

In rural/remote areas of Canada and elsewhere, PHC reform involves introducing innovations in the organization of health service delivery to address geographic inequities and meet population health needs (eg, health promotion, chronic disease management; Banner *et al.*, 2010). Although rural–urban differences vary by country, rural communities worldwide generally have poorer accessibility to health care services and resources than urban communities (Farmer *et al.*, 2012). Rural Canadians also typically exhibit poorer health outcomes than their urban counterparts (DesMueles *et al.*, 2006;

Williams and Kulig, 2011; White, 2013), a situation partially rooted in inequities in social determinants of health including sociodemographics (eg, lower income and education), lifestyle (eg, higher rates of smoking and obesity, poorer dietary practices, lower physical activity levels), and geography (eg, degree of rurality) (DesMueles *et al.*, 2006; White, 2013). Rural residents thus require additional time, travel, and finances to meet their health care needs (Grzybowski and Kornelsen, 2013). Internationally, rural/remote communities are becoming hubs of innovation in PHC delivery to address these issues (Wakerman and Humphreys, 2011), encouraging the growth and integration of services across acute care and community sectors, with accompanying advanced and expanded practice roles for rural/remote nurses, paramedics, and other health professionals providing PHC services (Mitton *et al.*, 2011).

Nurses fill a range of roles in the context of PHC, working in settings where care is individual/family focused (eg, home care), community focused (eg, public health), and integrated (eg, general practice) (Banner *et al.*, 2010). One challenge to PHC reform shared by most countries is the redefinition of practice roles and functions to meet reform demands, specifically the resistance offered by traditional models of physician-centred care (Mitton *et al.*, 2011; Mable *et al.*, 2012). This resistance can result in some health care professionals, particularly advanced practice nurses, being underutilized and undervalued as integral members of collaborative PHC teams (Lavis, 2011). Barriers that hinder the integration of nurse practitioners (NPs) in particular within the Canadian PHC system include differences in legislation across provinces and territories (eg, policies restricting NPs from prescribing and referring to medical specialists) and variations regarding the educational preparation requirements of NPs (Donald *et al.*, 2010).

Primary Health Care Engagement

The current period of PHC reform requires unambiguous constructs plus reliable and valid indicators of those constructs, to assess ongoing changes in the PHC system (Williams, 2011). To this end, Haggerty and colleagues developed definitions of 24 PHC attributes considered relevant in Canada as well as internationally, in consultation with

Primary Health Care Research & Development 2016; **17**: 72–86

Canadian health care providers, decision-makers, and academics (Haggerty *et al.*, 2007). Levesque *et al.* (2011) further characterized these attributes as essential to either professional or community-oriented models, or both. Professional models represent the traditional physician-centred care model (ie, primary care), staffed by predominantly fee-for-service family physicians serving patients' general medical needs. Community-oriented models involve multiple health and social professionals delivering services aimed at improving individuals' health as well as serving their medical needs, in community- or public-administered organizations (Levesque *et al.*, 2011). This conceptualization of community-oriented models aligns with the community-based PHC definition that guided the present study.

A number of instruments are currently available to evaluate dimensions of PHC delivery. However, many of these instruments were developed to evaluate patient rather than provider experiences (Flocke, 1997; Safran *et al.*, 1998; Shi *et al.*, 2001; Wong and Haggerty, 2013). Further, many of these tools were developed for use in primary care rather than PHC settings. Fewer instruments are available to assess key PHC dimensions from the perspective of physicians (Schoen *et al.* 2006) and other health care providers, including NPs, physiotherapists, pharmacists, and others (Dahrouge *et al.*, 2009; Johnston and Burge, 2013).

Health care professionals are well placed to observe many of the activities and functions that characterize PHC delivery, for instance, the activities that promote and maintain accessibility, interdisciplinary collaboration, and comprehensive care. Workplaces that are involved in these functions to a greater degree may be said to exhibit a higher level of PHC engagement on the key dimensions being assessed. There is significant merit in developing a provider-focused instrument that is relevant to multiple disciplines (eg, nurses, physicians, pharmacists, and occupational therapists) given that strengthening the interprofessional team-based nature of health care delivery is one of the key principles of PHC reform believed to underpin improved service access, quality, and equity (McPherson and McGibbon, 2010).

The purposes of this project were to (1) develop a new scale to measure the perceptions of rural/remote nurses regarding the engagement of their workplaces in key dimensions of PHC, (2) conduct

a content evaluation of the newly developed Primary Health Care Engagement (PHCE) Scale, including item-by-item verification, (3) conduct an assessment of the psychometric properties of the PHCE Scale using data from a pilot survey of nurses with nursing experience in rural/remote Canada, and (4) use the findings from the psychometric assessment to refine the number of items in the PHCE Scale. The refined PHCE Scale has been included in a larger Canada-wide survey of rural/remote nurses; data collection with a sample of ~10 000 nurses began in April 2014.

Methods

Design

The first of the three phases of this study focused on instrument development. The first phase consisted of a literature review to identify published measures of PHC, followed by expert consultation with our 16-member research team to identify essential dimensions of PHC in rural/remote settings. Our research team included 13 registered nurses (RNs)/NPs (10 of whom are nursing faculty), representing six provinces and one territory of Canada's 13 provinces and territories. This phase concluded with the generation of six items for each of the dimensions by the scale developers (J.G.K. and E.C.W.).

