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Determining Success Factors in Interprofessional Practice with Dynamic Teams

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Determining Success Factors in Interprofessional Practice with Dynamic Teams

A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy at Virginia Commonwealth University

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List of Abbreviations

IOM - Institute of Medicine

IHI - Institute for Healthcare Improvement

WHO - World Health Organization

IPEC - Interprofessional Education Collaborative

IPE - Interprofessional Education

CAIPE - Centre for the Advancement of Interprofessional Education

CIHC - Canadian Interprofessional Health Collaborative

HPAC - Health Professions Accreditors Collaborative

IPLC - Interprofessional Learning Continuum

CINHAL - Cumulative Index of Nursing and Allied Health Literature

ERIC - Educational Resources Information Centre

MeSH - Medical Subject Headings

TDM - Development Measure

THSKAT - Tuft Health System Knowledge Assessment Test

PVTHC - Perception of Value of Team Health Care

TCI - Team Competence Instrument

RIPLS - Readiness for Interprofessional Learning Scale

ATHCTS - Attitudes Towards Health Care Teams Scale

TPS - Team Performance Scale

C-ICE - Creighton Interprofessional Collaborative Evaluation

PPPC - Patient Perception of Patient-Centeredness

RHWP - Richmond Health and Wellness Program

VCU - Virginia Commonwealth University

BSN - Bachelor of Science in Nursing

NP - Nurse Practitioner

ICC - Intra-class correlation coefficient

IEPS - Interdisciplinary Education Perception Scale

COPD - chronic obstructive pulmonary disease

CAD - coronary artery disease

MI - myocardial infarction

GERD - gastroesophageal reflux disease

CMS - Center for Medicare and Medicaid Services

CCW - Chronic Conditions Data Warehouse

HIV/AIDS - human immunodeficiency virus/ acquired immunodeficiency syndrome

SOAP - subjective, objective, assessment and plan

S-CVI - Scale Content Validity Index

IRB - Institutional Review Board

PI - Principal Investigator

REDCap - Research Electronic Data Capture application

VIF - Variance Inflation Factor

Abstract

Background: In the healthcare setting, effective teamwork is essential to achieve the quadruple aim of improving patient outcomes, improving population health, increasing health worker satisfaction, and reducing medical cost and error. The interprofessional healthcare team is dynamic to cope with complex issues and needs existing in the healthcare environment. Healthcare students must be trained to function properly within a dynamic team before entering the workforce. Understanding the important factors that predict dynamic team effectiveness helps health educators to establish team training models that focus on improving collaborative student performance that facilitates their transition to practice and helps to improve the health and system outcomes.

Objectives: 1) Assess the impact of a practice-based interprofessional education (IPE) model on student attitudes and knowledge toward interprofessional teamwork. **2)** Evaluate predictors associated with team effectiveness among dynamic student teams participating in a practice-based IPE setting.

Methods: This was an exploratory cross-sectional study using a multi-measures approach to evaluate dynamic student teams in a real-life environment. Measures include self-reported surveys, a knowledge test, video recording of team encounters, and an assessment of team healthcare plans. Study participants consist of students and clients participating in the Richmond Health and Wellness Program (RHWP) during the 2018 fall semester. Basic demographic information was collected from the students and clients. Student perceptions and knowledge were assessed using the Attitudes Towards Health Care Teams Scale (ATHCTS) and geriatrics knowledge questions. Team effectiveness was assessed based on students, clients, observer, and faculty rating. Pre/post analyses were conducted to assess the impact of RHWP on students'

learning outcomes. Regression analyses were conducted to assess predictors associated with team effectiveness.

Results: The sample size was equal to 72 students and 48 clients who participated in 100 clinical sessions. Most of the students were undergraduate nursing students (n = 27; 42.2 %), female (n = 56; 87.5 %), white (n = 45; 70.3 %), aged 20-29 years (n = 51; 79.7 %) and had small amount of experience working in a healthcare environment (n = 19; 29.7 %). Majority of the clients were African American (n = 42; 87.0 %), with education level less than high school (n = 25; 52.1 %) and average age of 67.2 (±9.4) years. Only 10 (20.8%) clients had a behavioral health visit, and the average number of client wellness visits was 24.2 (±20.2). The team size had an average number of 3.6 (±0.9) students, with most of the encounters occurring in building A clinic (31%) and were debriefed by nursing faculty (57%). Overall, there was a significant improvement in student attitudes and knowledge after participating in RHWP ($p = 0.0002$ and $p = 0.0005$ for ATHCTS and geriatrics knowledge questions, respectively). Among the evaluation approaches, faculty and client ratings were robust to evaluate dynamic student team effectiveness (R-squared = 53.6 % and 41.7 %, respectively). Predictors of faculty rating included student age 40-49 years ($b = -3.96$, $p = 0.0072$), client age ($b = 0.28$, $p < 0.0001$), white client ($b = 5.91$, $p = 0.0033$), client with education level of 12 years ($b = -3.48$, $p = 0.0020$) or higher ($b = -3.68$, $p = 0.0332$), number of wellness visits ($b = -0.06$, $p = 0.0157$), number of students on the team ($b = -1.51$, $p = 0.0182$), clinic in building C ($b = -3.81$, $p = 0.0255$) and D ($b = 8.30$, $p = 0.0002$), and faculty from pharmacy ($b = -13.28$, $p = < 0.0001$) and social work ($b = -10.71$, $p = < 0.0001$). Predictors of client rating include male student ($b = -6.70$, $p < 0.0001$), student with prior healthcare career ($b = 6.16$, $p = 0.0151$), number of clients each student encountered ($b = 1.77$, $p = 0.0154$), client age ($b = -0.36$, $p = < 0.0001$), client who was neither black nor white ($b = -25.43$, $p < .0001$),

client with more than 12 years of education (b = 6.56, p = 0.0008), number of wellness visits (b = -0.07, p = 0.0154), number of students on the team (b = -1.53, p = 0.0354), and clinic in building D (b = 6.38, p = 0.0016) and E (b = -8.97, p = < 0.0001).

Conclusion: Practice-based IPE models are an excellent opportunity for health professions students to improve their skills, knowledge, and attitudes toward interprofessional teamwork, preparing them for the collaborative-practice environment. Video recording can be used as a data collection measure to assess dynamic team effectiveness in a real-life environment. The results of this study suggests that in practice-based IPE models faculty and client ratings can be used as an approach to evaluate dynamic student team effectiveness. Further studies are needed to evaluate dynamic team interactions and identify elements corresponding to team development.

Chapter 1: Introduction

1.1 Interprofessional Education and Practice

Background

Collaborative practice has been emphasized by healthcare leaders, administrators, and providers as an essential element to restructure the healthcare system. A series of reports published by the Institute of Medicine (IOM) highlight the importance of interprofessional education and collaborative practice to strengthen the healthcare system and improve health outcomes.[1, 2, 3] Additionally, the Institute for Healthcare Improvement (IHI) focuses on the contribution of collaborative practice in achieving the quadruple aim of improving patient experience, improving population health, reducing medical cost and errors, and increasing the healthcare team's satisfaction.[4, 5, 6]

Collaborative practice occurs when a team of healthcare providers from different professions work collaboratively with clients to deliver high-quality, team-based care. Thus, collaborative practice requires a specific set of competencies to support the proper function of the interprofessional team. These competencies focus on understanding the roles and responsibilities of each member within the team and utilizing appropriate communication strategies to deliver client-centered care. Delivering client-centered care supports effective collaboration and shared value decision-making among team members and clients.[7]

The interdependence that exists between the health education system and the healthcare system has been explained by various frameworks published by D'Amour and Oandasan, the World Health Organization (WHO) Study Group on Interprofessional Education and Collaborative Practice, and Frenk et al. [7, 8, 9]

Early on, members from six associations of health professions schools in the United States, including dentistry, nursing, medicine, osteopathic medicine, pharmacy, and public health, recognized the importance of restructuring the health education system to prepare students to work effectively in collaborative practice environment. As a result, the Interprofessional Education Collaborative (IPEC) was established to guide and endorse the incorporation of interprofessional education (IPE) into the health education system curriculum. Recently, the IPEC expanded to include health professions specializing in podiatric medicine, physical therapy, occupational therapy, psychology, veterinary medicine, optometry, allied health, social work, and physician assistants.[10, 11]

IPE Definition

Interprofessional education has varying definitions across organizations. The WHO describes IPE as an occasion that occurs "when students from two or more professions learn about, from and with each other to enable effective collaboration and improve health outcomes."[7] The Centre for the Advancement of Interprofessional Education (CAIPE) defines IPE as occurring "when two or more professions learn with, from and about each other to improve collaboration and the quality of care."[12] The Interprofessional Education Consortium defines IPE as "a learning process that prepares professionals through interdisciplinary education and diverse fieldwork experiences to work collaboratively with communities to meet the multifaceted needs of children, youth, and families. It provides the knowledge, skills, and values individuals need to collaborate effectively with others as they serve communities and families."[13] The Canadian Interprofessional Health Collaborative (CIHC) describes IPE as an event that occurs when "health care professionals learn collaboratively within and across their disciplines in order to gain the knowledge, skills, and values required to work with other health care

professionals."[14]

Despite variation in the IPE definition, all agree that IPE is an approach which enables students to work with their colleagues in other health disciplines throughout their education, where they can share their knowledge and expertise and build their teamwork skills, preparing them for collaborative practice.[15, 16, 17]

IPE Competencies

In United States, the IPEC expert panel identifies four main domains that cover IPE competencies.

1) Value and ethics for interprofessional practice: work with different professions in professional environment where expertise is shared and respected
2) Roles and responsibilities: understand the roles and responsibilities of different professions toward achieving an appropriate healthcare plan
3) Communication: communicate effectively with clients, communities, and healthcare professionals to deliver high-quality, patient-centered team-based care
4) Teamwork: utilize teamwork skills to perform effectively in different teams. Effective teams require appropriate planning, implementation, and evaluation of client and community needs to achieve safe and effective outcomes

These competency domains guide health professions educators in designing IPE curricula with appropriate activities and assessment plans that best reflect the effectiveness of IPE on learning, health, and system outcomes.

