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ORIGINAL ARTICLE

The Interprofessional Care Access Network (I-CAN): achieving client health outcomes by addressing social determinants in the community

Katherine J. Bradley[a], Peggy Wros[b], Nicholas Bookman[c], Launa Rae Mathews[b], Heather Voss[b], Tanya L. Ostrogorsky[c], and Kate LaForge[b]

[a]OHSU-PSU School of Public Health, Portland, OR, USA; [b]OHSU School of Nursing, Portland, OR, USA; [c]OSU College of Pharmacy, Portland, OR, USA

ABSTRACT

Four health professions schools at an academic health science university and a partner state university collaborated to develop the *Interprofessional Care Access Network* (I-CAN), a model of healthcare delivery and interprofessional education that addresses the Triple Aims for vulnerable populations in three underserved neighborhoods. Program goals were achieved through community-based partnerships and the development of a health-care workforce prepared for competent practice in emerging models of care. In the first three years, almost 600 nursing, medicine, dentistry, and pharmacy students worked with clients referred from community partners, providing interprofessional care coordination addressing life instability and social determinants of health. The evaluation has demonstrated substantial improvement of health-related outcomes for clients who began in the first three years of the program and specifically those who completed intake and follow-up documentation (N = 38). There were substantial reductions in the aggregate number of emergency department visits, emergency medical service calls, and hospitalizations when compared to the 6 months prior to starting I-CAN. Estimated cost savings for the 38 clients, based on minimal estimated costs for these indicators alone, were over $224,000. A three-year qualitative review of client progress notes indicated that as a result of interprofessional student team interventions, many clients improved access to health insurance and primary care, and stabilized housing. Since the evaluation was completed, three programs have been added in rural and urban communities, demonstrating the model is scalable and replicable.

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Introduction

The United States (US) Affordable Care Act (ACA) has provided unprecedented opportunities for healthcare reform and the creation of innovative solutions to persistent problems in the health-care system. At the same time, the Triple Aim has challenged health-care professionals to improve the experience of care, improve population health outcomes, and reduce the cost of care (Berwick, Nolan, & Whittington, 2012). In spite of progress toward these goals, US experts in the health reform movement have noted that there continues to be a failure of health-care professionals working collaboratively in the community to address social determinants of health (SDH) – which are root causes of illness and perpetuate health disparities (Baum, Begin, Houweling, & Taylor, 2009; Berwick, 2014; Braveman & Gottlieb, 2014; Institute for Alternative Futures, 2012; National Academies of Sciences, Engineering, and Medicine, 2016; U.S. Department of Health and Human Services [USDHHS], 2010; World Health Organization [WHO] & Commission on Social Determinants of Health, 2008). *Healthy People 2020* defines SDH as "the conditions in which people are born, live, work, and age that affect their health" (USDHHS, 2010). To address these root causes, the scope of health and healthcare must be expanded to include SDH and integrated into the training and socialization of new health-care professionals. Competencies related to population health and health disparities have been added to accreditation requirements for health professions schools, which is essential preparation for the next generation of leaders in health reform with the capacity to build an effective community-integrated healthcare system focused on prevention and promotion (Gourevitch, 2014; Halfon et al., 2014).

The national initiative to develop and test models of interprofessional education and collaborative practice (IPECP) and to evaluate their impact on health and health systems is an integral aspect of health reform. This work is consistent with the Institute of Medicine Report (2015) linking interprofessional learning with downstream person or population-directed outcomes. Universities and academic health centers are integrating IPECP into health professions curricula, in which students learn about, from, and with each other (WHO, 2010), and developing programs addressing the *Core Competencies for Interprofessional Collaborative Practice* (Interprofessional Education Collaborative Expert Panel [IECEP], 2011). National efforts have focused on classroom, case study, and simulation approaches, but it has been more challenging to establish robust interprofessional collaborative experiences for students in clinical practice – particularly in the community. IECEP placements have been reported in the following health-care settings:

- Nursing home or residential care facilities for older adults (Annear, Goldberg, Lo, & Robinson, 2016; Annear, Walker, Lucas, Lo, & Robinson, 2016; Sheppard et al., 2015);

CONTACT Katherine J. Bradley bradleyk@ohsu.edu OHSU-PSU School of Public Health, 3455 SW US Veterans Hospital Rd., MC: SN-5S, Portland, OR 97239