The second phase involved an iterative process of content evaluation and item revision of a draft version of the new scale, by our research team and 19-member advisory team. Members of the advisory team represented nine provinces and territories as well as the federal level of public health services governance. In the final phase, a pilot survey was undertaken for the purpose of psychometric evaluation of the new instrument. On the basis of psychometric assessment, all subscales in the instrument were retained but each was subsequently trimmed to three to five items. The refined scale was later included in a larger nationwide survey, the Nursing Practice in Rural and Remote Canada II Study. This larger survey will investigate the nature of nursing practice in rural/remote Canada, with a goal to assist health service planners to improve service quality and access in rural/remote areas.

The aim of the three-phase design employed in the present study was to create an instrument that

was comprehensive enough to reflect the essential dimensions of PHC yet included the smallest possible cluster of items (between three and five) within subscales that exhibited acceptable internal consistency. As noted by Furr and Bacharach (2008: 173), an instrument ‘...might not cover every conceivable facet of the construct, but hopefully the selected items reflect a fair range of elements relevant to the construct’, and is not so lengthy and time-consuming as to deter potential respondents. The length of the new instrument was of concern given the fact that it would be included in a subsequent wide-ranging 27-page survey of nurses in different professional roles [RNs, NPs, registered psychiatric nurses (RPNs), and licensed practical nurses (LPNs)]. Further psychometric testing based on data from the larger survey will involve exploratory factor analysis to test the proposed factor structure of the refined instrument. Convergent and discriminant evidence (Furr and Bacharach, 2008) will also be gathered based on correlations with constructs believed to be related and unrelated to PHC engagement.

Instrument development

This process involved review by our 16-member research team of the 24 PHC attributes and their definitions developed by Haggerty *et al.* (2007). As shown in Table 1, our research team identified 14 attributes as most relevant to rural/remote PHC and grouped these into 10 dimensions for the purpose of subscale development, namely (1) accessibility/availability, (2) patient–provider relationship, (3) continuity, (4) population orientation, (5) community participation, (6) equity, (7) intersectoral team, (8) interdisciplinary collaboration, (9) quality improvement, and (10) comprehensiveness.

The process of identifying the attributes that were most relevant to rural/remote PHC was guided by the work of Levesque *et al.* (2011). Levesque *et al.* ranked the 24 PHC attributes developed by Haggerty *et al.* (2007) on a 5-point scale from ‘somewhat important’ to ‘essential’ with respect to: (a) community-oriented models of PHC, (b) professional models of PHC, and (c) both models (Levesque *et al.*, 2011). The attributes that we found most relevant to rural/remote PHC were those attributes that Levesque *et al.* considered essential or very important to community-oriented models of PHC, given that these models aligned best with the

community-based PHC definition guiding the present study. For four of the 10 dimensions depicted in Table 1, Levesque *et al.* ranked the original attributes as essential to both professional and community-oriented PHC models (accessibility/availability, patient–provider relationship, comprehensiveness, and continuity). Levesque *et al.* rated the original attributes of four dimensions as essential to community-oriented models alone (population-orientation, community participation, equity, and interdisciplinary collaboration). Quality improvement was considered very important to both models, while intersectoral team was classified as very important to community-oriented models, but only somewhat important to professional models. Of the 24 PHC attributes developed by Haggerty *et al.*, the 10 attributes that our team considered least relevant to rural/remote PHC were informational continuity, technical quality of clinical care, clinical information management, system integration, advocacy, family-centred care, whole-person care, accountability, availability, and efficiency/productivity. These attributes were not included in our instrument.

Guided by the definitions in Table 1, the scale developers (J.G.K. and E.C.W.) generated a 60-item PHCE Scale that consisted of six items for each of the 10 dimensions. We limited the number of items to a maximum of six with the understanding that the items with the lowest item-total correlations within each dimension, based on psychometric evaluation of pilot survey data, would be removed to create a refined version of the scale for a subsequent larger nation-wide survey of rural/remote nurses. The generated items were informed by key studies that addressed one or more of the dimensions [WHO, 1986; Flocke 1997, Shi *et al.*, 2001; Canadian Institute for Health Information (CIHI), 2006; Davis *et al.*, 2007; Dahrouge *et al.*, 2009; Bloch *et al.*, 2011; Levesque *et al.*, 2011; Wong *et al.*, 2011; Saskatchewan Ministry of Health, 2012]. Nine items across four dimensions (accessibility/availability, patient–provider relationship, continuity, and population orientation) were minimally adapted with permission from a survey administered to primary care physicians and NPs (Dahrouge *et al.*, 2009).