Recently, the accreditation councils of many health professions schools in the United States required their schools to implement IPE into their curriculum. This led to the formation of

the Health Professions Accreditors Collaborative (HPAC) to regulate the appropriate implementation of an IPE curriculum that aligns with IPEC competencies.[11]

IPE Models

Interprofessional education can exist in different models, such as exchange-based, action-based, observation-based, simulation-based, and practice-based IPE models. In the exchange-based model, learning occurs by sharing views or expertise about a specific case. Learners in the action-based model work collaboratively with each other on a particular project. In the observation-based model, learning occurs through shadowing or observation, which is then followed by discussion. The simulation-based model uses an artificial aid to represent real-life clinical scenarios where students work together to provide care for an artificial patient.

In the practice-based model, students work with their colleagues from different health professions to provide an appropriate care plan for the particular patient under the supervision of a licensed clinical expert. Such a model provides an excellent opportunity for the students to work in a setting that resembles the real-word environment.[18] Thus, the practice-based setting is considered an excellent opportunity for the students to build up their IPE competencies in terms of acquiring knowledge, skills, and attitudes that will enable them to work effectively in interprofessional teams and prepare them for a collaborative practice environment. The practice-based setting is the bridge between education and practice. Health educators should select the appropriate assessment methods to ensure their graduates are ready to work successfully in a collaborative practice environment.[19]

IPE Evaluation

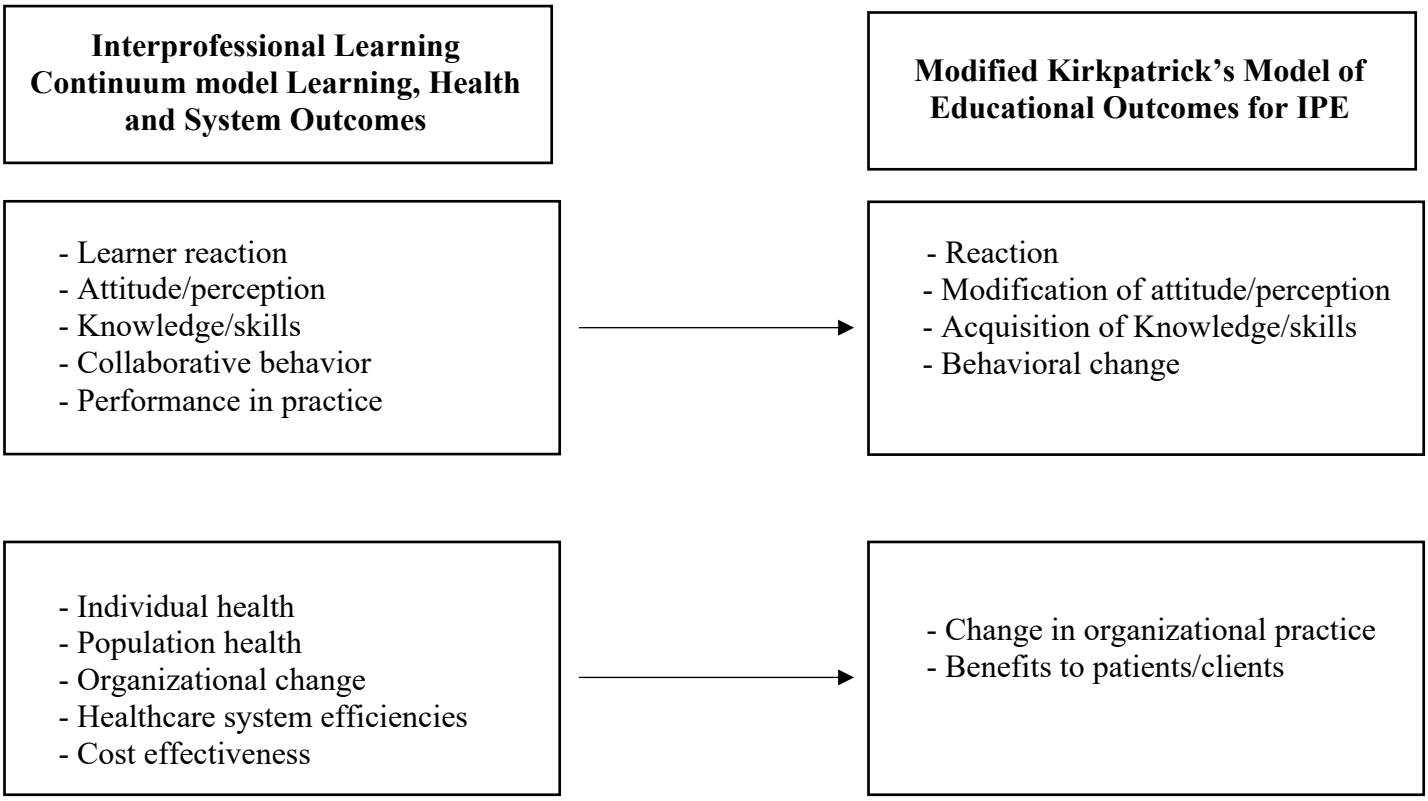
In recent years, IPE evaluation has extended beyond assessing the impact of IPE on student skills, knowledge, and attitudes to concentrate on the impact of IPE on collaborative

practice and patient outcomes. In response, the IOM launched an interprofessional conceptual model for evaluating IPE outcomes: the Interprofessional Learning Continuum (IPLC) model.[16] The model consists of four interdependent components: stages of learning, learning outcomes, health and system outcomes, and predisposing factors. The learning outcomes focus on the learner reaction, attitude/perception, knowledge/skills, collaborative behavior, and performance in practice. These learning outcomes match the three levels of outcomes suggested by the Modified Kirkpatrick's Model of Educational Outcomes for IPE; Level 1: Learner's reaction, Level 2 a: Modification of attitudes/perceptions, Level 2 b: Acquisition of knowledge/skills, and Level 3: Behavioral change. The health and system outcomes focus on patient and population health as well as organizational change to improve healthcare system efficacy while reducing unnecessary cost and error. Such outcomes were conceptualized by the Kirkpatrick's model for the classification of interprofessional outcomes in Level 4 a: Change in organizational practice and Level 4 b: Benefits to patients, families, and communities.[16, 20] Matching of IPE outcomes between the IPLC model and Modified Kirkpatrick's Model of Educational Outcomes for IPE are displayed in Figure 1.1.

Many studies in the IPE literature were conducted to assess short-term learning outcomes related to learner reaction toward IPE learning experience, changes in attitudes or perceptions toward the value of a team-based approach, and acquisition of knowledge and skills related to IPEC competencies. These outcomes were helpful for health educators and accreditors to reflect on the effectiveness of IPE programs. More studies are needed to assess the impact of IPE on collaborative behavior and performance in practice. The outcomes of such studies will help to understand the long-term effects of IPE in preparing health professions graduates to work in

collaborative practice environments, which will eventually lead to the improvement in the health and system outcomes.[21]

Figure 1.1 Matching of IPE Outcomes between the Interprofessional Learning Continuum Model and Modified Kirkpatrick's Model of Educational Outcomes for IPE [16, 20]



1.2 Interprofessional Teamwork

Background

Interprofessional teamwork is developing as an important component to achieving the quadruple aim of improving patient health outcomes, improving population health, increasing health worker satisfaction, and reducing medical costs and errors. Positive health outcomes are achieved through the development of communication, efficacy, cost-effectiveness, and patient centeredness. Health worker satisfaction is achieved by the environment of mutual respect where all team members understand their roles and responsibilities and utilize appropriate communication strategies and collaborative skills.[10, 22]

In the interprofessional education setting, teamwork is one of the important IPE competencies that overlaps with the other competencies. Teamwork requires the involvement of two or more students from different educational backgrounds who consider themselves as one entity providing optimum patient-centered care. Thus, effective teamwork requires team members to work in an environment of mutual respect where they share a common health goal, understand the roles and responsibilities of each member within the team, utilize effective communication skills, and value the input of their teammates.[23]

The Nature of Interprofessional Healthcare Teams

In the healthcare literature, the principles of teamwork are driven from research outside the healthcare domain. Interprofessional education experts use these principles to create a framework that supports teamwork training. In IPE literature, different team training models are utilized. The team training model incorporates different skills that are associated with better teamwork performance. Despite that, evaluation studies have failed to find a gold standard team training model that can be used in different IPE settings.[24, 25, 26]

The team characteristics in the healthcare environment are different than the team characteristics in a non-healthcare environment. The non-healthcare teams are usually small, discrete, and fixed, while healthcare teams are large, heterogeneous, and dynamic. The unique characteristics of the healthcare team arise to deal with the complex issues and needs that occur in the healthcare system.[24]

A study by DiazGranados et al. [27] showed that healthcare team processes vary across different healthcare settings. Accordingly, each team is required to utilize a specific set of skills to enhance team effectiveness. For example, the study found that in the non-rehabilitation setting, team members communicate via various communication tools, including face-to-face and communication boards. In addition, goal setting and decision making were shared with all team members. In the acute care setting, information exchange, decision making, and goal sharing were more physician-oriented. Within the code team, the information exchange and communication were more physician dominant. Each team utilized a different pattern to evaluate the patient case. Both the rehabilitation and acute care teams approached the patients in a sequential manner. All team members in the code team approached the patient at the same time. Interpersonal relationships were emphasized among team member in the rehabilitation team; in contrast, interpersonal relationships were not emphasized in the acute care and code teams.[27]

A report by Reeves et al. [28] argued that interprofessional teamwork varies depending on the team purpose as well as the clinical and patient needs. They differentiated four types of interprofessional work where two or more health care professionals work together to address healthcare and system needs. These were grouped under interprofessional teamwork, interprofessional collaboration, interprofessional coordination, and interprofessional networking. Each type of interprofessional work utilized and prioritized different skills associated with

effective teamwork; for instance, interprofessional teamwork required specific skills related to common team identity and responsibility, transparency, interdependence, and incorporation of team members. Both interprofessional collaboration and coordination required shared responsibility, clarity of team roles and goals, and to a lesser extent, shared team identity. However, interdependence and incorporation of team members were seen as less important in interprofessional coordination groups than in collaborative groups. In interprofessional networks, the utilization of teamwork skills was considered less important than coordination. Choosing the type of interprofessional work depends mainly on the patient and healthcare system needs. For instance, utilization of interprofessional networking is valued in noncomplex clinical settings where the work is predictable and non-urgent, while interprofessional teamwork is effective in a complex clinical setting where the nature of the clinical work is unpredictable and urgent.[28]

In conclusion, the nature of the interprofessional healthcare team is dynamic and depends on clinical setting and health and system needs. Consequently, different skills are needed to reach the overall goals of improving the health and system outcomes. Healthcare students must be trained to function properly within a dynamic team before entering the workforce. This will facilitate their transition and help to improve the health and system outcomes.