- Hospitals (Brault, Therriault, St-Denis, & Lebel, 2015; Brewer & Stewart-Wynne, 2013; Falk, Hult, Hammar, Hopwood, & Dahlgren, 2013; Hallin & Kiessling, 2016; Head et al., 2016);
- Outpatient services (Self & Parham, 2016);
- Rehabilitation centers (Brault et al., 2015);
- Primary and chronic care clinics (Brault et al., 2015; Frakes et al., 2014; Sicat, Huynh, Willett, Polich, & Mayer, 2014; Thompson et al., 2016);
- School-based clinics (Luebbers, Dolansky, Vehovec, & Petty, 2017);
- Transitional care (Vogler, Arnoldi, Moose, & Hingle, 2017);
- Emergency departments (Ericson, Masiello, & Bolinder, 2012); and rural practice facilities (Craig, Barnard, Glasgow, & May, 2014; Schuller, Amundson, McPherson, & Halaas, 2017).

In addition, community-based IPECP experiences have included student engagement with seniors (Conti et al., 2016; Gould, Lee, Berkowitz, & Bronstein, 2015; Renschler, Rhodes, & Cox, 2016) and medically underserved families (De Los Santos, McFarlin, & Martin, 2014; Opina-Tan, 2013).

It has been well-documented that interprofessional clinical education programs provide value and benefit for students working together to provide patient care, however there needs to be a stronger evidence base for interprofessional education that describes the impact on population health outcomes, cost of care, and patient experience (Brandt, Lutfiyya, King, & Chioreso, 2014). Of the interprofessional clinical experiences for students reported above, only two programs evaluated patient outcomes. Brewer and Stewart-Wynne (2013) evaluated patient satisfaction on a hospital-based unit with medicine, nursing, physiotherapy, occupational therapy, social work, pharmacy, dietetics, and medical imaging students. Thompson et al. (2016) evaluated the achievement of goals determined by the care team and patient during a longitudinal clinic-based interprofessional educational experience with students from 13 different health professions. A related group of articles describes interprofessional student-run clinics (SRC), which provide opportunities for interprofessional clinical education and practice. Evaluation of the impact of SRC has demonstrated positive patient outcomes and satisfaction (Haggarty & Dalcin, 2014; Haines, Kent, & Keating, 2014; Kent & Keating, 2013; Kent, Martin, & Keating, 2016; Lawrence, Bryant, Nobel, Dolansky, & Singh, 2015).

Four health professions schools at an academic health science university and a state university partner collaborated to develop the *Interprofessional Care Access Network* (I-CAN) as an innovative model for healthcare delivery and interprofessional education that addresses the Triple Aim for vulnerable populations in urban neighborhoods and rural communities (Wros, Mathews, Voss, & Bookman, 2015). The focus of I-CAN is to establish an evidence-based model demonstrating the impact of interprofessional health-care team interventions focusing on SDH. As a clinical interprofessional education program, I-CAN teaches collaboration and accountability within a community context in which students learn to understand local health-related problems that directly impact patient outcomes and population health issues. The model brings interprofessional teams of nursing, medicine, dentistry and pharmacy students together in underserved communities. The purpose of this article is to describe the development and interventions of the I-CAN model and the evaluation results, which have demonstrated substantial improvement of client outcomes in the first three years following program implementation (2013–2016).

The specific goals of I-CAN are to: 1) reduce preventable health-care utilization among underserved clients and families in partner neighborhoods and communities; 2) develop a sustainable, scalable, and replicable service delivery model that addresses the SDH and partners with communities to achieve the Triple Aims; and 3) prepare an interprofessional health-care workforce to lead collaborative teamwork in communities.

Background

The model

I-CAN aligns healthcare delivery, community services, and interprofessional academic programs by coordinating care through Neighborhood and Community Academic Practice Partnerships (NCAPPs). See Figure 1. The program is led by the School of Nursing, and includes clinical faculty and health professions students from the Schools of Dentistry, Medicine, and Nursing, and the College of Pharmacy. Each neighborhood or community serves specific local vulnerable and underserved populations identified by community practice partners, which include federally qualified health centers or community clinics, community service agencies, and community dental clinics. Some of these partnerships were pre-existing clinical sites, and others have been developed based on population needs specific to each NCAPP.

