

Evaluation of an interprofessional care coordination model: Benefits to health professions students and the community served

Pamela L. Parsons, PhD, RN, GNP-BC^a, Patricia W. Slattum, PharmD, PhD^b,
Carla K. Thomas, MS, CTRS, CPHQ^c, Jennifer L. Cheng, MS^c, Danah Alsane, PhD^b,
Jean L Giddens, PhD, RN FAAN, ANEF^{d*}

^aDepartment of Family and Community Health Nursing, School of Nursing, Virginia Commonwealth University, Richmond, VA

^bDepartment of Pharmacotherapy and Outcomes Science, School of Pharmacy, Virginia Commonwealth University, Richmond, VA

^cHealth Quality Innovators (HQI), Richmond, VA

^dSchool of Nursing, Virginia Commonwealth University, Richmond, VA

ARTICLE INFO

Article history:

Received 11 April 2020

Received in revised form

1 September 2020

Accepted 20 September 2020

Available online November 19,
2020.

Keywords:

Interprofessional education

Interprofessional practice

Older adults

Care coordination

Community-based care

ABSTRACT

Background/Purpose: An innovative care coordination program was developed to enhance wellness among low-income older adults living in subsidized apartment buildings and to provide rich interprofessional education experiences for health professions students.

Methods: Program effectiveness for the residents was measured through an evaluation of participation, services used, and healthcare utilization. Educational effectiveness was measured through a change in health concepts and perceptions of interprofessional practice.

Findings: Health care utilization among participating residents showed an 8.6% reduction in emergency department visits and 9.8% reduction in hospital admissions. Students demonstrated improved knowledge in motivational interviewing ($p = .02$); diabetes ($p = .02$); hypertension ($p \leq .01$); and frailty ($p \leq .01$). Changes in students perception of interprofessional practice were significant in two areas; Teamwork and Collaboration ($p \geq .00$); and Person Centeredness ($p = .00$).

Discussion: This care coordination model may be an effective approach to reduce care resource utilization among medically complex lower income older adults and provides a rich interprofessional learning experience for students.

Cite this article: Parsons, P.L., Slattum, P.W., Thomas, C.K., Cheng, J.L., Alsane, D., & Giddens, J.L. (2021, May/June). Evaluation of an interprofessional care coordination model: Benefits to health professions students and the community served. *Nurs Outlook*, 69(3), 322–332. <https://doi.org/10.1016/j.outlook.2020.09.007>.

*Corresponding author: Jean L Giddens, School of Nursing, Virginia Commonwealth University, 1100 East Leigh Street, Richmond, VA 23298.

E-mail address: jgiddens@vcu.edu (J.L. Giddens).

0029-6554/\$ -see front matter © 2020 Elsevier Inc. All rights reserved.

<https://doi.org/10.1016/j.outlook.2020.09.007>

Introduction

Despite the significant advances in healthcare over the past two decades, low-income older adults with multimorbid health conditions remain among those with highest disease burden, highest healthcare utilization, and poorest health outcomes. Nearly 800,000 older adult households reside in low-income housing and receive rent assistance through federal support ([Health Impact Project, 2015](#)); as many as half of these individuals are disabled with functional impairment and high chronic disease burden ([Centers for Disease Control and Prevention, 2017](#)). The high rate of health problems, coupled with the social and economic challenges related to accessing resources, results in higher health care utilization, including higher rates of emergency department visits and hospital admission. In addition, these individuals frequently transfer to costlier higher levels of care ([Parsons & Boling, 2007](#); [Dong, Simon, & Evans, 2012](#)).

While hospital-driven interventions that prevent readmissions are well-described ([Coleman, Parry, Chalmers, & Min, 2006](#); [Naylor et al., 1999](#)), housing-based interventions that prevent initial admissions or ED visits are limited ([Kandilov et al., 2018](#)). Certain apartment buildings designated for low-income older adults have been shown to have high rates of ED utilization ([Parsons & Boling, 2007](#)). Overarching strategies that have been described to support these populations include: (a) payment reform to encourage community-based care, (b) better organization of community services, (c) more integration of older adults into the broader community, and (d) increased training of the healthcare and social service workforce to meet population needs ([Kandilov et al., 2018](#)). Specific interventions, including integrating care coordinators into the system of health and social services ([Henwood et al., 2018](#)), housing-based clinics ([Sanders, 2016](#)), partnering with emergency medical services to identify high-need patients ([Agarwal et al., 2015](#)), case management ([You, Dunt, Doyle, & Hsueh, 2012](#)), and home-based visits ([Stuck, Egger, Hammer, Minder, & Beck, 2002](#)), have shown some success with person-centered outcomes such as improvements in quality of life or satisfaction. Two housing-based interventions that decrease utilization of acute health services include: (a) integrating primary care into the setting – a costly approach that is challenging to sustain ([Callahan, 2015](#)); and, (b) connecting social workers to residents to help with accessing services ([Gusmano, Rodwin, & Weisz, 2018](#)). Overall, the most cost-effective model for place-based care is unknown, and more research is needed to determine the impact of different models within different populations and the best direction for overarching policy and payment ([The Mayor's Anti-Poverty Commission, 2013](#); [U.S. Census Bureau, 2018](#)).

Low-income housing settings for older adults represent an opportunity to improve health outcomes through the integration of wellness services,

supporting “aging in place”, and decreasing downstream healthcare utilization. Additionally, these settings represent opportunities for community-based learning experiences for students.

An interprofessional team of faculty from an academic health science center created the Richmond Health and Wellness Program (RHWP), an innovative model that focuses on resident-centered care in three cluster areas: assessment and access to care, health promotion and prevention services, and social determinants of health services ([Parsons, Slattum, & Bleich, 2019](#)). The implementation of this model was supported by federal grant funding. The overall intent of the faculty-led model is to enhance wellness among low-income older adults (particularly those with multiple chronic conditions) by serving as an adjunct to primary care. The model also serves as a robust, interprofessional education (IPE) experience for students by incorporating the four core competencies for interprofessional collaborative practice (Values/Ethics, Roles Responsibilities, Interprofessional Communication, and Teams/Teamwork) ([Interprofessional Education Collaborative \[IPEC\], 2016](#)). Many IPE learning experiences are classroom-based using case studies as the primary basis for learning. However, the RHWP provides a unique opportunity for students to participate in IPE within the context of an interprofessional practice model – in other words, students are exposed to what interprofessional practice actually looks like, thus gaining direct experience with the IPEC core competencies ([IPEC, 2016](#)).