Predictors Associated with Team Effectiveness

In literature specific to teamwork, predictors associated with team effectiveness can be grouped under individual, team, and organizational factors. The individual factors could include, but are not limited to, heterogeneity and familiarity among team members, interdependency, and leadership skills. Heterogeneity can refer to the mix of professions or experience, knowledge, social characteristics, attitudes, and personalities. Familiarity indicates the understanding of the role and responsibility for each member within the team. Leadership skills associated with

effective communication, motivation, creativity, positivity, and feedback tend to improve the team performance. The team-level factors that play a role in enhancing team performance could include the team size, shared goals, motivation, feedback, and communication in the group. Setting goals is a fundamental step to achieving team outcomes, which raises the quality of team performance. Motivation at the team level has an impact on raising team effectiveness. Proper communication and receiving feedback help to raise the level of team productivity. The organizational support, such as motivation, training, and information access also helps to improve team effectiveness.[29]

In the IPE literature, common predictors associated with team effectiveness include proper communication, understanding the roles and responsibilities, mutual respect, problem-solving and leadership skills, shared team identity and goals, adaptability, and positive attitude toward the value of a team-based approach.[30, 31, 32]

Team Effectiveness Measures

Guzzo and Dickson [29] suggest a variety of approaches to evaluate team effectiveness, including:

1) Team outputs
2) Effects on team members
3) Feedback and improvement

Applying such approaches in a healthcare setting can support the successful evaluation of interprofessional team effectiveness, which will facilitate determining the impact of IPE on collaborative practice and patient outcomes.

In the healthcare setting, team outputs can be assessed through the evaluation of the quality of healthcare plan and/or client satisfaction. The significance a team has to its members can be evaluated using attitudinal measures. The development of team competence to perform

efficiently in the future can be achieved through reflection and feedback.[16, 29]

In IPE settings, different study designs are used to evaluate the effectiveness of interprofessional student teams, including quantitative, qualitative, and mixed methods. In some studies, teamwork intervention was offered as a team training module using a variety of learning methods such as seminars, workshops, courses, and online materials. Teamwork evaluation can sometimes occur as part of program evaluation to assess the effectiveness of team intervention. On the other hand, teamwork evaluation may occur as a consequence to evaluate IPEC competencies. The main approaches used to evaluate team effectiveness in IPE settings include observation, discussion, and self-reported measures.[33, 34, 35, 36, 37] These approaches can be linked to those suggested by Guzzo and Dickson [29] as follows:

1) Utilize observational methods, including direct observation or video recording, to evaluate team output
2) Use self-reported measures, such as survey or reflection notes, to assess the effects the team has on its members
3) Use the discussion approach that occurs in the form of interview or debriefing to improve team development

In conclusion, interprofessional teamwork is one of the important competencies that overlaps with other competencies specific to IPE, such as value and ethics, communication, and roles and responsibilities. In the healthcare setting, teamwork is often practiced in groups that are dynamic to cope with the complex requirement existing in the healthcare system. Thus health professional staff and students must be trained on how to function in dynamic teams. More studies are needed to understand factors associated with improvement in dynamic team process and effectiveness. Utilizing different approaches to evaluate dynamic team effectiveness helps to

determine appropriate evaluation methods and reveal important factors associated with dynamic team success. These factors can be targeted to design team training model focus on necessary skills and competency related to work in dynamic teams.

1.3 References

1. Conference on the interrelationships of educational programs for health professionals (1972 : Washington, D.C.). *Educating for the health team : Report of the conference on the interrelationships of educational programs for health professionals, October 2-3, 1972*. Washington, D.C. : National Academy of Sciences; 1972.

2. Institute of medicine (U. S.). Committee on quality of health care in America. Crossing the quality chasm: A new health system for the 21st century. 2001. doi:10.1037/e317382004-001

3. Long KA. The institute of medicine report: Health professions education: A bridge to quality. 2003;4(4):259-262.

4. Institute for healthcare improvement: Triple aim for populations. http://www.ihi.org:80/Topics/TripleAim/Pages/default.aspx. Accessed May 25, 2019.

5. Bodenheimer T, Sinsky C. From triple to quadruple aim: Care of the patient requires care of the provider. *Ann Fam Med*. 2014;12(6):573-576. doi:10.1370/afm.1713

6. Sikka R, Morath JM, Leape L. The quadruple aim: care, health, cost and meaning in work. *BMJ Qual Saf*. 2015;24(10):608-610. doi:10.1136/bmjqs-2015-004160

7. Health professions network nursing and midwifery office within the department of human resources for health. *Framework for action on interprofessional education & collaborative practice*. World health organization, department of human resources for health, CH-1211 Geneva 27, Switzerland; 2010. http://www.who.int/hrh/nursing_midwifery/en/.

8. D′amour D, Oandasan I. Interprofessionality as the field of interprofessional practice and interprofessional education: An emerging concept. *Journal of Interprofessional Care*. 2005;19(sup1):8-20. doi:10.1080/13561820500081604

9. Frenk J, Chen L, Bhutta ZA, et al. Health professionals for a new century: transforming education to strengthen health systems in an interdependent world. *The Lancet*. 2010;376(9756):1923-1958. doi:10.1016/S0140-6736(10)61854-5

10. Interprofessional education collaborative expert panel. *Core competencies for interprofessional collaborative practice*. Washington, D.C.: Interprofessional education collaborative.; 2011.

11. *Core competencies for interprofessional collaborative practice: 2016 Update*.; 2016:22.

12. UK centre for the advancement of interprofessional education. *Interprofessional education: What, how & when?* Vol 13.; 1997.

13. The interprofessional education consortium. *Creating, implementing, and sustaining interprofessional education*. Stuart foundation, San Francisco, CA; 2002. http://iccs.csumb.edu/html/community/stuart.

14. The Canadian interprofessional health collaborative. Interprofessional education & core competencies literature review. 2007.

15. Earnest M, Brandt B. Aligning practice redesign and interprofessional education to advance triple aim outcomes. *Journal of Interprofessional Care*. 2014;28(6):497-500. doi:10.3109/13561820.2014.933650

16. Committee on measuring the impact of interprofessional education on collaborative practice and patient outcomes; Board on global health; Institute of medicine P. *Measuring the impact of interprofessional education on collaborative practice and patient outcomes*. The national academies press; 2015. doi:10.17226/21726

17. Buring SM, Bhushan A, Broeseker A, et al. Interprofessional education: Definitions, student competencies, and guidelines for implementation. *Am J Pharm Educ*. 2009;73(4). https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2720355/. Accessed July 8, 2019.

18. McNair R, Stone N, Sims J, Curtis C. Australian evidence for interprofessional education contributing to effective teamwork preparation and interest in rural practice. *Journal of Interprofessional Care*. 2005;19(6):579-594. doi:10.1080/13561820500412452

19. Lie DA, Forest CP, Walsh A, Banzali Y, Lohenry K. What and how do students learn in an interprofessional student-run clinic? An educational framework for team-based care. *Med Educ Online*. 2016;21(1). doi:10.3402/meo.v21.31900

20. Hammick M, Freeth D, Koppel I, Reeves S, Barr H. A best evidence systematic review of interprofessional education: BEME Guide no. 9. *Medical Teacher*. 2007;29(8):735-751. doi:10.1080/01421590701682576

21. Reeves S, Boet S, Zierler B, Kitto S. Interprofessional education and practice guide No. 3: Evaluating interprofessional education. *Journal of Interprofessional Care*. 2015;29(4):305-312. doi:10.3109/13561820.2014.1003637

22. Xyrichis A, Ream E. Teamwork: a concept analysis. *Journal of Advanced Nursing*. 2008;61(2):232-241. doi:10.1111/j.1365-2648.2007.04496.x

23. Clements D, Dault M, Priest A. Effective teamwork in healthcare: research and reality. *HealthcarePapers*. 2007;7(Special):26–34. doi:10.12927/hcpap.2013.18669

24. Dow AW, Zhu X, Sewell D, Banas CA, Mishra V, Tu SP. Teamwork on the rocks: Rethinking interprofessional practice as networking. *Journal of Interprofessional Care*. 2017;31(6):677-678. doi:10.1080/13561820.2017.1344048

25. Fox L, Onders R, Hermansen-Kobulnicky CJ, et al. Teaching interprofessional teamwork skills to health professional students: A scoping review. *Journal of Interprofessional Care*. 2018;32(2):127-135. doi:10.1080/13561820.2017.1399868

26. Jeffcott SA, Mackenzie CF. Measuring team performance in healthcare: Review of research and implications for patient safety. *Journal of Critical Care*. 2008;23(2):188–196. doi:10.1016/j.jcrc.2007.12.005

27. DiazGranados D, Dow AW, Appelbaum N, Mazmanian PE, Retchin SM. Interprofessional practice in different patient care settings: A qualitative exploration. *Journal of Interprofessional Care*. 2018;32(2):151-159. doi:10.1080/13561820.2017.1383886

28. Reeves S, Xyrichis A, Zwarenstein M. Teamwork, collaboration, coordination, and networking: Why we need to distinguish between different types of interprofessional practice. *Journal of Interprofessional Care*. 2018;32(1):1-3. doi:10.1080/13561820.2017.1400150

29. Guzzo RA, Dickson MW. Teams in organizations: Recent research on performance and effectiveness. *Annual Review of Psychology*. 1996;47(1):307-338. doi:10.1146/annurev.psych.47.1.307

30. Shrader S, Kern D, Zoller J, Blue A. Interprofessional teamwork skills as predictors of clinical outcomes in a simulated healthcare setting. *Journal of Allied Health; Washington*. 2013;42(1):e1-6.