Content evaluation and item revision

A two-day in-person session was held in June 2012 with our 16-member research team, to review

Primary Health Care Research & Development 2016; 17: 72–86

Table 1 Dimensions (subscales) of the Primary Health Care Engagement (PHCE) Scale, source attributes, and definitions

Dimension (subscale)	Attribute ^a	Definition ^a
Accessibility/ Availability	First contact accessibility	The ease with which a person can obtain needed care (including advice and support) from the practitioner of choice within a time frame appropriate to the urgency of the problem
	Accessibility/ accommodation	The way primary health care resources are organized to accommodate a wide range of patients' abilities to contact health care clinicians and reach health care services
Patient–provider relationship ^b	Interpersonal communication	The ability of the clinician to elicit and understand patients concerns, explain health care issues, and engage in shared decision making, if desired
	Respectfulness	The extent to which health professionals and support staff meet users' expectations about interpersonal treatment, demonstrate respect for the dignity of patients, and provide adequate privacy
Continuity	Cultural sensitivity	The extent to which a clinician integrates cultural considerations into communication, assessment, diagnosis, and treatment planning
	Continuity-relational	A therapeutic relationship between a patient and one or more providers that spans various healthcare events and results in accumulated knowledge of the patient and care consistent with the patient's needs
Population orientation	Management continuity	The delivery of services by different providers in a timely and complementary manner such that care is connected and coherent
	Population orientation	The extent to which primary care providers assess and respond to the health needs of the population they serve
Community participation	Client–community participation	The involvement of client and community members in decisions regarding the structure of the practice and services provided
Equity	Equity	The extent to which access to healthcare and good-quality services is provided on the basis of health needs, without systematic differences on the basis of individual or social characteristics
Intersectoral team	Intersectoral team	The extent to which the primary care provider collaborates with practitioners from non-health sectors in providing services that influence health
Interdisciplinary collaboration	Multidisciplinary team	Practitioners from various health disciplines collaborate in providing ongoing care
Quality improvement	Quality improvement process	The institutionalization of policies and procedures that provide feedback about structures and practices and that lead to improvements in clinical quality of care and provide assurance of safety
Comprehensiveness	Comprehensiveness of services	The provision, either directly or indirectly, of a full range of services to meet patients' healthcare needs. This includes health promotion, prevention, diagnosis and treatment of common conditions, referral to other providers, management of chronic conditions, rehabilitation, palliative care and, in some models, social services

^a Attributes and definitions reproduced from Haggerty *et al.* (2007). Adapted with permission from Haggerty *et al.* (2007). Copyright © 2007 American Academy of Family Physicians. All rights reserved.

^b Term 'Patient–Provider Relationship' derived from Hogg *et al.* (2008).

the pilot survey measures. During the two-day session, members of the research team evaluated the content, wording, and format of every item in the first version of the 60-item PHCE instrument to reflect the context of PHC in rural/remote communities. Based on the definitions in Table 1, team members were specifically requested to flag for removal or revision those items that were irrelevant to each dimension and to ensure that the full range of content relevant to each dimension was included (Cook and Beckman, 2006; Furr and Bacharach, 2008). In addition, region- and program-specific terminology were revised to broaden the scale's appeal to nurses across Canada; language was revised to be inclusive with regard to gender, sexual orientation, and vulnerable groups; items were modified to reflect an orientation to health promotion as well as to medical care; and formatting was revised to include italics for emphasis and examples for illustrative purposes. The 16-member research team received updated versions of the instrument and participated in two team teleconferences. Subsequent versions of the instrument underwent an iterative process of review by the research team during seven teleconference meetings, until consensus was achieved on the inclusion of every item in the preliminary 60-item PHCE instrument.

Pilot survey

The preliminary 60-item PHCE Scale was included in a pilot survey of nurses with nursing experience in rural/remote settings. Psychometric evaluation in the pilot survey phase was undertaken to refine the 60-item scale to a 40-item version.

The survey consisted of four parts (demographics, current employment, work community, and work setting), plus one adapted 12-item Work Satisfaction Scale (Williams *et al.* 1999) and three newly developed scales (60-item PHCE Scale, 42-item Practice Resources Scale, and 60-item Practice Demands Scale). The central purpose of the pilot survey was to conduct a psychometric evaluation of each of the four scales. These analyses were used to reduce the number of items in each of the longer scales, in order to include refined versions in a subsequent larger nation-wide survey of rural/remote nurses. Pilot testing also involved evaluation of online administration of the survey.

Participants

The pilot survey population consisted of all RNs, NPs, LPNs, and RPNs in current practice in Canada with nursing experience in rural or remote locations. Eligible participants had current or previous experience working in rural or remote locations and met one of the following criteria: (1) were currently employed in nursing, (2) on leave from nursing for fewer than six months or (3) retired but occasionally employed in nursing. The target sample was 100 participants based on power analysis to determine the minimum sample size necessary for internal consistency reliability testing of a 60-item scale (Bonett, 2002).

Participants were recruited using a snowball sampling method. Research team members each received six paper survey packages as well as a recruitment email containing a link to the online version of the survey (and access code) to distribute to peers and colleagues across rural/remote Canada. In addition, requests were made to a small number of national nursing organizations to forward the recruitment email to membership, advertise the study in paper and electronic newsletters, and post the recruitment advertisement on social media sites.

Data collection

Data were collected by cross-sectional English mail and online questionnaire from September to December 2013. Participants had the option of completing either an online or paper version of the survey. Both versions included an information sheet, feedback form, and survey questionnaire. The paper package also included a cover letter and self-addressed stamped envelope.