The purpose of this paper is to present findings from the initial evaluation (2014–2016) of the program, how it has benefited the community served, and benefits to students participating in the program as part of their clinical experiences.

Methods

Description of the Program

The RHWP is an on-site nurse-led program offering wellness and care coordination services to individuals residing in low-income housing for older adults in five locations. Each of the apartment buildings are located in urban neighborhoods with limited access to transportation, high rates of crime, and few options for shopping and food access ([Holton & Jettner, 2015](#); [Virginia Performs, 2017](#)). Most residents are over the age of 65, although some younger disabled individuals also reside in the buildings.

The program is open to all residents of the buildings. RHWP faculty partner with building managers and community leaders in each location; a Resident Services Coordinator in each building helps to connect residents with the program. RHWP operates at each building on a consistent half or full day per week depending on the number of residents in that building.

The interprofessional RHWP team includes faculty and students from nursing, pharmacy, medicine, social work, and other health professions (physical therapy, occupational therapy, kinesiology and psychology) at Virginia Commonwealth University. Students complete clinical experiences within RHWP as part of their clinical training for their degree programs.

Resident participation in the program is completely voluntary. Recruitment for the program occurs through informational “town hall” sessions within each building, word of mouth, and referrals from each Resident Services Coordinator. For those residents who wish to participate – referred to as a “resident-participant” – a consent form is signed as part of the enrollment process. The consent process confirms that participation is voluntary and that the resident can drop out at any time, describes the services provided through RHWP, and informs the participant that these services do not replace those provided by their healthcare provider. Because the RHWP team does not have access to medical records, the resident-participant is informed that their data and activities are recorded by RHWP as “case notes”.

A comprehensive structured geriatric intake assessment is conducted as part of the initial visits. The intake assessment – which incorporates evidenced-based measures for frailty (Morley, Malmstrom, & Miller, 2012), cognition (Borson, Scanlan, Chen, & Ganguli, 2003), depression (Marc, Raue, & Bruce, 2008), functional status (Katz, Ford, Moskowitz, Jackson, & Jaffe, 1963), and vulnerability (Saliba et al., 2001) – is used to develop and implement an individualized wellness and care coordination plan.

Following the intake assessments, resident-participants can use any or all services offered by the program when they choose (as often as once per week when the RHWP program is onsite). Resident-participants access the services through (a) on-site wellness visits, (b) home visits, and (c) education sessions. Wellness visits can be scheduled (with extended visit time of 30–45 min per visit) or unscheduled as walk-in visits for unplanned or urgent needs. RHWP team members also make a home visit (to an apartment within the building) for participants who have recently been discharged from a hospital, nursing home, or emergency department as well as those with a decline in their health status. Group education sessions are led by students on a variety of topics such as nutrition and medication management.

Wellness and health preventative services offered by the faculty and students include chronic disease monitoring (such as blood pressure, blood glucose, and weight), health education, behavioral health assessment and support, and medication self-management education. Each resident-participant is provided education on chronic conditions to assist with transitions between settings for care. Ideally these interactions help them identify challenges before needing urgent or emergency care.

Care coordination services include communicating changes in clinical status to primary care providers

(PCP) through telephone communication or connecting residents to an appropriate provider (for those without an identified provider). The RHWP team offers to make the call on behalf of the resident-participant, or the option to or to make the call themselves. If the resident-participant wishes to contact the provider, he or she is provided with the health data obtained as part of the RHWP visit (such as blood pressure measurements or blood glucose readings from the case notes).

The program also links resident-participants to other community service agencies to address social determinants of health. These connections are either made by the RHWP team on behalf of the resident-participant, or information regarding the community service agency is given to the resident-participant if he or she prefers to make the contact. Areas of greatest emphasis include transportation and food insecurity.

The intake assessment form, wellness plans, and other data documented as part of the services offered by RHWP are recorded as case notes and are used by the RHWP team to provide continuity in services to enrolled participants. The case notes were initially collected and stored in a paper format. However data are now collected and stored electronically in a secure database

Description of the Interprofessional Learning

All health science students enrolled at Virginia Commonwealth University have core interprofessional education (IPE) content as part of the curriculum. Two didactic courses are offered for students across disciplines that incorporate IPEC core competencies within the context of case-based learning. The RHWP clinical experience builds on content from the IPE courses. Services are provided by interprofessional student teams and their supervising faculty making for a rich, practice-based IPE experience.

RHWP supports undergraduate and graduate students in nursing and other disciplines. The nursing school leads the program from a faculty and student training perspective, and all student experiences are arranged by a central coordinator employed by the nursing school. The coordination of student participation is extremely complex, taking into account the size and capacity of each RHWP site, multiple disciplines, degree plans, and calendars. Although the number and type of students vary, on most days 10 to 20 students are assigned a clinical experience at RHWP. The list below provides insight to the types of students who rotate through RHWP in a typical semester:

- Undergraduate nursing students enrolled in a community health course; 15-week rotation (8 hr, 1 day every other week); five students/day; 40 students/semester
- Graduate nursing students enrolled in nurse practitioner (NP) concentrations; most NP students

complete a 3-week (8 hr, 3 days/week) rotation. One to two students/day; 15 students/semester

- Pharmacy students (3rd and 4th year) complete a 5-week block rotation (4–8 hr, 3 days/week). Two to three students/day; 12 students/semester.
- Medical students (3rd and 4th year) complete a 3- or 4-week rotation (8 hr, 3-day/week). One to two students/day; 5 students a semester.
- Social Work students (undergraduate and graduate) are placed for an entire semester (8 hr, 3 day/week). Two students/day; 2 students/semester.
- Other health professions – varies but may represent one or two students on a given day.

At the beginning of the academic semester, all students who are assigned clinical experiences at RHWP are required to attend a 4-hour orientation to become familiar with the goals of RWHP, what to expect as a student, protocols, and specifically what they will be doing while on site. Students work through a case study that exemplifies a common resident-participant scenario within RHWP, allowing students to discuss how to work in teams, how and when to use evidence-based tools and assessments, and gain insight into the health disparities and inequity they will encounter. The orientation also includes a session dedicated to motivational interviewing (MI) concepts within an interprofessional framework with the expectation that students will incorporate MI strategies while interacting with the resident participants.