The I-CAN model designates a nurse faculty-in-residence who works in a community practice setting, supervising students and serving as the liaison between the program and the NCAPPs. This faculty member has experience in population health and partners with a variety of health-care providers, nurses, case workers, social workers, and other professionals, depending on the work of the community agency. The program was initially implemented in an

Figure 1. Community partner model.

Table 1. I-CAN populations by neighborhood.

Neighborhood	Target Populations
Old Town Portland	Chronically sub-acute; elderly; homeless; disabled; veterans
West Medford	Single parent families; disabled adults; Hispanic migrant workers
Southeast Portland	Immigrants and refugees from Africa and Asia

inner city neighborhood (Old Town Portland); expanded to a community in a southern part of the state (West Medford) in year 2, and to a second urban neighborhood (Southeast Portland) in year 3. Each NCAPP serves a different population based on local need as indicated in Table 1. Due to the staged approach to site development, and the long-term work to address SDH with complex clients, some clients who entered the program in years two and three were still working with student teams at the end of the data collection period and their outcomes extend beyond year 3; as a result, their outcomes are not included. Across those first 3 years, almost 600 health professions students participated in the program.

The intervention

Community partners in consultation with the faculty-in-residence, refer clients based on criteria that include: two or more non-acute EMS calls or missed medical appointments in the past six months; lack of a primary care home; lack of health insurance; elders and families lacking stable housing; or children with family members with a disabling chronic illness or developmentally delayed parent(s). Clients are often resistant to traditional approaches to health care or have distrust or lack of understanding of the healthcare system. Many are socially isolated and/or have fallen into intergenerational gaps in the healthcare system stemming from a lifetime within a culture of poverty. The cost of health care for these individuals is disproportionately high due to lack of preventive care, high incidence of multiple chronic illnesses, and the use of emergency medical services (EMS) and the emergency department (ED) for non-urgent care.

The faculty-in-residence contacts clients and obtains their consent for participation in the program and huddles with students to plan the first client meeting, which is most often in the client's home. Student teams complete an intake assessment and collaborate with the client, faculty-in-residence, and community practice partner to develop a list of goals and a prioritized plan. Over weeks and months, the faculty-in-residence and interprofessional student teams visit clients weekly to develop supportive relationships, work on issues that prevent clients from successfully managing their health, and coordinate care. Home visits and environmental assessments are essential community health strategies for truly understanding the significant SDH issues that some clients face. Interventions focus on SDH-related barriers, health navigation, health literacy, and self-sufficiency as a foundation for prevention and disease management. The client is directly connected to resources within the local community, and clients are often accompanied on visits until they can negotiate agencies independently. Priorities may include housing, health insurance, food security, or connection with a primary care provider home.

Student engagement in I-CAN is flexible. Nursing students generally serve as care coordinators and provide care continuity over the term, while other health professions students rotate through the team for variable lengths of time each term. For example, nursing students participate for two days a week for 1–3 terms, and dental students visit clients with the team for 4 hours per week with follow up at the community dental clinic. Student teams are made up of at least two students on each home visit, and students huddle before visits and debrief afterwards. The team composition varies based on which students have assigned rotations in the neighborhood or community and the needs of the client. Some students participate within a required clinical course, and others for elective credit. Each interprofessional student team maintains a rolling caseload of two to three clients, and there are three to four teams per neighborhood or community. Referring community practice partners huddle weekly with the faculty-in-residence and students to review and update plans, and each NCAPP meets quarterly to discuss client progress and identify population health issues identified through care coordination with individuals and families.