Preliminary instrument

The preliminary 60-item PHCE Scale included in the pilot survey contained 10 subscales: accessibility/availability, patient-provider relationship, continuity, population orientation, community participation, equity, intersectoral team, interdisciplinary collaboration, quality improvement, and comprehensiveness (Table 1). Participants were instructed to respond to the items in relation to their primary workplace (where they spent most of their time in the past 12 months) and the catchment area served by their primary workplace.

Primary Health Care Research & Development 2016; **17**: 72–86

Each subscale consisted of six items, two of which were negatively worded and four positively worded. The negatively worded items were randomly distributed within each subscale. The items used a 5-point Likert scale of 1 (strongly disagree), 2 (disagree), 3 (neutral), 4 (agree) 5 (strongly agree) plus a 'not applicable' option. Negatively worded items were reverse scored. Higher subscale scores indicated perceptions of a higher degree of workplace engagement in 10 key dimensions of PHC.

Statistical analyses

All data were analysed using SPSS 20.0. Demographic characteristics were investigated with descriptive statistics, including frequencies, mean, SD, and range. Case mean imputation was performed for every participant's subscale that was missing 25% or less of the items (ie, one item) in the preliminary 60-item instrument, and in the subscales with four or more items in the refined 40-item instrument (El-Masri and Fox-Wasylyshyn, 2005). Where a subscale was missing more than 25% of the items (ie, two or more) in the preliminary 60-item instrument, or one item in the three-item subscales in the refined 40-item instrument, that participant's subscale was discarded.

After performing case mean imputation for missing values, reliability analysis was conducted with each subscale. Reliability assessment is an important element of the process of developing and refining subscales (Furr and Bacharach). Using the item discrimination method (Furr and Bacharach, 2008) in addition to judgement regarding the theoretical value of each item, the corrected item-total correlation of each item within each subscale was assessed. A low item-total correlation suggests inconsistency between an item and the test (ie, subscale) as a whole. Item-total correlations lower than 0.20 were considered very weak, 0.20 to 0.39 weak, 0.40 to 0.59 moderate, 0.60 to 0.79 strong, and 0.80 and above very strong (Swinscow and Campbell, 2002). The item with the lowest item-total correlation in each subscale was removed and the Cronbach's α coefficient for the subscale with the remaining items was evaluated. This process was repeated for each subscale as necessary. A Cronbach's α coefficient of 0.70 suggested modest and acceptable internal consistency reliability for the subscales, considering the early stage of this research (Nunnally and

Primary Health Care Research & Development 2016; **17**: 72–86

Bernstein, 1994). Cronbach's α coefficient can be computed on the basis of one test administration, as in the current cross-sectional pilot survey, and as such is generally used more than other statistical tests to demonstrate internal consistency reliability (DeVon *et al.* 2007; Tavakol and Dennick, 2011).

Results

Sample characteristics

The sample included 89 participants recruited by snowball sampling method. The majority of participants practiced in the British Columbia/Alberta region ($n = 60$; 69.0%), followed by Saskatchewan/Manitoba ($n = 15$; 17.2%). As shown in Table 2, 92.1% of participants ($n = 82$) were women and the average age was 44.8 years (range 24–82, SD = 12.4). Most nurses indicated their primary position as staff nurse/direct care provider ($n = 60$; 67.4%) and their registration status as RN (88.8%). The most frequently reported place of employment was community health centre ($n = 29$; 32.6%), followed by hospital ($n = 24$; 27%) and public health department/unit ($n = 16$; 18%). The majority of participants worked in communities with populations under 5000 ($n = 49$; 55.0%) and one in three nurses lived outside of their work community ($n = 29$; 32.6%).

Psychometric evaluation

As shown in Table 3, item-total correlations within the subscales of the preliminary 60-item PHCE Scale ranged from -0.13 to 0.76 . Four of the 60 items correlated very weakly ($r < 0.20$) with the total subscale correlations. A further 16 items correlated weakly ($0.20 \leq r < 0.40$), 25 items correlated moderately ($0.40 \leq r < 0.60$), and 15 items correlated strongly ($0.60 \leq r < 0.80$). Within each subscale, the item with the lowest item-total correlation was removed one at a time, and the contribution of each remaining item to the internal consistency reliability for that subscale was evaluated. After item removal, 10 refined subscales in the 40-item PHCE Scale remained (Table 4).

As indicated in Table 4 by comparing the 60-item subscales and the 40-item subscales, the α estimates for seven subscales increased when the number of items in those subscales was reduced. The α estimates decreased for the remaining three

Table 2 Demographic characteristics of survey respondents ($n = 89$)

Characteristic	n (%) or M (SD, range)
Gender	
Female	82 (92.1)
Male	6 (6.7)
No response	1 (1.1)
Age (years) ^a	44.8 (12.4, 24–82)
Number of years since first registering in Canada ^b	18.4 (12.1, 0–42)
Employment status	
Full time	51 (57.3)
Other (part time/job share/casual/contract/term)	38 (42.7)
Primary position	
Manager/supervisor/coordinator	9 (10.1)
Staff nurse/direct care provider	60 (67.4)
Clinical nurse specialist	3 (3.4)
Educator/instructor	13 (14.6)
Other	2 (2.2)
No response	2 (2.2)
Registration status ^c	
Registered nurse	79 (88.8)
Nurse practitioner	14 (15.7)
Registered psychiatric nurse	2 (2.2)
Licensed practical nurse	3 (3.4)
Primary place of employment	
Community health centre	29 (32.6)
Public health department/unit	16 (18.0)
Hospital	24 (27.0)
Multidisciplinary primary health care clinic	2 (2.2)
Physician's office/family practice unit or team	2 (2.2)
Other	16 (18.0)
Primary work community population	
100 000 or over	6 (6.7)
10 000–99 999	22 (24.7)
5000–9999	12 (13.5)
1000–4999	31 (34.8)
<1000	18 (20.2)
Live in primary work community	
Yes	60 (67.4)
No	29 (32.6)

^a Non-response ($n = 1$).