A typical day in the RHWP site begins with a short 30-minute meeting involving all students and faculty attending for the day. The meeting may include brief updates and clarification of assignments and then a short education sessions on core geriatric content (on which a geriatric knowledge assessment is based). Specifically, topics are mapped to the multidisciplinary competencies in the care of older adults. Students are then divided into groups of 3 or 4 students (representing different disciplines) to support wellness visits with anywhere between 2 and 4 student teams running simultaneously; other students may be involved with home visits and student-led group learning sessions.

Student teams involved with the wellness visits interact with the resident-participant to learn the purpose of the visit and to provide appropriate wellness-based services, care coordination, or referrals as needed. Students rotate activities throughout the day allowing all students an opportunity to complete the various activities associated with the wellness visits. Faculty provide guidance to the students and ensures the needs of the resident-participant are appropriately met. At the completion of each wellness visit, the faculty member debriefs with the students, applying evidence-based practice concepts and interprofessional concepts to goal planning and issues discussed during the wellness visit and the morning learning session. Each team completes six to eight wellness appointments in a clinical day. An exemplar of a resident-participant encounter is provided in the [Box 1](#).

Box 1 – Exemplar of Wellness Visit

Mr. Bishop, a 67-year-old man approached the RHWP team, who were located in the community room of his apartment building, requesting to join the program because of a “health scare” after fainting in the lobby on the previous day. The incident prompted the building manager to call an ambulance. Paramedics determined that his blood sugar was “very low” and provided onsite treatment. Although the paramedics encouraged him to be transported to the hospital for follow up care, he elected not to go.

After obtaining consent, the nursing student conducting the initial history learned that Mr. Bishop has diabetes, hypertension, and heart failure. Because he was unable to remember what medications he was prescribed, Mr. Bishop went up to his apartment and brought all of his medications with him so his medication profile could be established. During the medication review, it was discovered that one of his insulin pens was empty; he was aware of the need for a refill but could not get a ride to the pharmacy. He explained that he normally takes 40 units from the blue pen and 10 units from the green pen, but assumed it was okay to substitute insulin from the green pen when the blue pen ran out. Upon further questioning by the pharmacy student, it was discovered that he was unable to read and interpret the medication instructions. Also, it was determined that he had been substituting a long-acting insulin with a short-acting insulin, which may have caused a hypoglycemic reaction on the previous day.

With Mr. Bishop’s permission, the faculty member contacted the primary care provider (PCP) and relayed the events and informed her of the low health literacy concern. The PCP was unaware that health literacy was an issue. The pharmacy student called to get a prescription refill and the social worker student arranged transportation to the pharmacy to pick up the prescription. The RHWP team also developed a self-management plan with Mr. Bishop that included medication self-management and general diabetes education. Further they recommended regular wellness visits for follow-up.

In a debriefing session, the faculty member led a discussion around challenges and barriers to access care, diabetic guidelines for older adults; health literacy; and best practices for communication with another provider.

Students are also assigned to a team to complete home visits at the apartment of a resident-participant who is ill or has recently been discharged from a healthcare service. These visits, involving two students and a faculty member, involve an assessment (including a home assessment) and teaching related to changes in his or her condition. At the completion of each home visit, the faculty member debriefs with the students, applying evidence-based and interprofessional concepts to refine the plan. Depending on the site, the RHWP team may complete up to six home visits in a day.

During a clinical day, students may also be assigned to conduct a group education session for the resident-participants. These learning sessions support the needs of the resident-participants and also align with the learning goals of the student.

Specific objectives support the clinical experiences for students in the various courses. As an example, over

the course of a semester, the undergraduate nursing students are expected to engage in the interprofessional team wellness visit, complete interviews and health assessments, develop wellness goals, participate in health coaching, and determine pathways to address identified care coordination needs. The students also complete community assessments and provide group education at the sites. As another example, nurse practitioner students (or other graduate students) help lead the interprofessional teams, guide risk assessments, establish primary, and secondary prevention goals and participate in discussions regarding medication self-management. All students gain first-hand experiences of the impact social determinants have on the overall health of vulnerable populations with multiple morbidities and complex care needs.

Measurement of Program Effectiveness

The effectiveness of the program has been measured from the standpoint of resident outcomes and educational outcomes. All aspects of the program evaluation plan was reviewed and approved by the university's institutional review board.

Resident Outcomes

Resident outcome effectiveness was determined by evaluating data in the areas of (a) program participation among residents, (b) types of activities utilized by residents, and (c) estimates of health care utilization. The activities of the RHWP were tracked using an adaptation of the Medical Home Care Coordination Measurement Tool (Antonelli, 2011) previously used in pediatric clinics (Vaz et al., 2018) and modified with permission of the primary author. The main domains of the Care Coordination Tool (CCT) consist of care coordination activities needed, activities performed to fulfill care coordination needs, outcomes prevented, outcomes that occurred due to care coordination activities, and notes. To evaluate the impact of RHWP on healthcare utilization, a subset of RHWP enrollees' aggregate chronic disease burden, medication and healthcare utilization (based on Medicare claims data) were compared to Medicare beneficiaries living in the same ZIP Codes as the RHWP residential sites. Medicare data and analysis was obtained through a partnership with a local care transitions coalition supported by Health Quality Innovators (HQI), the Medicare Quality Innovation Network-Quality Improvement Organization (QIN-QIO) for Virginia. RHWP data and comparison data were collected from January 1, 2014 to December 31, 2016.

Demographics, comorbidity data, and utilization endpoints were compiled for both groups from Medicare claims data. The number of chronic conditions for each enrollee was established by searching for high frequency and high-risk ICD-9/10 codes across Parts A and B claims over the entire 3-year evaluation period. The conditions included: (a) cancer, (b) chronic pulmonary disease, (c) coronary artery disease, (d) heart failure, (e) peripheral vascular disease, (f) chronic liver

disease, (g) diabetes, (h) chronic renal failure, and (i) dementia. Once a chronic condition was attributed to an individual, it became part of his/her profile for all three years of the evaluation even if the condition may have been newly diagnosed or resolved during the evaluation time frame. Only enrollees where we were able to extract chronic conditions data based on diagnoses coded in medical claims were included in our analysis. RHWP participants with no claims data were not included in this portion of the evaluation.