Methods

Community-based initiatives such as I-CAN benefit from evaluation based on a realist framework for the assessment of program outcomes (Pawson & Tilley, 1997). Realist evaluation is an approach rather than a specific method and typically employs different methods to work towards an understanding of what causes change. It incorporates data from diverse sources to capture the context as well as the outcomes of a program (Cox, Cuff, Brandt, Reeves, & Zierler, 2016) and distinguishes between traditional research and program evaluation (Chen, 2013). The realist contexts for I-CAN include the local characteristics, health needs, resources, and services within geographically specific neighborhoods or communities and their availability for vulnerable people. As recommended by Cox et al. (2016), methods include both qualitative and quantitative approaches to evaluate the effect of the interprofessional teamwork on individual, population health, and systems outcomes. A variety of methods and sources of data provide deep understanding of both interventions and outcomes, including review of chart notes and databases to evaluate progress towards client goals and, health-care utilization, and cost of care; focused client surveys; satisfaction surveys for clients and students; interviews of community partners and faculty-in-residence; minutes of team and NCAPP meetings; and summaries of local and political impact of population health interventions The current paper focuses on the achievement of individual client goals; intermediate goals such as access to primary care, health insurance, and housing; and aggregate outcomes related to decreasing EMS calls, ED visits, and hospitalizations. Longer-term outcomes include better population outcomes in I-CAN communities, and improved overall satisfaction and reduced cost of care for I-CAN clients as compared with comparable clients.

Data collection

Client data were collected by student teams at intake, on each visit, after 12 visits, and on discharge. The intake assessment included self-reported data on demographics and personal characteristics,

health behaviors, SDH, and utilization of EMS, ED, and hospitalizations over the previous six months. The development of the intake assessment was informed by reviewing community partner intake and assessment forms, a literature review, and in consultation with the faculty-in-residence. A series of multiple choice questions addressed health behaviors and SDH, e.g. "Where do you sleep?" with response options "House," "Apartment," "Single Room Occupancy," "Friend's Home," "Shelter," "Not Housed," and "Other," with clients being able to indicate more than one response. Questions adapted from Froelicher's *Health Services Utilization Questionnaire-Revised*, regarding health-care utilization over the previous six months were dichotomous (Yes, No), with follow up questions about frequency and type of activity if the response was "yes." (Froelicher, Sohn, Max, & Bacchetti, 2004). Questions were constructed to assess the client's life management stability, e.g. "Has your housing situation changed in the last six months?" and "What is your source of monthly income?" A limited physical health screen was conducted (blood pressure, pulse, respirations, vision and dental) with questions regarding physical activity, balance, and falls history over the past 12 months. Additionally, clients were asked about the quality of life using the European Quality of Life Survey (EQ-5L-3D) (EuroQol, 2012) and depression using the Patient Health Questionnaire (PHQ-9) (Kroenke, Spitzer, & Williams, 2001). The intake assessment provided a baseline understanding of the client needs and was used by the students and client to develop the client's goals and interventions. The client was reassessed for comparison with intake data after every 12 visits and/or on discharge from the program. Students documented assessments and interactions during client visits, including activities completed on their behalf, into weekly chart notes. The qualitative summaries of client health status, goals, and care plan activities, as well as logs of time, duration, and location of interactions were also part of the visit summaries.

Data analysis

Client intake data were exported into a database following intake into the program; these data were analyzed and descriptive statistics reported quarterly. Self-reported data regarding the frequency of ED visits, EMS calls, and hospitalizations were also collected on intake and after 12 visits and/or discharge, analyzed and descriptive statistics reported annually. The cost savings formula applied the estimated cost per event (2012 mean) from the Agency for Healthcare Research and Quality's Medical Expenditure Panel Survey (AHRQ MEPS, 2012) for ED visits and hospitalizations. For EMS callouts, the estimates utilized Medicaid patient data from the local city/county EMS system (J. Jui, personal communication, 2012). These measures were determined to be the best match for the client populations in I-CAN.

Client weekly qualitative visit summaries were extracted from the clients' weekly chart notes and analyzed annually using Dedoose, a qualitative data analysis software (Dedoose, 2016). In year one, the evaluation team reviewed chart notes from the first two terms and developed a common coding scheme (see Table 2) derived from the data to facilitate evaluation of program goals and outcomes. Codes focused on client care coordination, student engagement, factors related to SDH and churn – which is a state of constant instability and transition related to health-care utilization. Additional codes related to mental/behavioral health were added in year 2 as it became apparent that these were major factors in working with the very vulnerable I-CAN clients. Evaluation team members initially coded the chart notes in pairs, and then individually as they developed common understanding and confidence in the codebook. Coded data related to SDH and churn factors were extracted and analyzed to provide insight into client progress toward their goals and inform program improvement discussions at monthly core team and faculty meetings.

Table 2. I-CAN qualitative codes.