^b Non-response ($n = 1$).

^c May hold more than one registration.

subscales. Satisfactory Cronbach's α coefficients ranging from 0.70 to 0.83 were estimated for seven of the 10 refined subscales (accessibility/availability, continuity, population orientation, community participation, intersectoral team, interdisciplinary collaboration, and quality improvement). Alpha values for three of the 10 refined subscales fell below 0.70, ranging from 0.61 to 0.64 (equity, comprehensiveness, and patient-provider relationship). The Cronbach's α estimate was 0.93 ($n = 63$) for the preliminary 60-item PHCE

Scale. After refining the subscales, the α value was 0.91 ($n = 66$) for the refined 40-item PHCE Scale.

Refined instrument

The refined 40-item PHCE Scale consisted of two five-item subscales (population orientation and equity), six four-item subscales (accessibility/availability, patient-provider relationship, continuity, community participation, intersectoral

Primary Health Care Research & Development 2016; **17**: 72–86

Table 3 Item analysis of the preliminary 60-item Primary Health Care Engagement (PHCE) Scale ($n = 89$)

Item	M	SD	r	Cronbach's α if item deleted
A. Accessibility/availability				
1. When my workplace is open, patients can see a healthcare provider the same day if they need urgent care	4.34	0.85	0.44	0.693
2. The services in my workplace are organized to be as accessible as possible to as many patients as possible (eg, appointment times are flexible, extended hours of operation, walk-ins accepted, etc.)	3.68	1.13	0.52	0.666
3. Patient accessibility to healthcare services provided in my workplace is an ongoing concern ^a	2.95	1.26	0.25	0.742
4. Even if my workplace has closed for the day, patients can still see a healthcare provider <i>in person</i> from my workplace if they need urgent care	3.26	1.48	0.62	0.625
5. It is difficult for patients to obtain the care they need, when they need it, from a healthcare provider in my workplace ^a	4.03	0.95	0.41	0.699
6. Even if my workplace has closed for the day, patients can still get medical advice from a healthcare provider in my workplace <i>by phone</i> if they need urgent care	3.34	1.54	0.56	0.648
B. Patient-provider relationship				
1. Healthcare providers and/or staff in my workplace should treat patients with more respect and dignity ^a	3.28	1.19	0.34	0.585
2. I ask patients for their opinions when discussing their care	4.48	0.57	0.24	0.612
3. My workplace supports healthcare providers to think of patients as partners in their own care	3.98	0.88	0.51	0.513
4. Healthcare providers and/or staff in my workplace should be more concerned with maintaining patient confidentiality ^a	2.77	1.19	0.42	0.546
5. For those patients who do not speak English or French very well, I use an interpreter or I speak their language	3.53	1.01	0.25	0.614
6. My workplace is a safe place for patients to receive healthcare services	4.24	0.77	0.41	0.559
C. Continuity				
1. I have a good understanding of the health history of most of the patients I see	3.84	0.99	0.40	0.654
2. In my workplace, the standard of patient care varies depending on the healthcare provider (eg, some providers offer better care than others) ^a	2.41	1.08	0.18	0.724
3. In my workplace, patients usually see the same healthcare provider each time they visit	2.78	1.16	0.36	0.670
4. I have easy access to information about my patients' past health care provided by the healthcare providers <i>in my workplace</i>	3.71	1.06	0.49	0.624
5. Coordinating care for patients that takes place outside of my workplace is a difficult process ^a	2.59	0.96	0.54	0.612
6. I have easy access to information about my patients' past health care provided by other healthcare providers <i>outside of my workplace</i>	2.61	1.10	0.60	0.583
D. Population-orientation				
1. I have a good understanding of the community's health needs	3.96	0.61	0.39	0.700
2. My workplace has taken part in a needs assessment of the community	3.40	1.08	0.45	0.680
3. My workplace keeps current registries of patients who have chronic conditions	3.31	1.13	0.48	0.669
4. My workplace is slow to respond to the health needs of the community ^a	3.39	0.98	0.50	0.661
5. There is monitoring within my workplace of patient outcome indicators (eg, number of diabetics with A1C within normal limits, fall rates)	3.39	0.93	0.49	0.665
6. There is a poor fit between the services in my workplace and the community's healthcare needs ^a	3.61	0.91	0.41	0.689
E. Community participation				
1. My workplace is guided by a volunteer advisory board	2.65	1.19	0.23	0.845
2. My workplace does not seek input from the community about the healthcare services it needs ^a	3.55	0.96	0.68	0.723
3. Community members are treated as partners when deciding about healthcare service delivery changes in my workplace	3.14	0.98	0.64	0.731
4. Community members do not have a say about the healthcare services delivered by my workplace ^a	3.37	1.02	0.55	0.755
5. My workplace supports healthcare providers to think of the community as a partner in healthcare service delivery	3.57	0.78	0.60	0.748
6. My workplace has implemented changes that emerged from community consultations	3.37	0.89	0.69	0.724
F. Equity				
1. Due to their individual or social characteristics (eg, poverty, language, culture, ethnicity, sexual orientation etc.), some patients have problems accessing the healthcare services offered in my workplace ^a	2.88	1.27	0.48	0.414
2. Healthcare providers in my workplace understand the impact of social determinants of health such as housing, level of education, job status or family support	3.94	0.84	0.38	0.493