Medication and comorbidity data were compared categorically between groups. Utilization data and enrollment status were compiled by quarter and compared over time using a zero-inflated Poisson regression model. This technique was chosen based on the nature of the outcome (non-normally distributed count data with an excess of zeros) (Lambert, 1992). To evaluate the fixed effects of the enrollment group, we assessed the interaction between the enrollment group and timeframe (quarter) on hospital utilization and ED visits adjusted for number of chronic conditions. Throughout the analyses, enrollment group was treated as binary categorical data while number of chronic conditions and timeframe were treated as continuous. Analyses were performed using the statistical software SAS, version 9.3.

Educational Outcomes

The measurement of student outcomes involved tracking of the types and number of students participating, the typical mix of students in the setting on any given day, and the collection of survey data to learn about students' perceptions of the experience, and educational benefit. Survey data were collected from students for four academic semesters in 2016 and 2017. Students were informed that although participating in RHWP was a required clinical experience, data collection (through the completion of surveys) was being done as a part of program assessment, and completion of the surveys was voluntary.

Three instruments were used to collect educational outcome data. A survey, developed by the RHWP team, was used to assess knowledge gains in frequent concepts seen in the RHWP space. Specifically, the survey included 9 items for demographics, and 27 multiple choice questions evaluating students' understanding of 9 concepts (communicating with older adults, health literacy, motivational interviewing, diabetes, hypertension, cognition, falls, frailty, medications, and polypharmacy) in the care of older adults. Although the survey was not formally validated, the knowledge-based survey questions were created using evidence-based clinical guidelines. The survey was administered twice to measure changes over time as a result of their experience. The presurvey was given to students during their orientation; the postsurvey was administered on their last day of clinical. The Wilcoxon signed-rank test was used to examine pre-post knowledge gains.

A second instrument used in the evaluation of educational outcomes was the 40-item modified Readiness for Interprofessional Learning Scale (mRIPLS). The mRIPLS evaluates students attitudes and perceptions of students and professionals to determine their readiness for interprofessional learning and change. The internal consistency for RIPLS was 0.76, demonstrating sufficient validity and reliability. Principle factor analysis resulted in three factors: teamwork and collaboration ($\alpha=0.88$), patient centeredness ($\alpha=0.86$), and sense of professional identity ($\alpha=0.69$) (Reid, Bruce, Allstaff, & McLernon, 2006). The mRIPLS was administered to all students during orientation at the same time the presurvey (described earlier) was administered.

The third instrument used was the Team Performance Scale (TPS), an 18-item survey that measures the quality of learning team interactions in medical education settings. The TPS was used to assess students perceptions of their experiences in an interprofessional team. The Cronbach's alpha for this scale is 0.97 (Thompson et al., 2009). The TPS was administered to all students on the last day of their clinical experience with the postsurvey.

Findings

Demographics of RWHP Resident Participants

A total of 368 residents were enrolled in RHWP from January 2014 through December 2016, representing about 50% of the total population of the apartment buildings and 57% of the five buildings' total Medicare population. The majority of enrollees were female (58%) with most being African American (72%). Most were aged 65 and older (74%) with many reporting income less than \$1,000.00 per month. Of the 368 enrollees, 344 (93%) reported having a PCP upon enrollment. Table 1 presents the baseline demographic data of RHWP enrollees.

Accessing RHWP Services

The engagement of resident-participants with RHWP steadily grew over the initial 3-year evaluation period. In 2014, participants had a mean average of 5.6 visits per year. In 2015, the mean visits per year increased to 7.8, and by 2016, the mean visits per year increased to 8.4. The increased visits per year are attributed to ongoing visibility and interest in services provided.

Care Coordination Services

During the evaluation period a total of 7,355 care coordination needs were identified among RWHP participants. The two services most frequently used were disease monitoring (35%) and health education (28%). Other services including chronic disease monitoring (11%), medication self-management (5%), and appointment scheduling (4%) were common services provided,

Table 1 – Self-Reported* Demographic Characteristics of Richmond Health and Wellness Program Enrollees (n = 368) from January 2014 Through December 2016

RHWP Program Enrollees Characteristics	n (%)
Age (years)**	
Less than 55	11 (3%)
55–64	83 (22.6%)
65–74	145 (39.4%)
75–84	95 (25.8%)
85 and older	21 (5.7%)
Not reported	13 (3.5%)
Gender	
Female	215 (58.4%)
Male	152 (41.3%)
Not reported	1 (0.3%)
Race	
African American	265 (72%)
White	53 (14.4%)
Other	6 (1.6%)
Not reported	44 (12%)
Monthly income	
≥\$1,000	85 (23.1%)
<\$1,000	183 (49.7%)
Not reported	100 (27.2%)
Education	
< High school education	121 (32.9%)
High school graduate/GED	107 (29.1%)
> High school	79 (21.5%)
Not reported	61 (16.6%)
Health insurance	
Dual eligible (Medicare/Medicaid)	153 (41.6%)
Medicare only	137 (37.2%)
Medicaid only	22 (6%)
Not reported/uninsured/other	56 (15.2%)

* Note: All data reflects self-reported information at time of enrollment.

** Note: Age in 2014 or at enrollment if enrolled in 2015 or 2016.

representing 10,663 interventions to address these needs. Most interventions were carried out as face-to-face conversations with the client during the clinic visit and did not require communication with outside providers or alternate agencies. The most common documented outcomes (n = 6,399) included meeting in real-time the resident's immediate needs and answering questions or concerns (55%), advising resident/family on home self-management (22%), resident advocacy (4%), and referral for a primary care provider office visit (4%).

Health Care Utilization

Mentioned previously, the RHWP team did not have access to resident-participant medical records. For this reason, program effectiveness for health care utilization was evaluated comparing a population of Medicare beneficiaries in the same zip code as RHWP participants with Medicare benefits. Out of the 368 RHWP participants, 304 (82.6%) were Medicare beneficiaries. Of these 304 Medicare beneficiaries, 227 had claims which provided the data for our analysis.