31. Ekmekci O, Sheingold B, Plack M, et al. Assessing performance and learning in interprofessional health care teams. *Journal of Allied Health; Washington*. 2015;44(4):236-243D.

32. Rotz ME, Dueñas GG. "Collaborative-ready" students: Exploring factors that influence collaboration during a longitudinal interprofessional education practice experience. *J Interprof Care*. 2016;30(2):238-241. doi:10.3109/13561820.2015.1086731

33. Kent F, Rachael AF, Newton JM, Keating JL, Dodic M. How do interprofessional student teams interact in a primary care clinic ? A qualitative analysis using activity theory. *Advances in Health Sciences Education*. 2016;21(4):749-760. doi:10.1007/s10459-015-9663-4

34. Care T, Shunk R, Dulay M, Chou CL. Huddle-Coaching: A Dynamic intervention for trainees and staff to support team-based care. *Academic Medicine*. 2014;89(2):244-250. doi:10.1097/ACM.0000000000000104

35. Coleman MT, Roberts K, Wulff D, et al. Interprofessional ambulatory primary care practice-based educational program. *Journal of Interprofessional Care*. 2009;1820. doi:10.1080/13561820701714763

36. Dienst ER, Byl N. Evaluation of an educational program in health care teams. *J Community Health*. 1981;6(4):282-298.

37. Cooper H, Spencer-dawe E, Mclean E. Beginning the process of teamwork: Design , implementation and evaluation of an inter-professional education intervention for first year

undergraduate students students. *Journal of Interprofessional Care*. 2009;1820. doi:10.1080/13561820500215160

Chapter 2: Literature Review

Teamwork Evaluation in Non-Specialty Practice-Based IPE Settings

2.1 Introduction and Objective

Interprofessional education is an approach that aims to improve educational outcomes, as well as health and system outcomes. Achieving such outcomes requires effective training focused on incorporating IPEC competencies to teach various health professions students how to function within interprofessional teams. Effective interprofessional teamwork has been linked to improvement in patient outcomes with minimal cost and error. It also helps to increase patient and provider satisfaction.[1]

In the health education system, interprofessional teamwork training occurs in different IPE settings for different levels of learners. For early learners, teamwork training often occurs in didactic courses where students are introduced to the value of team-based approaches to delivering patient-centered care thus minimizing cost and error. Additionally, students are presented with effective teamwork principles, such as recognition of other professionals' roles and scope of practice, as well as the application of appropriate communication techniques to resolve any arising conflict and achieve shared decision making. After that, teamwork training is reinforced in a simulation setting to teach clinical skills, where students apply clinical knowledge and teamwork principles to deal with complex patient cases adopted from real-life scenarios. For advanced learners, teamwork training occurs in a practice-based IPE setting where interprofessional students apply and integrate uni- and interprofessional competencies to deliver patient-centered care under the supervision of faculty. Thus, a practice-based IPE setting helps students to develop the necessary clinical experience, knowledge, and skills that will enable them to work effectively in a collaborative practice environment. Evaluating learning outcomes related

to collaborative behavior and performance in practice is a fundamental step in preparing health professions students to enter the workforce.[2, 3, 4]

The majority of studies have been conducted to assess the effects of a practice-based setting on learner reaction, knowledge, and attitudes toward the interprofessional team learning experience. These studies address the content of teamwork learning without studying the process of team development and corresponding factors associated with team effectiveness. More studies are needed to explain how interprofessional team learning occurs and identify the important variables that facilitate team training in a practice-based IPE setting. Results from such studies inform the development of interprofessional team training to guide effective interprofessional education experiences.[5]

In the literature specific to IPE, different reviews have been conducted to assess the effect of IPE on learning outcomes. In most cases, learning outcomes were linked to changes that occurred in student reactions, attitudes, knowledge, skills, and performance.

A review by Lapkin et al. [6] reports evidence of IPE effectiveness among different health professions programs and settings. The review suggests that IPE effectiveness was linked mainly to modification in student perceptions and attitudes. Moreover, most of the studies utilized a didactic IPE model to teach students interprofessional team competency. It is suggested by the review that a practice-based IPE model has a significant impact on IPE outcomes through the integration of theoretical and clinical skills.[6] Kent and Keating [7] published a systematic review conducted to assess the impact of IPE on outcomes related to students and patients in primary care clinics. In such settings, the common learning outcome was related to teamwork competency. The majority of the studies utilized self-report measures to evaluate changes in student attitudes, knowledge, and skills in relation to teamwork. Such measures rely on assessing

the individual perception to team effectiveness and process. They lack the ability to capture the complexity of teamwork in dynamic setting such that the healthcare system.[7] Another review published by Schutte et al. examined [5] the effects of student-run clinics on student outcomes. A positive impact was observed in student outcomes related to attitude, knowledge, and skills.[5] Combined results from the different reviews indicate the potential need for research focused on exploring how teamwork is learned.

A recent review by Fox et al. [3] focused on evaluating IPE studies aimed to educate about and/or evaluate teamwork competency. Results indicate that team training occurs in different IPE settings, including hospitals, clinics, and simulation centers. Additionally, different education strategies were utilized to train interprofessional student teams such as simulation, experiential, and active learning. Most of the studies used self-report measures to assess teamwork perception and attitude. The review highlighted the absence of rigorous evaluation methods and measures to assess teamwork skills and collaborative behavior.[3]

In summary, combined results from previous reviews indicated that the practice-based IPE learning model has a positive impact on student learning outcomes in term of improvement in student attitude, knowledge and skills about function in interprofessional teams. Recently, IPE studies oriented toward implementation and assessment of teamwork training model focus on teamwork skills in various IPE settings. This review focuses mainly on assessing the interprofessional education literature on various approaches used to evaluate teamwork effectiveness among student teams operating in non-specialty, practice-based IPE settings.

2.2 Methods

Literature Search

The review was conducted using the PubMed/MEDLINE database as the standard medical search database. The search was supplemented with educational intervention databases such as the Cumulative Index of Nursing and Allied Health Literature (CINAHL) and Educational Resources Information Centre (ERIC) via ProQuest to detect articles published in more education-oriented journals.

The initial search was conducted in PubMed/MEDLINE database using a combination of Medical Subject Headings (MeSH) terms or subheadings and keywords targeting students' teamwork evaluation in practice-based IPE settings. The search terms included interprofessional education, teamwork or collaboration, practice setting, evaluation or assessment, and student. A transitional search using a synonym of the search terms was utilized in the CINHAL and ERIC via ProQuest database as described in Table 2.1.

Review Process

The scoping review was conducted in February of 2018 and updated in June of 2019. Titles, abstracts, and relevant references were screened using predefined inclusion and exclusion criteria to identify eligible studies. The review included studies published in peer-reviewed journals in the English language that focused on evaluating aspects of teamwork development or performance and which occurred in non-specialty, practice-based IPE settings. The review excluded non-original articles, such as letters, editorials, and abstracts without the full text. Studies that focused mainly on evaluating student attitudes toward the value of teamwork, IPEC competencies in general, and patient outcomes were also excluded. Studies where the students

were not part of interprofessional teams or those that focused on specific patient scenarios were excluded from this review.

The final search combining all databases produced a total of 406 studies. After removing duplicates, a total of 391 articles remained for preliminary screening by title and abstract. After applying the inclusion and exclusion criteria, 20 articles remained for full review. A total of five articles were identified to be discussed in this review, as they were relevant to the literature review objective. The details of review process are provided in Figure 2.1.

Data Abstraction and Analysis

Data were extracted from the final eligible articles using the following categories: evaluation approach or design, participant characteristics, teaching methods, assessment approach, and outcomes.

Articles were critiqued based on the evaluation approach utilized to determine effective evaluation design. Additionally, assessment tools were analyzed to determine the effectiveness of such tools to evaluate teamwork behavior. Finally, learning outcomes were examined to determine the level of outcome assessment based on the IPLC model.[1]

2.3 Results

A summary of the reviewed studies' characteristics is given in Table 2.2.

Study Designs

Different study designs were used to evaluate teamwork in non-specialty, practice-based IPE settings. Four of the included studies used a mixed methods approach. Teamwork evaluation occurred as a part of program evaluation in all of the mixed methods studies.[8, 9, 10, 11] Additionally, two studies utilized a pre/post teamwork training assessment without a control

group,[8, 11] and two studies used the same design with a control group.[9, 10] Only one study used a qualitative approach to evaluate teamwork.[12]

Participants Characteristics

Learners from medicine and nursing accounted for most of the participants across the included studies. Pharmacy students were involved in two of the studies,[11, 12] as well as physiotherapy students.[8, 11] Other professions included social work and occupational therapy. Three studies included advanced learners,[8, 9, 10] and one study targeted early learners. [11]

Across all of the studies, the sample size ranged from 23 to 442 students. The majority of the studies occurred in primary care or general practice settings.

Teaching Methods

Four of the studies indicated that participants received teamwork-specific educational interventions. These interventions utilized a variety of approaches to teach students the skills required to deliver team-based, patient-centered care. All four studies used didactic learning modules as an introductory component to teamwork training.[8, 9, 10, 11] Some of the studies further reinforced team training through an experiential learning model.[8, 10, 11] Experiential learning activities included group discussion, coaching, and workshops. In studies that utilized a comparison group, the teamwork training model was presented to the intervention group only. [9, 10] Teamwork training interventions have been developed through different phases, such as planning, implementation, and evaluation.