Table 3 (Continued)

Item	M	SD	r	Cronbach's α if item deleted
3. My workplace is organized to address the health needs of vulnerable or special needs populations	3.49	1.07	0.43	0.455
4. It is part of my job to help my patients access services to help them improve their housing, education, or employment	3.70	1.02	0.05	0.606
5. Some patients in my workplace do not receive the healthcare they need because they cannot afford it (eg, do not fill prescriptions, do not get recommended treatment such as physiotherapy, dental work etc.)^a	2.50	1.29	0.26	0.534
6. Regardless of their geographic location, all patients have access to the same healthcare services offered in my workplace	3.05	1.33	0.25	0.540
G. Intersectoral team				
1. My work takes me outside my workplace into other settings such as the school, women's shelters, or the recreation centre	3.38	1.40	0.33	0.680
2. Community agencies should try to work together more harmoniously (eg, education, government, law enforcement, civic facilities, non-profit groups) ^a	1.58	0.65	-0.13	0.744
3. I work closely with community agencies (eg, education, government, law enforcement, civic facilities, non-profit groups)	3.38	1.09	0.53	0.586
4. Community agencies meet on a regular basis to discuss common issues that affect health	2.96	1.02	0.44	0.620
5. There have been improvements in the way community services (eg, health, social, education) are now delivered, based on community agencies working together	3.19	0.94	0.64	0.560
6. Healthcare providers in my workplace do not work closely with community agencies (eg, education, government, law enforcement, civic facilities, non-profit groups)^a	3.25	1.09	0.62	0.552
H. Interdisciplinary collaboration				
1. I am not able to consult with healthcare providers from other disciplines in my workplace regarding patient care (eg, family physicians, occupational therapists, social workers, etc.) ^a	3.96	0.97	0.32	0.809
2. In my workplace, there is a collaborative atmosphere between healthcare providers from different disciplines to provide healthcare services (eg, nurses, family physicians, occupational therapists, social workers, etc.)	3.84	0.90	0.74	0.708
3. My workplace does not provide the resources necessary to provide team-based patient care (eg, physical space, time) ^a	3.43	1.10	0.47	0.778
4. In my workplace, I work closely with healthcare providers from other disciplines to provide healthcare services (eg, family physicians, occupational therapists, social workers, etc.)	3.81	0.85	0.61	0.742
5. Healthcare providers from other disciplines in my workplace consult me regarding patient care (eg, family physicians, occupational therapists, social workers, etc.)	3.82	0.77	0.52	0.762
6. Where there is overlap in responsibilities of healthcare providers from different disciplines in my workplace, it is understood who should take the lead for a particular patient's care (eg, nurses, family physicians, occupational therapists, social workers, etc.)	3.31	1.06	0.65	0.727
I. Quality improvement				
1. My workplace regularly uses patient health indicators to measure quality improvement	2.84	0.99	0.76	0.792
2. My workplace regularly measures quality improvement	2.93	1.10	0.69	0.806
3. My workplace does little to support staff and healthcare providers to improve the quality of patient care ^a	3.35	0.95	0.63	0.818
4. There is a process in my workplace for responding to critical incidents	3.95	0.88	0.64	0.817
5. Patient charts in my workplace are out-of-date in terms of medications and/or current health issues^a	3.49	1.05	0.46	0.852
6. There is a process in my workplace for healthcare providers to respond to information from clinical audits or other data sources (eg, number of diabetics or pap rates)	3.11	0.98	0.59	0.827
J. Comprehensiveness				
1. For services my workplace does not provide, patients are directly referred to the necessary health or social services	3.94	0.74	0.24	0.433
2. My workplace should offer more harm reduction or illness prevention initiatives that aim to reduce patients' health risks^a	2.28	1.08	0.44	0.298
3. Health promotion and/or illness prevention are part of my everyday work	4.13	0.90	0.22	0.437
4. There should be more initiatives in my workplace to address chronic conditions^a	2.18	1.07	0.27	0.410
5. My workplace offers most of the primary healthcare services that our patients require	3.23	1.18	0.28	0.407
6. Healthcare providers in my workplace manage patients with multiple chronic conditions	4.20	0.82	-0.02	0.541

Note: Italics appeared in original items; bolded items were retained in the final 40-item PHCE Scale; r = corrected item – total correlation.

^a Reverse scored.