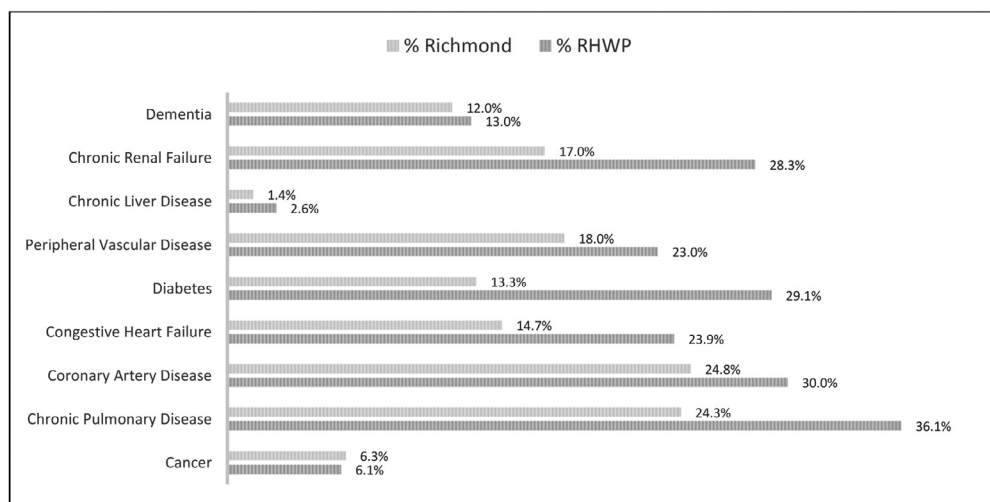


Figure 1 – Percent of RHWP enrollees with chronic conditions compared to Richmond Medicare population.

We found that RHWP enrollees with Medicare had a greater chronic disease burden with 50% of enrollees having two or more chronic conditions compared to 38% in the comparison population. RHWP enrollees also had higher frequencies of eight of the nine specific conditions selected for analysis (Figure 1). Further, 59.3% of the RHWP enrollees had 11 or more prescribed medications annually compared to 45% of the general Medicare Population.

Healthcare utilization (emergency department visits and hospital utilization) were correlated with enrollment, time, and comorbidity. When compared to the comparison population (Medicare beneficiaries living in the same zip codes) RHWP participants had higher rates of ED visits (2.19x comparison group; $p = .002$) and hospital admissions (2.35x comparison group; $p = .013$). An increase in emergency department visits (1.09x per each additional quarter; $p < .001$) and hospital admissions increased over time for both the RHWP participants and the comparison group. For all individuals, an increasing number of chronic conditions correlated with more ED visits (1.34x per each additional condition; $p < .001$) and hospital admissions (1.94x per each additional condition; $p < .001$).

Because the RHWP enrollees were more medically complex, we adjusted for the number of chronic conditions. Using this adjustment, there was a benefit of being enrolled in the RHWP over time. ED visits were 8.6% lower than predicted based on the baseline rate for similar patients in the comparison group ($p = .002$). In addition, hospital admissions were 9.8% lower than predicted ($p = .010$). Figures 2 and 3 present this effect on ED visits and hospital admissions, respectively, for an individual with the median number of comorbidities for the population (two chronic conditions).

Educational Findings

Data to evaluate the educational benefits were collected between August 2016 and December 2017.

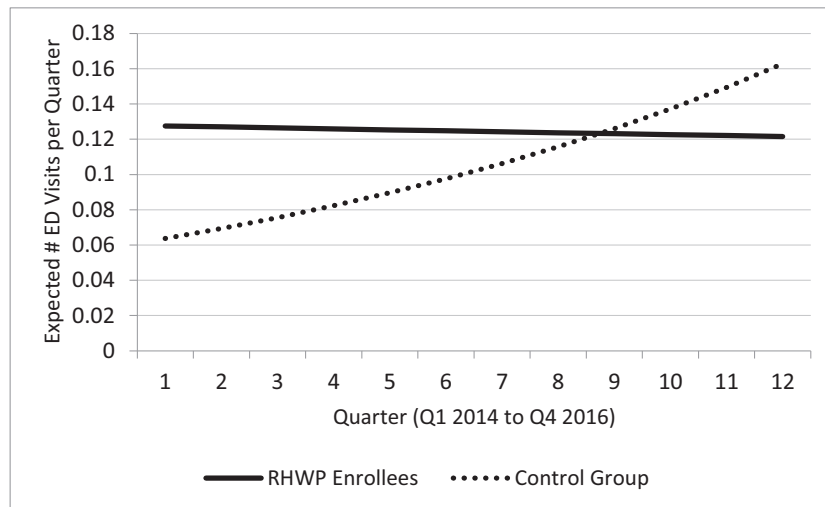
During this time period, a total of 319 students had a clinical experience at RWHP, and a total of 199 students elected to complete the survey, representing a response rate of 62%. Those who responded included undergraduate nursing (41%), graduate nursing (16%) pharmacy (13%), social work (1%), medicine (2%), and students from a variety of other professional schools (17%); 14% of respondents did not indicate their program of study.

The Wilcoxon signed rank test was used to analyze the pre-post test scores. Students' understanding of concepts affecting older adults improved in four areas: motivational interviewing ($p = .02$); diabetes ($p = .02$); hypertension ($p \leq .01$); and frailty ($p \leq .01$) (see Table 2).

The mean (SD) of the TPS score was 5.37 (0.67) out of 6, indicating that teams performed well. There was significant positive relationship between the TPS and two of the mRIPLS subscales: TWC ($p \geq .00$); and PC ($p = .00$), suggesting that students generally had positive attitudes toward interprofessional learning at the start of their RHWP experience and perceived that their teams performed well participating in RHWP.

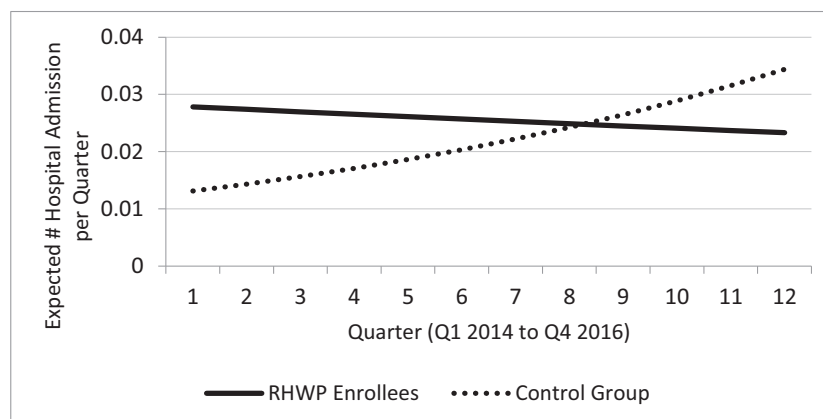
Recognizing the limited usefulness of the TPS and mRIPLS correlations, a few comments from student evaluations regarding the benefits and challenges of the interprofessional experiences have been included here. These are not intended to represent formal qualitative data, but rather serve as supplemental information to provide a glimpse of the student perspective from the RWHP experience.