Client	Student	SDH	Churn
Goals	Team Interventions	Transportation	Hospitalization/ED
Barriers	Barriers to Service	Housing	EMS/Police
Strength/Support	Student Learning	Food	Primary Care Provider
Follow Through	IPE Experiences	Income	Health Insurance
Outcomes		Employment	
		Safety & Security	

Ethical considerations

All aspects of the study were reviewed and approved by the authors' Institutional Review Board for the protection of Human Subjects (Reference number:0000009409).

Results

In the first three years of the program, I-CAN student teams provided care coordination for 138 clients across the three neighborhoods. Demographic data indicated that 52% of the clients were male, 47% female and 1% transgender. The largest age group served was 40– 64-year-olds (46%), followed by those 65 to 89 (28%) and 20 to 39 (26%). One third were non-English speakers, reflecting the diverse immigrant and refugee communities served. Most clients had a high school education or less; 49% had some high school education, 29% had less than a 9th grade education. Twenty-two percent had some post-secondary education.

Reflecting the complexity of clients' health and churn of their lives, 49 met their goals or transitioned out of the program, 38 were lost to follow up, 15 became ineligible (usually due to relocation), 14 withdrew, and 7 died in the follow-up period. The remaining 15 are still active clients. Client visits took time (averaging 49 minutes) to build relationships, collect intake data and prioritize goals. Self-reported data on intake demonstrated that 37% did not have a primary care home, 23% lacked stable housing, and 20% lacked health insurance. In the six months prior to referral 33% reported at least one EMS call, 33% a hospitalization, and 48% had at least one visit to the ED; of the latter, 24% had three or more visits.

In the first two years, 84% of the clients reported multiple acute and chronic disease problems. In response to the question "What are your health concerns?" the top three medical problems identified were musculo/skeletal, dental, and endocrine (generally diabetes). Three out of four clients reported concerns with pain, mobility, and activities of daily living. For 43% of

clients, the co-occurrence of mental/behavioral health issues added to the complexity of managing their daily lives. Medication management was another challenge as over 70% of the clients were unable to identify all of their medications. In addition, 14% prioritized concerns with housing, safety, and transportation. Most I-CAN clients had multiple chronic health problems that coexisted with SDH barriers (Table 3).

Qualitative analysis was conducted on chart data from all three years. Coded data were extrapolated from chart notes, capturing client progress related to primary care access and utilization, health insurance coverage and utilization, and stable housing. The coded chart notes provided evidence that was quantified to determine whether clients were moving towards stabilization or continuing to live with churn.

> Client was excited to talk to us because he now has *Script Talk* (a device that allows individuals who are visually impaired to safely identify and take their medications). He got it for free from (agency). He showed us how it worked and he was very excited to show it to the pharmacy at (the Clinic). We walked to (the Clinic) … he showed some members of his care team and a pharmacy extern.

Table 4 identifies the percentage of clients each year that showed improvement from the student team interventions. The percentages differ each year, reflecting the variable needs of the neighborhoods, e.g. in the refugee and immigrant neighborhood added in year 3 (Southeast Portland), housing was less of an issue, which resulted in a decrease.

To improve primary care access, student teams developed supportive partnerships with clients to assist them with navigating the healthcare system; accessing primary, specialty, and dental care options; scheduling and coaching for appointments; providing reminders; arranging transportation to improve follow through; and attending appointments to support communication with the provider. While client needs and challenges varied, the activities for accessing primary care were consistent across neighborhoods and years.

> Client concerns are mostly about accessing health care, seeing a doctor and paying for prescriptions. Does not currently have insurance, a doctor, or a medical home.

> Dental student exam indicated need for crown….no dental coverage under (Medicaid) schedule a checkup and cleaning at (community dental clinic) which provides dental care for homeless or low-income individuals…

Table 3. Primary self-reported client concerns.

Health Concerns	SDH Concerns
Medication management	Housing
Musculoskeletal issues/pain Mental/behavioral health	Safety/security
Dental/oral health	Transportation
Endocrine issues (e.g., diabetes)	Insurance
Substance abuse	Employment

Table 4. Client outcome measures.

	Year 1*	Year 2*	Year 3*
Improved Access to Primary Care	63%	43%	49%
Improved Health Insurance Status	53%	29%	24%
Improved or Stabilized Housing	27%	28%	8%

*Year 1 n = 30, Year 2 n = 28, Year 3 n = 49.