Outcomes Assessment

All of the included studies assessed aspects related to students learning outcomes. These outcomes mainly targeted changes in students' attitudes and perceptions, knowledge, and skills related to interprofessional team-based care. Some of the studies assessed teamwork behavior

and identified factors that could influence collaborative behavior.[8, 10, 12] These factors included leadership, team member contribution, disease severity, timing, work demand, mentoring, facilitation, and group dynamics. Table 2.3 presents a summary of learning outcome domains. Only one study measured patient-related outcomes. [11] Assessment of such outcomes was done through evaluating the difference between uni- and multi-professional student teams in terms of patient satisfaction, patient function, and comprehensiveness of care. In addition, the total number of patients seen, number of referrals, team effectiveness, and satisfaction were compared between the two different kinds of teams.

Evaluation Approach

Each of the included studies used self-report measures to assess learning outcomes related to student attitudes, knowledge, and skills. These measures included the Team Development Measure (TDM), Tuft Health System Knowledge Assessment Test (THSKAT), Perception of Value of Team Health Care (PVTHC), Team Competence Instrument (TCI), and the Readiness for Interprofessional Learning Scale (RIPLS).[9, 10, 11]Additionally, student interviews and written feedback were used to assess the same learning outcomes.[8] Each of the self-reported measures assesses different aspect related to teamwork, such that the TDM evaluate elements of team development related to cohesion, communication, and clarity of team roles and goals. The THSKAT utilizes a specific set of questions to assess healthcare system knowledge related to team care that was introduced as a part of the learning model. The PVTHC used to assess the attitude toward the interprofessional team-based approach. Similarly, the RIPLS used to assess student perception toward interprofessional learning. The TCI was used to assess teamwork skills after participation in the team learning model. The qualitative data collected from student interviews and written feedback were used to assess the student perception toward

learning programs. [8, 9, 10, 11] The variation between self-reported measure in evaluating different aspects related to teamwork indicate the limitation of such a measure to capture the complexity of teamwork in the healthcare setting.

Teamwork behavior was assessed using a variety of approaches, such as direct observation, interviews, and written feedback. Direct observation data were collected by using an observational tool or note documentation.[8, 10, 12] Both the structure and unstructured observation are essential to capture the complexity of teamwork behavior in the healthcare setting. In many cases, the structure observation associated with the utilization of tools that are specific to a particular scenario. Such that Shunk et al. [8] used a team huddle checklist to identify factors that contribute to improvement in the team huddle approach. The utilization of such tool hinders to capture different factors related to team behavior. The unstructured observation such that the one occur in Kent et al. [12] study helps to identify different level factors associated with improvement in team behavior.

2.4 Discussion

Results of this review were inconclusive in regard to identifying an ideal evaluation approach to assess teamwork in practice-based IPE settings. More recently, IPE evaluation studies moved beyond assessing the impact of IPE on student reaction, attitudes, knowledge, and skills to concentrate on evaluating teamwork performance and its impact on collaborative practice. The results of this review showed that the need to evaluate this outcome was reinforced by recent IPE studies. In regard to evaluating teamwork effectiveness, different studies were conducted using a variety of evaluation approaches and tools. The majority of the studies used a mixed methods approach to assess teamwork behavior and identify variables that affect collaboration in a clinical setting. The utilization of a pre/post survey study design was common

across the evaluation studies. In some of the studies, learners were assigned to an intervention or control group to assess the effectiveness of a team training program. The primary assessment tools were self-reported measures.

Despite the variation in study designs, the literature specific to non-specialty IPE practice-based settings lacks the rigorous evaluation methods to assess teamwork. The use of self-report measures to evaluate teamwork has weaknesses, as the individual perception of teamwork skills doesn't always align with the perception of skills as observed by others. In addition, these measures cannot be depended upon in isolation to capture the complexity of teamwork in practice-based settings. Observational studies are more robust to assess teamwork, as observation helps to identify different factors that can affect teamwork behavior, including individual, team, and organization-level factors. In such studies, data can be collected either by direct observation or video recording. The advantages of video recording outweighing direct observation as a method to assess teamwork behavior in the healthcare setting. In the healthcare system, the teams are unstable and dynamic, which makes it hard to capture every factor that could predict teamwork behavior through direct observation. The use of video recordings can help to capture multiple factors that play a role in determining the collaborative behavior. With the video recording, more than one analysis can be conducted to assess different aspects related to teamwork, such as performance, interaction, or effectiveness. In addition, more than one researcher can conduct the analysis, which will ultimately strengthen the reliability of the results. Moreover, it helps to intensely study the quality of collaborative behavior, which will help to reveal the most important factors that influence success in practice.[13]

In conclusion, the interprofessional education literature lacks the standardized evaluation approach to assess team effectiveness among interprofessional student teams participate in non-

specialty IPE setting. The utilization of self-reported measures accounted for the most common evaluation approach used to evaluate the attitude and knowledge of teamwork. Observational studies are robust to capture the complexity of teamwork in the healthcare setting. Thus, future studies should utilize an observational evaluation approach to assess teamwork effectiveness and performance. Besides, such an approach will help to identify factors or predictors associated with team success. These factors can be targeted to create a team training model focused on improved student performance within interprofessional teams, which ultimately helps in their transition to practice.

Table 2.1 Search Term for Each Database

Databases	Search Term
PubMed/MEDLINE	((((((("interprofessional education" OR "interprofessional curriculum" OR "interprofessional learning" OR "interdisciplinary education" OR "Interprofessional Relations"[Mesh] OR "Education, Professional"[Mesh])))) AND ((Student team OR Team OR Teamwork OR Care team OR care teams OR Collaboration OR "collaborative practice" OR "interprofessional collaboration" OR "cooperative learning" AND "Cooperative Behavior"[Mesh] OR "Patient Care Team"[Mesh])))) AND (("Clinical placement" OR "practice setting" OR "community based" OR "Primary care" OR "Primary Health Care"[Mesh])))) AND ((Evaluation OR Assessment OR Instrument* OR Questionnaire* OR Survey OR Scale* OR Measure* OR Tool* OR "Data Collection"[Mesh] OR "Program Evaluation"[Mesh] OR "Program Development"[Mesh] OR "Task Performance and Analysis"[Mesh])))) AND ((Student* OR Learner OR "Students"[Mesh] OR "Student Run Clinic"[Mesh]))
CINHAL	(((MH "Interprofessional Relations/ED")) OR ("interprofessional education") OR ("interdisciplinary education")) AND (((MH "Multidisciplinary Care Team/EV/ED")) OR ((MH "Cooperative Behavior/ED")) OR collaboration OR ("collaborative practice") OR ("interprofessional collaboration") OR teamwork) AND (("practice setting") OR ("community based") OR ("Primary care") OR ((MH "Primary Health Care/EV/ED"))) AND (((MH "Program Evaluation/ED")) OR ((MH "Data Collection/ED")) OR assessment OR evaluation OR (" data collection") OR measure*) AND (((MH "Student Placement/EV/ED")) OR student*)
Eric via ProQuest	("interprofessional education" OR "interdisciplinary education" OR MAINSUBJECT.EXACT("Interprofessional Relationship")) AND (MAINSUBJECT.EXACT.EXPLODE("Teamwork") OR teamwork OR collaboration) AND ((MAINSUBJECT.EXACT.EXPLODE("Program Evaluation") OR MAINSUBJECT.EXACT("Data Collection")) OR tool OR "data collection" OR measure)