- Benefits from the experience:
 - "I loved having different disciplines and seeing their roles in action."
 - "I believe it was really valuable to sit around a table with people from completely different disciplines."



¹Modeled for patients with the median number of chronic conditions (n=2)

Figure 2 – Modeled number of Emergency Department (ED) visits per quarter for RHWP enrollees versus comparison group



¹Modeled for patients with the median number of chronic conditions (n=2)

Figure 3 – Modeled number of hospital admissions per quarter for RHWP enrollees versus comparison group.

- “Interprofessional collaboration helps pt obtain need and students learn as well. For students it helps better define roles in the team. For pts it helps prevent unnecessary medical related costs.”
- “This showed me how important and effective interprofessional care is to helping patient outcomes.”
- Identified challenges included:
 - “It is hard for all team members to speak with pt so roles definitely have to be figured out “on the fly.”
 - “Because all patients are different, and all groups of students change things could be inconsistent.”
 - “I think having a set interprofessional team would help us work together more efficiently. At least letting us work together for a couple of weeks rather than switching every week.”

Discussion

The initial evaluation of the RWHP program suggests there is a positive benefit to both the community served and the students. The lack of faculty and students trained in the care of older adults and the importance of providing geriatric care with a team-based interdisciplinary approach is well known (Fulmer, 2020).

Through the engagement of the residents living in several low-income apartment buildings, RHWP delivered over 7,000 care coordination activities for the 368 enrollees in the three-year evaluation period. An important difference between an on-site wellness model and traditional primary care is the ability to have frequent, ongoing interactions and assessments, with the residents. These frequent interactions help to ensure their stability, reinforce education and adherence, and address changes to health and social needs

Table 2 – Geriatric Knowledge Before and After Participation in RHWP

Knowledge Domain	Presurvey Median (IQR)	Postsurvey Median (IQR)	p value
Communicating with older adults	3.00 (3.00–3.00)	3.00 (3.00–3.00)	.34
Health literacy	3.00 (2.00–3.00)	3.00 (2.00–3.00)	.25
Motivational interviewing	2.00 (1.00–2.00)	2.00 (1.00–2.00)	.02*
Diabetes	2.00 (2.00–3.00)	3.00 (2.00–3.00)	.02*
Hypertension	1.00 (1.00–2.00)	2.00 (1.00–3.00)	<.001*
Cognition	3.00 (2.00–3.00)	2.00 (2.00–3.00)	.79
Falls	3.00 (3.00–3.00)	3.00 (3.00–3.00)	.87
Frailty	2.00 (1.00–2.00)	2.00 (1.00–2.00)	.002*
Medication and polypharmacy	2.00 (2.00–3.00)	2.00 (2.00–3.00)	.06

* Significant p value <.05.

earlier than through established primary care venues. High touch engagement in the primary care setting has been shown to improve utilization and health outcomes (Ghany et al., 2018). RHWP provides a different model of high-touch care, focused on wellness, timely care coordination, and meeting people at the place where they live, all essential components of person-centered care. Faculty and students rely on these interactions to develop solutions suited to their challenges, which are both individual- and context-bound. This work inherently depends on the people being served, the healthcare practitioners, and contextual factors (Hewitt, Sims, & Harris, 2014).

The RHWP activities appear to address some health-related challenges through a community-embedded, interprofessional care coordination model. The comparison data between RHWP enrollees the general Medicare population confirmed the significant health disparities among RHWP enrollees and the general Medicaid population. Although RHWP program participants had a higher burden of chronic disease, RHWP enrollees had lower rates of hospitalizations and ED visits in analyses adjusted for disease burden. These findings are consistent with other studies evaluating health care utilization (Vandiver, Anderson, Boston, Bowers, & Hall, 2018).

Thus, this model shows the potential to be cost-effective and scalable for use in population-health. In line with other approaches (Callahan, 2015; Gusmano et al., 2018), RHWP is a pragmatic, local approach that may be useful in addressing care coordination for a complex population in other locales and complements the findings from other models targeting individuals with multi-morbidity and complexity (Iloabuchi, Mi, Wanzhu, & Counsell, 2014). This model adds to the evidence that defines care coordination strategies in the community setting that can provide benefit.

The evaluation also suggests benefit to students. By engaging students from multiple professions, the RHWP model may be a fertile training ground for training future practitioners about principles of care

coordination, interprofessional collaboration, geriatrics, community and population health and team functioning. The need for robust interprofessional learning opportunities, particularly for students in the health professions, has been well documented (Zorek & Raehl, 2013). The RHWP has the added value that the practice-based interprofessional learning likely exceeds what can be done in a classroom setting.

Limitations

The evaluation of RHWP presented here has several limitations. Because of the inability to conduct the evaluation of RHWP using a true control group and a precise and quantifiable intervention, a known limitation is that it is difficult (if not impossible) to directly attribute the leveling of the healthcare utilization to participation in the RHWP. The resident-participants are not engaged with RHWP through an established care system and use different health care systems and providers across the city for services. Because the RHWP team did not have access to health records, this led to challenges establishing a comparison group and the ability to connect to health data. Also, claims data are only available over a three-year period per CMS data storage policy for QIN-QIOs. As such, data proceeding the evaluation period were not available. Another known limitation is that the RHWP participants self-selected into the program, thus many not be representative of the larger population of older adults living in similar settings. In addition, some data may have been omitted from paper records, the care coordination tool, or claims data.

Several limitations in the evaluation of the educational benefits also exist. The use of an untested pre- and post-survey instrument developed by the RHWP team, and the fact that completing the survey was voluntary, makes drawing firm conclusions difficult and may represent the experiences of all students. Developing a process for interprofessional learning where each of the disciplines was able to adapt to a schedule that adhered with their class and school requirements was a challenge, thus limiting consistent participation, particularly in the early stages of implementation. The complexity of scheduling has proven to be one of the greatest challenges of the IPE component of RHWP. Finally, there was no attempt to link and measure students' learning in previous interprofessional education courses to the IPE experiences within RHWP.

Conclusion

The RHWP identified health needs, provided a number of diverse services, and moderated healthcare utilization of low-income older adults. These findings make it a promising approach for addressing the poor health outcomes experienced by low-income, older adults. The

initial results from this evaluation enhanced our commitment to not only continue this program but also identify additional activities to support the collaboration between older adults, healthcare practitioners, and external entities to improve health outcomes (Salter & Kothari, 2014). The results also enhanced our interest in expanding the number and types of students engaged in interprofessional clinical experiences.