> Determined what client must do to obtain housing…this includes regular provider visits in order to address chronic mental illness. We would like to facilitate a visit with a provider at (the Clinic) however, (the Clinic) is presently hesitant to schedule appointments with the client secondary to his history of missing appointments.

Addressing the availability or lack of insurance coverage was required to assist clients in achieving their goals. In the first year, the greatest need was assisting clients in signing up for insurance under the new ACA mandate. In the second and third years, the focus expanded to include client education about accessing and using insurance. Reinstating lapsed insurance; understanding coverage; initial provider assignment and reassignment to a more culturally responsive provider or setting; and finding community alternatives for gaps in services were typical interventions across all three neighborhoods.

> Client states that she would like for 3 of her children….to be switched to the same insurance plan as her other children…. When we asked for… children's insurance cards, she had multiple duplicates and outdated information. We … will help her organize important paperwork and get rid of outdated insurance cards.

> Students will contact (community agency) to allocate money for (client) dental appointment. The pharmacy student is following up on getting medications straightened out (blister packs filled correctly). We are looking into inhaler alternatives covered by his insurance.

> Met client at… (program providing medication assistance) . …. determined based on her dual insurance coverage that … (she wasn't eligible). Staff contacted (the Clinic) which suggested… contacting (regional agency). Regional agency contacted, took down client's information and said someone would contact her today or tomorrow to set up an appointment to see how they can assist her with getting her medications without a co-pay.

Stabilizing housing has been one of the most challenging goals to address for the clients, student teams, and community partners. The limited amount of low-income housing, long wait lists, financial limitations, and client behavioral challenges all contributed to slow movement. In year 3, the decrease in this measure reflected the addition of the Southeast Portland community, where housing instability was more stable because refugee and immigrant clients were provided with housing as part of their initial resettlement package.

> Client is very concerned about his housing. Stated that because he made a formal complaint about the conditions of his housing, the owner of the SRO (single room occupancy) gave him 30 days to vacate his room….

> Client notified me that he and (girlfriend) are no longer on the street…have been taken back in until the end of the month by the friend they were previously staying with. He also found out that his application with (agency) was approved but he has to try to get into an apartment within his price range that doesn't have a long waiting list.

> Client's options for housing are limited per the case manager. A motor home would require additional steps like parking and car insurance, neither of which the client is financially capable of. Other housing units are not an option because they will require background checks that the client will not pass due to his history of creating damage such as writing on mirrors, walls, doors, etc.

The qualitative chart notes provided a rich resource for understanding the challenges of clients in accessing insurance and health care, aligning care with service and moving towards stabilization.

Emergency and inpatient health-care utilization was measured by comparing the six-month period prior to intake and the period between intake and the 12th visit follow-up. The variable-length interval between intake and the 12th visit was adjusted and standardized for a six-month period and compared to the baseline rate. For the first 38 clients who completed intake and follow-up forms, utilization substantially decreased after 12 student care coordination visits, compared to the six months before joining I-CAN, for these factors alone. This provided an estimated $244,000 in cost savings per six months for reduced utilization (See Figure 2).

Discussion

This early data report from the first three years of I-CAN indicates that an interprofessional community-based intervention focused on SDH has the potential to improve client outcomes, reduce health-care utilization, and reduce costs. Consistent with recommendations by Cox et al. (2016) and based on long-term community relationships, I-CAN has developed committed partnerships that advance the missions and goals of both education and healthcare delivery, and evaluated the linkage between IPE and patient/population outcomes (Brandt et al., 2014). Results attest to the power of collaboration and the need for local coalitions of providers and community organizations to address SDH. I-CAN is an innovative care delivery model that reduces preventable health-care utilization among underserved clients and families in partner neighborhoods and communities. Under the supervision of a faculty member, interprofessional student teams engaged clients with complex health needs and addressed barriers related to SDH; learning "with, from and about each other" (WHO, 2010) as they coordinated access to community resources; and enhanced community integrated health-care experiences while reducing costs of care.