Table 4 Mean scores and internal consistency reliability of subscales in the preliminary 60-item Primary Health Care Engagement (PHCE) Scale and final 40-item PHCE Scale

Subscale	Preliminary 60-item PHCE Scale				Final 40-item PHCE Scale ^a			
	<i>n</i>	Mean score (SD)	Range	Cronbach's α	<i>n</i>	Mean score (SD)	Range	Cronbach's α
Accessibility/availability	77	21.6 (4.8)	11–30	0.72	78	14.7 (3.9)	7–20	0.75
Patient–provider relationship	86	22.3 (3.4)	13–30	0.62	86	14.3 (2.9)	6–20	0.64
Continuity	85	17.9 (4.0)	8–26	0.69	86	12.7 (3.1)	5–19	0.73
Population–orientation	84	21.1 (3.7)	11–30	0.72	84	17.1 (3.4)	8–25	0.70
Community Participation	84	19.7 (4.1)	9–30	0.79	86	13.5 (3.0)	6–20	0.83
Equity	84	19.6 (3.9)	11–30	0.56	86	15.9 (3.7)	6–25	0.61
Intersectoral team	81	17.7 (3.9)	6–26	0.67	84	12.9 (3.2)	4–20	0.78
Interdisciplinary collaboration	83	22.2 (4.0)	11–30	0.79	82	11.0 (2.3)	5–15	0.77
Quality improvement	81	19.7 (4.8)	6–28	0.85	82	13.2 (3.2)	4–19	0.79
Comprehensiveness	82	20.0 (3.1)	12–28	0.48	81	8.4 (2.2)	3–13	0.62

^a All subscales in the final 40-item PHCE Scale contained four items, with the exception of *Population Orientation* (five items), *Equity* (five items), *Interdisciplinary Collaboration* (three items), and *Comprehensiveness* (three items).

team, and quality improvement), and two three-item subscales (interdisciplinary collaboration and comprehensiveness). Before including the 40-item PHCE Scale in a larger nation-wide survey of rural/remote nurses, the tool was further revised as follows: items B1, B4, J2, and J4 (Table 3) were revised to remove the emphasis on 'should', since participant feedback indicated that these items caused confusion. 'Patient–provider relationship' was renamed 'patient-centred care', as this new name better reflects the overall construct. Negatively scored items that were removed from the subscales were not replaced with other negatively scored items, therefore, not all of the subscales in the refined instrument contain at least one reverse scored item. The refined 40-item PHCE Scale is available from the authors.

Discussion

The purpose of the present study was to assess the psychometric properties of a new scale developed to measure rural/remote nurses' perceptions regarding the engagement of their workplaces in key dimensions of PHC. Higher subscale scores reflected perceptions of a greater degree of workplace engagement on 10 key dimensions of PHC (accessibility/availability, patient–provider relationship, continuity, population orientation, community participation, equity, intersectoral team, interdisciplinary collaboration, quality improvement, and comprehensiveness). The refined 40-item PHCE Scale, comprised three to five items in each of 10 subscales, exhibited good internal consistency reliability ($\alpha = 0.91$) when tested in a pilot survey of Canadian nurses with experience practicing in rural or remote settings. Specifically, all but three of the 10 refined PHCE subscales demonstrated acceptable reliability ($\alpha \geq 0.70$), namely equity, comprehensiveness, and patient–provider relationship. It is possible that the items in these three subscales were measuring 'heterogeneous constructs', that is, more than one dimension, thus leading to lower α estimates (Tavakol and Dennick, 2011).

Significant PHC reform has been well underway across Canada since the late 1990s, leading to the introduction of the Health Transition Fund to support pilot testing of new PHC models and capacity building across the country (Mable *et al.*, 2012). However, Canada, similar to other WHO member countries, has yet to achieve a universal health care system with PHC principles at its centre as envisioned in the Alma-Ata Declaration on Primary Health Care (Gauld *et al.*, 2012). Implementing a PHC system in Canada that is integrated and coordinated has been a challenging task for numerous reasons (Wilson and Lavis, 2014). These challenges include a decentralized health care delivery system across 13 provinces and territories, the complexity of alternate payment structures for non-physicians involved in the delivery of PHC services (ie, other than fee-for-service), and the slow pace of implementing

and comprehensiveness). The refined 40-item PHCE Scale, comprised three to five items in each of 10 subscales, exhibited good internal consistency reliability ($\alpha = 0.91$) when tested in a pilot survey of Canadian nurses with experience practicing in rural or remote settings. Specifically, all but three of the 10 refined PHCE subscales demonstrated acceptable reliability ($\alpha \geq 0.70$), namely equity, comprehensiveness, and patient–provider relationship. It is possible that the items in these three subscales were measuring 'heterogeneous constructs', that is, more than one dimension, thus leading to lower α estimates (Tavakol and Dennick, 2011).

electronic health records and health information systems (Gauld *et al.*, 2012).