Now in its seventh year, the program continues to expand in the number of resident-participants, services offered and students engaged in clinical learning within RHWP sites. There are now over 1,000 resident-participants enrolled in six sites. An important additional service offered by RHWP (in partnership with the local food bank) is the Healthy Meal program, which provides a hot meal to residents of the apartment building once a week while the RHWP team is on site. This service was initiated based on a need identified by the RHWP team to address food insecurity and social isolation (Diallo et al., 2020). To date, over 1,000 students from nine disciplines have participated in the program; over the past 2 years, law students have also been participating.

The program implementation and initial evaluation was supported by federal grant funding. Since the completion of that funding, long-term program sustainability has been an ongoing priority. Sustainability of programs such as this requires commitment from all parties involved (Bernal, Shellman, & Reid, 2004; Hamner, Wilder, & Byrd, 2007). The program has successfully garnered donor support and additional grant support from various organizations. It has also recently received the Age-Friendly Health Systems designation from the Institute for Healthcare Improvement. Additionally, because of the opportunity to promote interprofessional learning among health professional students and the clear alignment for community engagement within the university's strategic plan, there has been significant resource support for this program at the university level through the provision of faculty time and staff support.

A robust and comprehensive study is underway to evaluate and potentially substantiate healthcare cost benefit. Such findings could lead to long-term support (such as subsidies from insurance agencies and/or Medicare managed care), to reduce costly hospitalizations among this population. From an education standpoint, there is a need to conduct a comprehensive evaluation of the interprofessional education component of RHWP. Long-term support and commitment from the university and from the deans of the participating schools is needed to successfully integrate RHWP into program curricula and for consistent student learning experiences through faculty engagement.

Fundings

This project is/was supported by the Health Resources and Services Administration (HRSA) of the U.S. Department of Health and Human Services (HHS) under grant

number [UD7HP26044](#), The Richmond Health and Wellness Program (RHWP): Expanding Nurse-Led Interprofessional Collaborative Practice (IPCP) Teams for Community-Dwelling Older Adults, total award amount \$1,488,584.00, 0% financed by nongovernmental sources. This information or content and conclusions are those of the author and should not be construed as the official position or policy of, nor should any endorsements be inferred by HRSA, HHS or the U.S. Government.

Medicare data and analysis were obtained through a partnership with a local care transitions coalition supported by Health Quality Innovators (HQI), the Medicare Quality Innovation Network-Quality Improvement Organization (QIN-QIO) for Virginia.

REFERENCES

- Agarwal, G., Angeles, R. N., McDonough, B., McLeod, B., Marzanek, F., Pirrie, M., . . . , Dolovich, L. (2015). Development of a community health and wellness pilot in a subsidized seniors' apartment building in Hamilton, Ontario: Community health awareness program delivered by emergency medical services (CHAP-EMS). *BMC Research Notes*, 8, 113, doi:[10.1186/s13104-015-1061-8](#).
- Antonelli, R. C. (2011). Care Coordination Measurement Tool (CCMT). Appendix IV: Care coordination measure instruments. *Care Coordination Measures Atlas*. Rockville, MD: Agency for Healthcare Research and Quality. 2011. Available from: <http://archive.ahrq.gov/professionals/systems/long-term-care/resources/coordination/atlas/careap4.pdf>.
- Bernal, H., Shellman, J., & Reid, K. (2004). Essential concepts in developing community-university partnerships. *Public Health Nursing*, 21(1), 32–40.
- Borson, S., Scanlan, J. M., Chen, P., & Ganguli, M. (2003). The Mini-Cog as a screen for dementia: Validation in a population-based sample. *Journal of the American Geriatrics Society*, 51(10), 1451–1454.
- Callahan, C. (2015). Controversies regarding comprehensive chronic care: Coordinated care: The drug-free wonder drug. *Journal of the American Geriatrics Society*, 63(9), 1938–1940.
- Centers for Disease Control and Prevention. (2017). National center for chronic disease prevention and health promotion, division of population health. BRFSS prevalence & trends data. Atlanta, GA. Available from: <https://www.cdc.gov/brfss/brfssprevalence/>.
- Coleman, E. A., Parry, C., Chalmers, S., & Min, S. J. (2006). The care transitions intervention: results of a randomized clinical trial. *Archives of Internal Medicine*, 166(17), 1822–1828.
- Diallo, A., Falls, K., Hicks, K., McQueen-Gibson, E., Obaid, R., Slattum, P., . . . , Parsons, P. (2020). The Healthy Meal Program: A food insecurity screening and referral program for urban dwelling older adults. *Public Health Nursing*, 37, 671–676, doi:[10.1111/phn.12778](#).
- Dong, X., Simon, M., & Evans, D. (2012). Elder self-neglect and hospitalization: Findings from the health and aging project. *Journal of the American Geriatrics Society*, 60(2), 202–209.
- Fulmer, T. (2020). A retrospective/prospective on the future of geriatric nursing. *Geriatric Nursing*, 41, 29–31.