Figure 2.1 Screening and Review Process

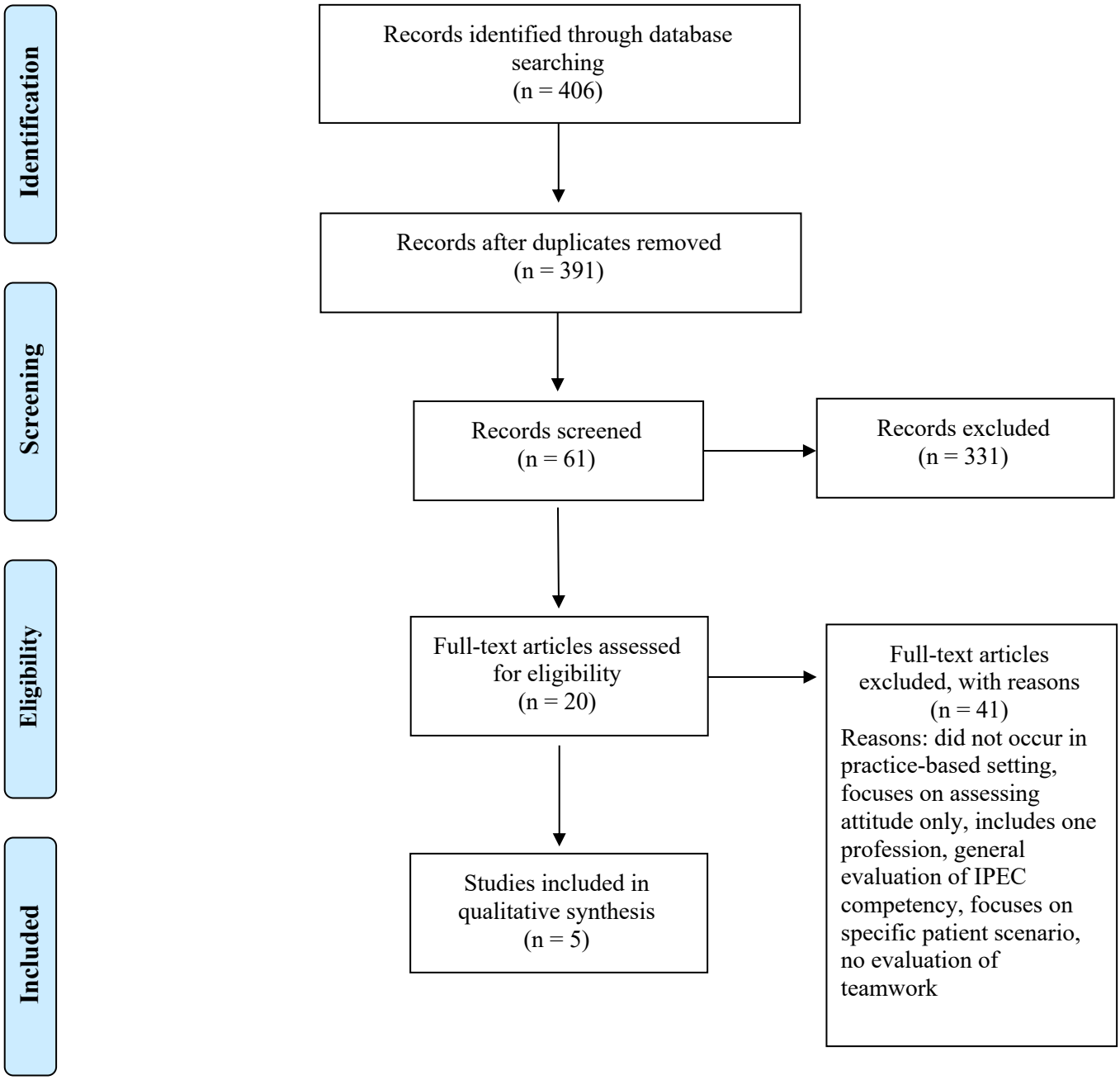


Table 2.2 Summary of Study Characteristics

Author Year Design	Setting	Discipline	Methods	Evaluation	Results	Notes
Kent et al. 2016 Qualitative	IP clinic in general practice and residential age care setting	Final year students from medicine, nursing, occupational therapy, pharmacy and physiotherapy	▪ Students were attending an introduction, working as a team to evaluate patient cases ▪ Students were presented each patient case for reflection and discussion	▪ Educators were present during patient encounter to observe student performance ▪ Student interviews	▪ Contribution of all team members influences the team's behavior ▪ Patient complexity vs. time ▪ Leadership is affected by other factors such as confidence and knowledge	
Shunk et al. 2014 Mixed method	Primary care clinic	Second year internal medicine residents and second year nurse practitioners	▪ Introduction to the huddle approach ▪ Assemble as a team and practice the huddle ▪ Huddle coach with checklist ▪ First round of the TDM ▪ Team building retreat ▪ Second round of the TDM	▪ Session and retreat evaluation ▪ Huddle checklist data ▪ Trainees interview ▪ TDM	▪ Session = 4 out of 5 ▪ Team building retreat = 4.4 out of 5 ▪ Huddle checklist: Work demand and time conflict hindered the huddle to occur ▪ Interview: importance of the huddle and team base approach ▪ TDM: score improvement from 59.4 to 64	▪ Results did not show evidence for the effectiveness of the huddle approach ▪ No statistical tests were conducted to report a significant change in TDM score ▪ No evaluation of the relationship between huddle checklist data, TDM and

						patient outcomes
Coleman et al. 2009 Mixed method	Ambulatory primary care	Nurse practitioner students, family medicine residents, and social work students	▪ Two group team learners vs. non-team learners ▪ Team learners attend lectures about teamwork ▪ Students were divided into teams ▪ They worked together to provide patient care plan	▪ Knowledge was assessed for the team learner group only using a post survey THSKAT ▪ Attitude was compared between the team learner and non-team learner group using pre/post survey PVTHC ▪ Skills were assessed pre and post for the team learner group only TCI ▪ Students in the team learner group provided written feedback about their program experience	▪ Knowledge ranged from 5.5 to 6.6 out of 7 which indicates satisfaction of participants toward the didactic content ▪ Attitude toward value of teamwork improved significantly between the team learner group and non-team learner group ($p = 0.027$) ▪ Skills were improved between the pre and post response ($p < 0.05$) ▪ Students' feedback: support the value of teamwork to provide patient care	▪ Results did not show any evidence for the effectiveness of the program ▪ Measurement tools were mainly created for the purpose of the project which could bias the results ▪ Non-consistency in evaluating the student attitude, knowledge, and skills between the two groups
Cooper et al. 2009 Mixed method	Not specified	Medicine, nursing, occupational therapy, and physiotherapy students	▪ Students were divided into two groups: intervention and control ▪ The intervention composed of e-learning materials and workshop	▪ RIPLS questionnaire completed as a pre and post measure by student from intervention and control group ▪ The students in the intervention group completed the	RIPLS: ▪ Significant results toward gain of knowledge and attitude ($p < 0.01$) ▪ Non-significant result toward acquisition of teamwork skills Qualitative data:	▪ The evaluation methods were not appropriate for the intervention ▪ Evaluation should concentrate on teamwork

				following: Student reflection, perception of meeting the learning objectives, and in-depth interview	▪ Positive impact of the intervention toward the improvement in teamwork attitude, knowledge, and skills ▪ Negative results toward the course content and materials, and lack of interprofessional representation ▪ The majority of students agreed that the course met the learning objectives	behavior using different tools ▪ Interpretation of RIPLS results were unclear
Dienst et al. 1981 Mixed method	Primary outpatient setting	Medicine, nursing, and pharmacy students	▪ Students received team education through seminar and during the clinic time	Student outcomes: ▪ pre/post survey to document change in teamwork knowledge, skills, and attitude ▪ Likert scoring scale to evaluate program Patient outcomes: ▪ Assessed through volume of patients seen and the comprehensiveness of service	Student outcomes: ▪ There was significant improvement in teamwork knowledge ($p<.001$) and teamwork skill ($p<.05$) ▪ There were no significant changes in teamwork attitude ▪ Students valued team education that occurred during the clinic more than seminar Patient outcomes: ▪ There were increases in volume of patients and team comprehensiveness for teams of students who attended the	▪ Older study ▪ Replicate the study design using rigorous evaluation measure

					education program (50% increase) compared to the students who did not attend	

TDM = Team Development Measure, THSKAT = Tuft Health System Knowledge Assessment Test, PVTHC = Perception of Value of Team Health Care, TCI = Team Competence Instrument, RIPLS = Readiness for Interprofessional Learning Scale

Table 2.3 Summary of Student Learning Outcomes

Author, year	***Learning outcomes**				
	Reaction	**Attitudes/perceptions**	**Knowledge/skills**	**Collaborative behavior**	**Performance in practice**
Kent et al., 2016		✔	✔	✔	
Care et al., 2014		✔	✔	✔	
Coleman et al., 2009		✔	✔		
Cooper et al., 2009		✔	✔	✔	
Dienst, 1981		✔	✔		

*Learning outcomes adapted from the Interprofessional Learning Continuum Model

2.5 References

1. Committee on measuring the impact of interprofessional education on collaborative practice and patient outcomes; Board on global health; Institute of medicine P. *Measuring the impact of interprofessional education on collaborative practice and patient outcomes*. The national academies press; 2015. doi:10.17226/21726

2. Brewer ML, Stewart-Wynne EG. An Australian hospital-based student training ward delivering safe, client-centred care while developing students' interprofessional practice capabilities. *J Interprof Care*. 2013;27(6):482-488. doi:10.3109/13561820.2013.811639

3. Fox L, Onders R, Hermansen-Kobulnicky CJ, et al. Teaching interprofessional teamwork skills to health professional students: A scoping review. *Journal of Interprofessional Care*. 2018;32(2):127-135. doi:10.1080/13561820.2017.1399868

4. Lie DA, Forest CP, Walsh A, Banzali Y, Lohenry K. What and how do students learn in an interprofessional student-run clinic? An educational framework for team-based care. *Med Educ Online*. 2016;21(1). doi:10.3402/meo.v21.31900

5. Schutte T, Tichelaar J, Dekker RS, van Agtmael MA, de Vries TPGM, Richir MC. Learning in student-run clinics: A systematic review. *Medical Education*. 2015;49(3):249-263. doi:10.1111/medu.12625

6. Lapkin S, Levett-Jones T, Gilligan C. A systematic review of the effectiveness of interprofessional education in health professional programs. *Nurse Education Today*. 2013;33(2):90-102. doi:10.1016/j.nedt.2011.11.006

7. Kent F, Keating JL. Interprofessional education in primary health care for entry level students — A systematic literature review. *Nurse Education Today*. 2015;35(12):1221-1231. doi:10.1016/j.nedt.2015.05.005

8. Care T, Shunk R, Dulay M, Chou CL. Huddle-coaching: A dynamic intervention for trainees and staff to support team-based care. *Academic Medicine*. 2014;89(2):244–250. doi:10.1097/ACM.0000000000000104

9. Coleman MT, Roberts K, Wulff D, et al. Interprofessional ambulatory primary care practice-based educational program. *Journal of Interprofessional Care*. 2009;1820. doi:10.1080/13561820701714763

10. Cooper H, Spencer-dawe E, Mclean E. Beginning the process of teamwork: Design, implementation and evaluation of an inter-professional education intervention for first year undergraduate Students. *Journal of Interprofessional Care*. 2009;1820. doi:10.1080/13561820500215160

11. Dienst ER, Byl N. Evaluation of an educational program in health care teams. *Journal of Community Health*. 1981;6(4):282-298.

12. Kent F, Francis-Cracknell A, McDonald R, Newton JM, Keating JL, Dodic M. How do interprofessional student teams interact in a primary care clinic? A qualitative analysis using activity theory. *Advances in Health Sciences Education*. 2016;21(4):749-760. doi:10.1007/s10459-015-9663-4

13. Jeffcott SA, Mackenzie CF. Measuring team performance in healthcare: Review of research and implications for patient safety. *Journal of Critical Care*. 2008;23(2):188–196. doi:10.1016/j.jcrc.2007.12.005

Chapter 3: Objectives, Specific Aims and Significance

3.1 Objective One

The first objective of this research is to assess students' perceptions of IPE and knowledge gains in geriatric competencies after participating in a practice-based IPE setting caring for older persons. This will be achieved by addressing the following specific aims:

Specific Aim One: Collect and summarize data from all students participating in a practice-based IPE program during the fall semester of 2018, including demographic information and prior interprofessional and teamwork experience.

Specific Aim Two: Use the Attitudes Towards Health Care Teams Scale (ATHCTS)[1] as a pre/post measure to assess any differences in student attitudes toward the value of interprofessional teamwork before and after completing the program.

Specific Aim Three: Utilize geriatrics knowledge questions created by course faculty as a pre/post measure to assess differences in students' geriatrics knowledge before and after completing the program.