To evaluate the quality of patient encounters with the PHC system during on-going reform, a number of different instruments may be used (Flocke, 1997; Safran *et al.*, 1998; Shi *et al.*, 2001; Haggerty *et al.*, 2011; Wong and Haggerty, 2013). While it is important to account for the patient perspective, it is equally important to solicit the perspectives of health care professionals who have unique insight into the system, in efforts to assess ongoing changes in the PHC system. The CIHI recently made available a survey which measures providers' perspectives on nine PHC dimensions (information technology, quality and safety processes, accountability, health human resources, team functioning, organizational adaptiveness, provider satisfaction, coordination of care, and collaboration; Johnston and Burge, 2013). While there is some overlap with the refined PHCE Scale in the present study, several dimensions are missing in the CIHI instrument, namely accessibility, patient-centred care, population orientation, equity, community participation, and comprehensiveness. These particular dimensions are important to a holistic PHC approach that involves multiple disciplines focused on the numerous factors associated with health. As a recent systematic review found, the dimensions of access, comprehensiveness, population orientation, and patient-centredness (ie, patient-provider relationship) have been employed to evaluate quality in PHC system performance in several international projects in the last two decades (Simou *et al.*, 2013). Obtaining the perspective of health care professionals on these particular dimensions of PHC is therefore a worthwhile endeavour.

Some study limitations should be considered when interpreting the findings. The first limitation concerns the fact that a content validity index was not calculated; rather, an iterative content evaluation process was undertaken that involved our 16-member research team and 19-member advisory team. Second, the PHCE Scale has been pilot tested solely with nurses, the majority of whom were RNs (88.8%), and has not been tested with other health care professionals. Third, reducing the number of items in the subscales may affect the viability of some subscales after exploratory factor analysis is conducted in the larger study. Further limitations concern the lack of factor analysis in

the present study. For a multidimensional construct, a statistical procedure such as factor analysis is typically employed in the instrument development process to help determine relationships between items and identify factors within the construct (DeVon *et al.*, 2007). Relying upon the item discrimination method to identify items for removal may have resulted in the loss of useful items, since high internal consistency reliability of a subscale is necessary, but not sufficient, evidence of validity (Cook and Beckman, 2006). A sample of 300 to 400 would be necessary for factor analysis of a 60-item scale, based on sample size parameters for this statistical technique (DeVellis, 2003). However, a firm start date for the larger survey was previously established in co-operation with many registration associations across Canada, therefore, it was not feasible to recruit a sample of this size due to time constraints. Although factor analysis is a typical step in the instrument development process, it is important to first gather content evidence by searching for previously published instruments and identifying constructs (Cook and Beckman, 2006). We placed significant emphasis on gathering content evidence by drawing on previous research that identified essential dimensions of PHC (Haggerty *et al.*, 2007; Levesque *et al.*, 2011), and further extended this line of inquiry by developing items that were informed by other relevant research (Flocke, 1997; Shi *et al.*, 2001; Dahrouge *et al.*, 2009; Bloch *et al.*, 2011; Levesque *et al.*, 2011; Wong *et al.*, 2011) and reports (WHO, 1986; CIHI, 2006; Davis *et al.*, 2007; Saskatchewan Ministry of Health, 2012).

Conclusion

In the present study that solicited the views of 89 Canadian nurses with experience practicing in rural or remote communities, a new 40-item PHCE Scale demonstrated a good reliability estimate (0.91, $n = 66$) for the overall refined 40-item PHCE Scale, and acceptable reliability estimates ($\alpha \geq 0.70$) in seven of 10 subscales. With their unique insight into the organization and delivery of health care, nurses provide a window into the functions and activities that characterize PHC delivery in their workplaces.

The current study provided an initial assessment of reliability and preliminary evidence of validity. The psychometric properties of the new 40-item

Primary Health Care Research & Development 2016; 17: 72–86

PHCE scale will be further assessed in a larger nation-wide survey of rural/remote nurses, for which data collection began in April 2014. The larger study will provide an opportunity to test the structure of the refined 40-item PHCE Scale, specifically whether the factors (subscales) will be supported. Analysis of correlations between the subscales and variables in the larger study will provide additional evidence of validity. We will also compare the degree of PHC engagement across work setting (eg, community health centre, multidisciplinary PHC clinic, family practice unit), type of nurse (RNs, NPs, RPNs, and LPNs), region (ie, province and territory), and population of work community. This new instrument has the potential to improve our understanding of key dimensions that characterize PHC systems in numerous countries, to assess ongoing changes in these systems. Researchers may consider employing the new 40-item PHCE Scale in research with other health care professionals (eg, family physicians, occupational therapists, dietitians), in urban as well as rural practice settings, in nations where PHC reform is underway.

Acknowledgements

The authors would like to thank the nurses who participated in the Nursing Practice in Rural and Remote Canada II pilot survey. They are also grateful to Nadine Meroniuk, Jessica Place, Leana Garraway, and Larine Sluggett for their assistance with data analysis and manuscript preparation.

Financial Support

The full study is funded by the Canadian Institutes of Health Research.

Conflicts of Interest

None.

Ethical Standards

The pilot survey was approved by the ethics committees of the research team: University of Northern British Columbia Research Ethics Board (E2013.0320.037.00), University of Saskatchewan (Behavioural Research Ethics Board Certificate of Approval), University of Lethbridge *Primary Health Care Research & Development* 2016; **17**: 72–86

(Certificate of Human Participant research), Aurora College (Scientific Research Licence), University of Montreal (Hospital Maisonneuve-Rosemont), and Dalhousie University (Health Science Research Ethics Board letter of approval).

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