- Ghany, R., Tamriz, L., Chen, G., Dawkins, E., Ghany, A., Forbes, E., Tajiri, T., . . . , Palacio, A. (2018). High-touch care leads to better outcomes and lower costs in a senior population. *The American Journal of Managed Care*, 24(9), e300–e304.
- Gusmano, M. K., Rodwin, V. G., & Weisz, D. (2018). Medicare beneficiaries living in housing with supportive services experienced lower hospital use than others. *Health Affairs (Millwood)*, 37(10), 1562–1569, doi:10.1377/hlthaff.2018.0070.
- Hamner, J., Wilder, B., & Byrd, L. (2007). Lessons learned: Integrating a service learning community-based partnership into the curriculum. *Nursing Outlook*, 55, 106–110.
- Health Impact Project. (2015). *Connecting public housing and health: A health impact assessment of HUD's designated housing rule*. Washington, DC: Pew Charitable Trusts. Available from: <http://www.pewtrusts.org/~media/assets/2015/06/connecting-public-housing-and-health.pdf>.
- Henwood, B. F., Harris, T., Woo, D., Winetrobe, H., Rhoades, H., & Wenzel, S. L. (2018). Availability of comprehensive services in permanent supportive housing in Los Angeles. *Health and Social Care Community*, 26(2), 207–213. doi:10.1111/hsc.12510.
- Hewitt, G., Sims, S., & Harris, R. (2014). Using realist synthesis to understand the mechanism of interprofessional teamwork in health and social care. *Journal of Interprofessional Care*, 28(6), 501–506.
- Holton, V., & Jettner, J. (2015). *Identifying regional priorities and opportunities*. VCU Division of Community Engagement. Available from: http://scholarscompass.vcu.edu/community_resources/27/.
- Iloabuchi, T., Mi, D., Wanzhu, T., & Counsell, S. (2014). Risk factors for early hospital readmission in low-income older adults. *Journal of the American Geriatrics Society*, 62(3), 489–494, doi:10.1111/jgs.12688.
- Interprofessional Education Collaborative. (2016). *Core competencies for interprofessional collaborative practice: 2016 update*. Washington, DC: Interprofessional Education Collaborative.
- Kandilov, A., van Hasselt, M., Saunders, A., Siegfried, N., Stone, R., Edwards, P., Collins, A., . . . , Brophy, J. (2018). The impact of the Vermont support and services at home program on healthcare expenditures. *Cityscape: A Journal of Policy Development and Research*, 20(2), 7–18. Office of Policy Development and Research, US Dept of Housing and Urban Development. Available from: <https://www.huduser.gov/portal/periodicals/cityscpe/vol20num2/article1.html>.
- Katz, S., Ford, A. B., Moskowitz, R. W., Jackson, B. A., & Jaffe, M. W. (1963). Studies of illness in the aged. The index of ADL: A standardized measure of biological and psychological function. *JAMA*, 185(12), 914–919.
- Lambert, D. (1992). Zero-inflated Poisson regression, with an application to defects in manufacturing. *Technometrics*, 34(1), 1–17.
- Marc, L., Raue, P., & Bruce, M. (2008). Screening performance of the Geriatric Depression Scale (GDS) in a diverse elderly home care program. *The American Journal of Geriatric Psychiatry*, 16(11), 914–921.
- Morley, J. E., Malmstrom, T. K., & Miller, D. K. (2012). A simple frailty questionnaire (FRAIL) predicts outcome in middle aged African Americans. *The Journal of Nutrition, Health and Aging*, 6(7), 601–608.
- Naylor, M. D., Broton, D., Campbell, R., Jacobsen, B. S., Mezey, M. D., Pauly, M. V., . . . , Schwartz, J. S. (1999). Comprehensive discharge planning and home follow-up of hospitalized elders: a randomized clinical trial. *JAMA*, 281(7), 613–620.
- Reid, R., Bruce, D., Allstaff, K., & McLernon, D. (2006). Validating the Readiness for Interprofessional Learning Scale (RIPLS) in the postgraduate context: are health care professionals ready for IPL? *Medical Education*, 40(5), 415–422.
- Saliba, S., Rubenstein, M., Solomon, D. H., Solomon, D. H., Young, R. T., Kamberg, C. J., Roth, C., MacLean, C. H., Shekelle, P. G., Sloss, E. M., . . . , Wenger, N. S. (2001). The Vulnerable Elders Survey: A tool for identifying vulnerable elders in the community. *Journal of the American Geriatrics Society*, 49(12), 1691–1699.
- Salter, K. L., & Kothari, A. (2014). Using realist evaluation to open the black box of knowledge translation: a state-of-the-art review. *Implant Science*, 9, 115, doi:10.1186/s13012-014-0115-y.
- Sanders, A. (2016). *Housing with services: Pooling resources to serve residents of 11 affordable housing properties*. Portland Oregon: Case study Sept 2016. Available from: https://www.leadingage.org/sites/default/files/Housing%20With%20Services_Portland%20OR_FINAL.PDF.
- Stuck, A., Egger, M., Hammer, A., Minder, C. E., & Beck, J. C. (2002). Home visits to prevent nursing home admission and functional decline in elderly people: Systematic review and meta-regression analysis. *JAMA*, 287(8), 1022–1028.
- The Mayor's Anti-Poverty Commission. (2013). *The Mayor's anti-poverty commission report*. Richmond, VA: Author. Available from: http://www.richmondgov.com/CommissionAntiPoverty/documents/Antipovertycommissionfinal1_17_2013c-printready.pdf.
- Thompson, B. M., Levine, R. E., Kennedy, F., Naik, A. D., Foldes, C. A., Coverdale, J. H., Kelly, P. A., Parmelee, D., Richards, B. F., . . . , Haidet, P. (2009). Evaluating the quality of learning-team processes in medical education: Development and validation of a new measure. *Academic Medicine*, 84(10 Suppl), S124–S127, doi:10.1097/ACM.0b013e3181b38b7a.
- U.S. Census Bureau. (2018). *Quick facts Richmond VA*. Washington, DC: U.S. Census Bureau. Available from: <https://www.census.gov/quickfacts/table/PST045216/51760>.
- Vandiver, T., Anderson, T., Boston, B., Bowers, C., & Hall, N. (2018). Community-based home health programs and chronic disease. *Professional Case Management*, 23(1), 25–31, doi:10.1097/NCM.0000000000000242 2018.
- Vaz, L. E., Farnstrom, C. L., Felder, K. K., Guzman-Cottrill, J., Rosenberg, H., & Antonelli, R. C. (2018). Utilizing a modified care coordination measurement tool to capture value for a pediatric outpatient parenteral and prolonged oral antibiotic therapy program. *Journal of Pediatric Infectious Disease Society*, 7(2), 136–142.
- Parsons, P., & Boling, P. (2007). Patterns of emergency care use in residential care settings: opportunities to improve quality of transitional care in the elderly. *Home Health Care Serv Q*, 26(4), 79–92.
- Parsons, P., Slatum, P., & Bleich, M. (2019). Mainstreaming health and wellness: The RHWP Innovation Model to complement primary care. *Nurs Forum*, 54, 263–269.
- Virginia Performs. (2017). *Poverty*. Commonwealth of Virginia. Available from: http://vaperforms.virginia.gov/Economy_Poverty.cfm.
- You, E. C., Dunt, D., Doyle, C., & Hsueh, A. (2012). Effects of case management in community aged care on client and carer outcomes: A systematic review of randomized trials and comparative observational studies. *BMC Health Services Research*, 12, 395, doi:10.1186/1472-6963-12-395.
- Zorek, J., & Raehl, C. (2013). Interprofessional education accreditation standards in the USA: A comparative analysis. *Journal of Interprofessional Care*, 27(2), 123–130, doi:10.3109/13561820.2012.718295.