3.2 Objective Two

The main objective of this study is to assess team effectiveness among interprofessional dynamic student teams participating in a practice-based IPE setting. The study also aims to explore predictors associated with better teamwork performance. This objective will be achieved by addressing the specific aims listed below:

Specific Aim One: Collect and summarize information related to student teams (student program, age, gender, race, prior healthcare and teamwork experience) and clients (client age, gender, education level, insurance and self-reported diagnosis) who consented to participate in this study.

Specific Aim Two: Utilize a variety of approaches to assess team effectiveness among dynamic student teams participating in a practice-based IPE program.

2.1) Use a video recording approach as a data collection measure to assess team effectiveness in practice-based IPE setting

2.2) Assess individual student ratings of team effectiveness using the Team Performance Scale (TPS)[2]

2.3) Assess client ratings of team effectiveness using a modified version of the Patient Perception of Patient-Centeredness (PPPC)[3]

2.4) Assess videos of team encounters to obtain an observer rating of team effectiveness using a modified version of the Creighton Interprofessional Collaborative Evaluation (C-ICE)[4]

2.5) Assess faculty ratings of team effectiveness using a modified version of QNOTE [5]

Specific Aim Three: Assess predictors of team effectiveness among dynamic student teams participating in a practice-based IPE program.

3.1) Assess relationships between student ratings and factors related to students, clients, and teams

3.2) Assess relationships between client ratings and factors related to students, clients, and teams

3.3) Assess relationships between observer ratings and factors related to students, clients, and teams

3.4) Assess relationships between faculty ratings and factors related to students, clients, and teams

3.3 Significance

In the healthcare environment, effective teamwork is essential for improving health outcomes with minimal cost and error, but teamwork is often practiced in groups that are dynamic. Health professions students must be prepared to practice in dynamic teams when they enter the workforce.[6, 7] Evaluating teamwork in settings where learners are transitioning from education to practice is necessary to:

1) Define factors that can be improved through educational interventions
2) Test instruments that assess interprofessional teamwork to ensure that they provide valid measures of team effectiveness
3) Identify strategies for educating health professionals and students about teamwork skills and competencies
4) Identify methods for linking learning outcomes with health and system outcomes

The results of this study contribute to the literature specific to IPE by examining the effects of an IPE practice-based model on multiple learning outcomes, including students' attitudes, knowledge, and skills related to interprofessional teamwork and geriatric competencies. Additionally, it focuses on utilizing different approaches to evaluate team effectiveness and its corresponding predictors. These approaches are adapted from the literature specific to dynamic teams in different settings. Thus, it helps to evaluate the impact of IPE on collaborative behavior and performance in practice.[6, 7, 8]

Another significant aspect of this study is its contribution to improvement of the educational experience by providing educators with data that can be used to inform curriculum development to help students learn the competencies and skills necessary to function most effectively in dynamic teams.

3.4 References

1. Curran V, Sharpe D. Attitudes of health sciences students towards interprofessional teamwork and education. *Learning in Health and Social Care*. 2008;7:146–156. doi:citeulike-article-id:3101535

2. Thompson BM, Levine RE, Kennedy F, et al. Evaluating the quality of learning-team processes in medical education: development and validation of a new measure. *Acad Med*. 2009;84(10 Suppl):S124–7. doi:10.1097/ACM.0b013e3181b38b7a

3. Hudon C, Fortin M, Haggerty JL, Lambert M, Poitras M-E. Measuring patients' perceptions of patient-centered care: A systematic review of tools for family medicine. *Ann Fam Med*. 2011;9(2):155-164. doi:10.1370/afm.1226

4. Iverson L, Todd M, Ryan Haddad A, et al. The development of an instrument to evaluate interprofessional student team competency. *Journal of Interprofessional Care*. 2018;32(5):531-538. doi:10.1080/13561820.2018.1447552

5. Burke HB, Hoang A, Becher D, et al. QNOTE: an instrument for measuring the quality of EHR clinical notes. *Journal of the American Medical Informatics Association*. 2014;21(5):910-916. doi:10.1136/amiajnl-2013-002321

6. Committee on measuring the impact of interprofessional education on collaborative practice and patient outcomes; Board on global health; Institute of medicine P. *Measuring the impact of interprofessional education on collaborative practice and patient outcomes*. The national academies press; 2015. doi:10.17226/21726

7. Reeves S, Xyrichis A, Zwarenstein M. Teamwork, collaboration, coordination, and networking: Why we need to distinguish between different types of interprofessional practice. *Journal of Interprofessional Care*. 2018;32(1):1-3. doi:10.1080/13561820.2017.1400150

8. Guzzo RA, Dickson MW. Teams in organization: Recent research on performance and effectiveness. *Annual Review of Psychology*. 1996;47(1):307-338. doi:10.1146/annurev.psych.47.1.307

Chapter 4: Methods

4.1 Study Designs

This exploratory study used a quantitative multi-measures approach to investigate the study objectives. The first objective utilized a pre- and post-design, while the second objective used a cross-sectional design. Data was collected from four sources:

1) Interprofessional students who participated in the Richmond Health and Wellness Program (RHWP) during the fall 2018 semester, using self-reported surveys and a knowledge test

2) RHWP clients through self-reported surveys and RHWP clinic records

3) Video recording of RHWP clinic encounters

4) RHWP faculty, using a rubric to assess specific aspects of the client care plan

Some measures were collected at the individual level, while others were collected at the team level.

4.2 Study Setting and Participants

Study Setting

The Richmond Health and Wellness Program was developed by faculty at Virginia Commonwealth University (VCU) as community-based care coordination clinic to serve low-income, independent-living older and younger disabled adults' health and wellness needs. The interprofessional learning outcomes of RHWP were for the students to be able to apply IPE and interprofessional geriatrics competencies to address RHWP client needs. In addition, it provides a training opportunity for pre-licensed healthcare students to learn the concept of team-based care prior to their transition to practice. Furthermore, RHWP serves as a research opportunity for faculty and students to perform clinical and educational research that will support the clients'

health outcomes and students' performance. There are currently five independent-living low-income apartment buildings served under RHWP. These buildings were identified based on a hotspotting concept where residents have high burden of chronic illness and utilization of healthcare facilities, such as unnecessary ER visits and ambulance use.[1,2] The buildings are different in size as well as the length of time that the clinic has operated in the building. Also, the number of student teams running simultaneously in each building varies, and therefore, the size of the teams differs in many cases. Besides, the time of the day of the clinic varies by sites. Table 4.1 presents details information about the different characteristics among RHWP sites.

The main goal of RHWP is aligned with the triple aim of improving the clients' health outcomes: maintain clients' safety, maintain clients' independent living, and reduce unnecessary medical costs and errors. To achieve these goals, weekly wellness clinics were established at each apartment building. The clinics were run by the interprofessional student teams under the supervision of clinical faculty. Each clinic day started with a brief didactic session focusing on interprofessional geriatrics competencies. After that, students were divided into interprofessional teams to meet with RHWP clients for a 30-45 minute session. The main goal for the student teams was to address the client needs by performing geriatrics assessments, chronic disease monitoring and medication reconciliation. They also helped with medication management and chronic disease management by providing health education. In addition, student teams assisted the client with referral management, organization of care transitions and appointments, handling prescriptions, and managing home visits.[1, 2]

Table 4.1 Characteristics of RHWP Sites

Comparing Characteristic	Building A	Building B	Building C	Building D	Building E
Number of residence	247	55	137	77	105
Starting of clinic	Fall 2012	Fall 2014	Spring 2018	Spring 2017	Fall 2015
Number of student teams	3	2	2	2	2
Time of the clinic	Morning and afternoon	Morning	Morning	Afternoon	Afternoon

Study Participants

The study participants included RHWP clients, students, and faculty. RHWP clients are older or disabled people with complicated health status impacted by social determinants of health. Interprofessional teamwork is therefore necessary to provide optimum healthcare.

During each academic semester, a new group of 80-100 interprofessional students are assigned to RHWP. Most students participate in a six-hour on-line and in-person clinic orientation and training in motivational interviewing before participating in clinic sessions. Each of the three clinic days each week begins with a 30-minute learning session focused on geriatrics and health equity competencies. Students from multiple health programs participate in the RHWP clinics for varying durations and intensity of experience depending on program needs and requirements. Pharmacy students participate during P3 Introductory Pharmacy Practice Experiences (24 hours over one semester) and P4 Advanced Pharmacy Practice Experiences (120 hours over five weeks). Undergraduate nursing students (BSN) participate during their fourth year (60 hours over one semester), and nurse practitioner (NP) students (adult/gerontology track, family track, psychiatry track) spend 24 hours over one semester during their final year. Medical students engage during their third year for 72 hours over three weeks. Undergraduate social work students spend 228 hours over one semester, and occupational therapy students spend 4 hours over one semester. For any given clinic session, there will be students participating for their first time and others who have served in the clinic during multiple clinic sessions. The mix of student

experiences results in dynamic student teams. At the start of each clinic session, students are divided into interprofessional teams of two to six students who meet with RHWP clients for care coordination, health and wellness assessments, and assistance in setting and achieving health goals. Interprofessional faculty debrief the student team encounters during or after each clinic visit. [1, 2]

4.3 Recruitment Strategy

Participant Inclusion/Exclusion Criteria

All students and clients participating in the RHWP during the fall 2018 semester were eligible to participate in the study. Home visits sessions were excluded because they require special appointments and do not always involve interprofessional teams due to the limited space in client apartments. Clients who were identified by the RHWP staff as having a significant cognitive issue, such that their ability to live independently was impacted, were excluded from the study.

Consent Process

The consent process for both students and clients started with an oral explanation of the study purpose, the voluntary nature of study participation, and the risks and benefits associated with participation in the study. After that, the researcher allowed some time for the participants to ask questions before signing the written consent form. Each participant was provided with two copies of the consent form (one to keep for their reference and one to sign and return to the researcher). The consent form included the contact information of study personnel and the VCU office of research so participants could reach out in case of questions, concerns, or complaints about the study. The consent form for RHWP clients was formed in large font to address possible vision concerns. Consent was required prior to participation in video recording or surveys. The

student and client consent forms are in Appendix 1.