During the initial three years, this program evaluation was limited by several factors related to the population served and data collection methods. The I-CAN program works in low resource and disadvantaged communities, where people were often distrustful of health-care professionals and had not been socialized into using the healthcare system for their benefit. This presented unique challenges for the student teams in building relationships, accessing resources, and maintaining client engagement. Client visits took extended periods of time and progress was often slow due to their lack of resilience and social isolation. Students needed time to learn from the community partners and establish trusting relationships with clients (Yancy, Gleen, Ford, & Bell-Lewis, 2018). Interventions were frequently derailed by gaps in the healthcare system and social safety nets (Abdus, Mistry, & Selden, 2015). Unpredictable client engagement limited the completeness of the data collection and was further complicated by reliance on client self-report. Understanding program effectiveness on health-care utilization will be strengthened going forward with data collection that interfaces with electronic medical records, providing more effective workflow, charting, documentation review, and real-time data management (Menachemi & Collum, 2011). Also, the I-CAN teams have gained experience with identifying characteristics of clients in each neighborhood or community that are more likely to engage productively with the program and local resources that provide needed services; as a result, fewer clients have been lost to follow-up or exited the program prior to achievement of outcomes.

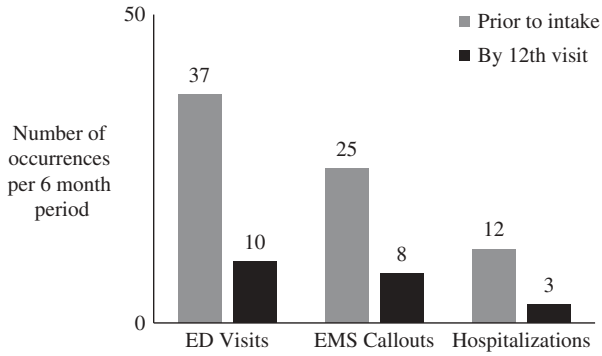

Figure 2. Comparison of health system utilization before entering I-CAN and after 12 visits.*

*Rates adjusted and standardized for the number of occurrences for six month period.

In regard to study limitations, finding instruments that reliably measured outcomes for this marginalized population, is an ongoing challenge. Standardized instruments on depression and quality of life were tested and discontinued when the instability of clients' lives and difficulty responding to items resulted in poor quality data. Beginning in year four, a measure of self-sufficiency that can be assessed by faculty or students was implemented and has proven to be a much more practical measure, providing a more consistent and comprehensive representation of client progress (Culhane, Gross, Parker, Poppe, & Sykes, 2008). Client satisfaction with their health care was also initially evaluated, but there were too many confounding variables for the data to be meaningful; following the initial data collection period, a measure of client satisfaction with the I-CAN program was substituted. Another limitation was that the data collection was reliant on student record-keeping (Schaar & Mustata Wilson, 2015). While weekly chart notes were often rich with detail, the quantitative data collection was challenged with incomplete entries. Turnover of student teams each term reflecting the academic schedule also contributed to challenges. Faculty-in-residence have become more involved in reviewing student documentation, which has improved over time. Data collection strategies and in-time review processes need to be strengthened to generate ongoing data for program improvement, establishment of the efficacy and cost-effectiveness of the I-CAN model, and contribution to an understanding of the strength of the intervention.

I-CAN has made substantial progress toward development of a sustainable, scalable, and replicable model through integration with the university's statewide interprofessional and rural campus initiatives, and student learning outcomes for I-CAN correlate with required university graduation competencies. In addition, I-CAN client outcomes are aligned with selected metrics identified by the state Medicaid system, which has provided opportunities to engage the regional Coordinated Care Organizations (CCO) as partners in three of the current sites. One CCO is currently

providing financial support, and another has committed to funding in the next academic year.

Concluding comments

Since this three year evaluation, Physician Assistant and Graduate Program in Human Nutrition students have joined the I-CAN student teams. In addition to the initial three sites, the I-CAN model has successfully scaled the program by adding sites in three additional communities with varying population and service needs; one in an urban community and two in rural areas of the state. Each developing NCAPP builds on existing local relationships between the nursing programs, clinical site coordinators for health professional students, and community health clinics and service agencies. I-CAN has created new roles for faculty and students, and demonstrated that students engaged in authentic healthcare delivery have the capacity to contribute to the achievement of health outcomes and reduced cost. Partners have identified the value of integrating I-CAN into their clinical practice models and expanding their organizational reach. As a model of interprofessional education, I-CAN has the potential to add capacity to any community with health professions education resources.

Disclosure Statement

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