Participant Recruitment

RHWP Students

The majority of the students consented to participate in the study during the orientation session held during the first week of the fall 2018 semester. At the orientation, the study objectives and rationale were presented to the students by the researcher, and signed written consent forms were collected at the end of the session. At the clinic day, the study objectives and rationale were discussed with the students who missed the orientation, and signed written consent forms were collected at that time.

RHWP Clients

Client consent was obtained at the clinic before the start of a clinic encounter. During the clinic's regular intake process, the researcher and/or the clinic coordinator provided the client with information regarding the study objectives and emphasized that the primary goal was to understand how the students work together as a team while providing the healthcare plan. The session was not recorded if the client declined to sign the consent form.

Consent was verified with all of the students and RHWP clients in an encounter prior to starting a video recording.

Participant Incentives

RHWP Students

No incentive was provided to the students who agreed to participate in the video recording and/or complete the surveys.

RHWP Clients

Clients who consented to participate were given a monetary incentive of $5 after completing the video recording and the survey.

4.4 Data Collection

Data collection occurred at three different phases throughout the fall 2018 semester. The first phase was conducted in the student orientation to the RHWP at the start of the semester. The researcher explained the study rationale and requested consent from the students to video record their team encounters during the clinic sessions. Students were also asked to complete a paper-based pre-survey to gather information regarding their interprofessional geriatrics competencies knowledge and attitudes toward the value of a teamwork approach in delivering healthcare. The second phase occurred throughout the fall semester during the regular clinic sessions. A total of 100 wellness visits were videotaped to assess the dynamic student teams' effectiveness. After each health and wellness visit, each individual student within the team completed a short paper-based survey about their perceptions of the quality of the teamwork interaction they experienced during the visit. RHWP clients completed a short paper-based survey to evaluate their experience with the student-provider teams. RHWP faculty assigned to the clinic assessed the written care plans for each team. The third phase of data collection occurred on the last day of the students' clinical rotation. Students were asked to complete a paper-based post-survey to evaluate their overall RHWP experience. Students who did not complete the post-survey on their last clinic day were provided with an option to complete an electronic version of the post-survey distributed by e-mail as a Google doc.

Videotaping and Coding Process

Clinic Video Recording Process

A total of 100 unique clinic encounters were recorded throughout the fall 2018 semester. The video recordings occurred in all RHWP sites, including buildings A through E. The recordings started on September 17th, 2018 and ended on November 19th, 2018. The recording schedule is presented in Table 4.2.

Table 4.2 Recording Schedule by Location and Week

Site	Week number										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Total**
Building A	3	3	5	3	3	3	4	3	4	-	31
Building B	-	1	1	-	2	2	2	2	2	2	14
Building C	2	3	2	3	-	3	3	2	3	-	21
Building D	2	1	2	1	2	1	3	2	2	2	18
Building E	2	2	2	2	2	1	2	2	1	-	16
Total	9	10	12	9	9	10	14	11	12	4	100

Video recording procedures were managed in a way that minimized the disruption to clinic flow and maximized the number of recordings to capture all the unique team-client encounters.

On the clinic day, students were divided into interprofessional teams based on their professions. The number of interprofessional student teams varied depending on the RHWP site. For sites like buildings B, D, C, and E, two interprofessional student teams were involved in client encounters simultaneously. In building A, three interprofessional teams conducted clinic encounters simultaneously. The main goal was to record as many unique encounters as possible. In some locations, team composition altered during the clinic due to factors related to program requirements; for example, BSN students were rotated between team visits and performing the standard intake process. Similarly, social work students were rotated between teams and social

events. On some days, we were able to record all of the unique teams possible depending on the number of clients and teams where all members consented to participate.

During the start of the clinic (for morning clinic: during the morning discussion, for afternoon clinic: during lunch time), the researcher fixed the camera by assembling its different parts, including the Tripod pan, Tripod cross bar, computer table, Logitech BRIO webcam, laptop, and the USB portable microphone. After that, the camera was arranged in a way to capture the student team without showing the client's identity. After determining the appropriate camera angle, a test was run to verify video quality.

Prior to the video recording, consent was verified with the students and clients. Video recording was initiated by the researcher. The researcher did not remain in the room during the team encounter. The recording was stopped by the researcher after the clients left the clinic room. At the end of the clinic, the researcher transferred all the recorded video onto an encrypted hard drive and deleted all recordings from the laptop that was attached to the camera.

Video Coding Process

Two coders were involved in the video coding process to increase the reliability of the study results. These coders included the main researcher (Danah Alsane) and a research assistant. The research assistant was recruited by a job posting through the graduate school at VCU. The final selection for the research assistant position was based on the applicant CV and interview. The selected research assistant had a background in public health with experience in quantitative and qualitative data analysis.

The C-ICE [3] instrument was used to code all recorded videos. Both coders completed the C-ICE instrument training videos published in the Creighton University C-ICE training website.[4] These videos included an introduction and Q&A video. In the introductory video, the instructor

discussed the C-ICE development process and provided relevant information related to the tool description and usage. In the Q&A video, two members of the instrument development team discussed common issues that arise with C-ICE usage. The instructors in the video displayed the scoring information, focusing on score selection criteria and calculating the overall instrument score. They also discussed the applicability of the C-ICE instrument in different IPE settings. Instructors in both videos highlighted the importance of prior discussion on how to utilize the instrument in evaluating specific IPE activities. This helps to improve the score consistency and reliability of results among different coders. In the training website, two clinical cases were presented as helpful resources to understand proper team interaction. A detailed case scenario with a sample care plan was presented. In addition, two videos presented an example of best practice and poor team interaction.

After completing the C-ICE instrument training module, the coders worked together to analyze the first two videos. They discussed the scoring procedure for each element within the instrument to agree on certain acceptable behaviors. After that, they started coding independently and reviewing their coding scores. For videos three through 20, the coders discussed the scoring criteria by reviewing their score for each element within the instrument. For videos 21 through 100, the coders reviewed flagged videos only based on inter-rater reliability results.

The coders followed a structured outline to code 10 videos weekly. The inter-rater reliability test was performed weekly to test the absolute agreement between both coders for the coded videos. The video coding process started January 14th, 2019 and ended March 31st, 2019.

Inter-rater Reliability

Inter-rater reliability was assessed using SPSS software (version 25).[5] The C-ICE instrument has an overall score value ranging from 0-1. Thus, the intra-class correlation

coefficient (ICC) was used to calculate the degree of agreement among the two coders. There are different types of ICC, and choosing the appropriate type depends on the analysis design (one-way or two-way), rater effects (random or fixed), and analysis unit (single measure or average measure).[6] This study used a two-way mixed effects, absolute agreement, average measures ICC model. The two-way mixed effects design assumes that each subject is measured by a fixed number of raters. Absolute agreement refers to the degree of agreement among the two raters, including systematic errors. The average measure worked by averaging the measures of different raters for each subject.

The standard criteria for ICC are: 0.00-0.40 = poor, 0.40-0.59 = fair, 0.60-0.74 = good, and 0.75-1.00 = excellent. This study used a minimum value of 0.75 as a benchmark for calculating the ICC. The ICC was calculated for each 10 videos independently. It was also calculated for the overall 100 videos. A detailed presentation of ICC results are given in Table 4.3.

If the ICC was < 0.75, a differences test was performed to identify the degree of disagreement in each group of 10 videos. Any video with a difference greater than 0.1 was reviewed by discussing the scoring strategy. Overall, 11 out of 80 independently coded videos were reviewed, and the score was corrected accordingly.

Table 4.3 ICC Results

	Video Number										
	1-10	**11-20**	**21- 30**	**31-40**	**41-50**	**51-60**	**61-70**	**71-80**	**81-90**	**91-100**	**1-100**
ICC	0.996	0.925	0.574 0.794*	0.992	0.516 0.854*	0.889	0.139 0.946*	0.838	0.715 0.907*	0.764	0.922

*Results of the second round

4.5 Other Study Measures

As stated previously, different measures were utilized during the study to collect data from the study participants. A detailed description of each measure is presented as it was utilized during the study. The surveys and study measures used for this study are in Appendix 2.

Student Pre/Post Survey

All of the students who engaged in the clinical learning experience were asked to voluntarily complete a pre- and post-survey to assess their learning experience. The pre-survey consisted of three parts: standard demographics section, knowledge questions related to interprofessional geriatric competencies, and a validated attitudinal measure about the value of teamwork. The demographic items included information related to students' program, age, gender, race, and questions related to prior healthcare and interprofessional teamwork experiences. The knowledge questions were developed by an interprofessional team of faculty based on the Partnership for Health in Aging interprofessional competencies and topic discussion content at RHW. These questions are divided into nine domains covering the interprofessional geriatrics competencies: communication with older adults, health literacy, motivational interviewing, diabetes, hypertension, cognition, falls, frailty, medication, and polypharmacy. The attitudinal measure includes the Attitudes Toward Health Care Teams Scale (ATHCTS). This scale was selected based on validity evidence to be used as an evaluation measure for education interventions with interprofessional student teams.[7]

The ATHCTS was originally developed by Heinemann et al. in 1999 to assess attitudes toward teamwork among interprofessional geriatrics healthcare teams. The scale contains 20 items and uses a 6-point Likert type response (1 = strongly disagree, 6 = strongly agree). There are two subscales: the Quality of Care/Process (14 items) and the Physician Centrality (6 items).

The Quality of Care/Process subscale measures an individual's attitude toward the quality of care delivered by the interprofessional healthcare team. The Physician Centrality subscale measures an individual's attitude toward the dominant physician influence in team decisions. The ATHCTS was used as a pre/post scale to evaluate team members' attitudes toward the value of teamwork in educational and clinical settings.[7]

The ATHCTS was further modified and adapted using the Quality of Care/Process subscale to assess the students' attitude toward the value of interprofessional teamwork in an educational IPE setting.[8, 9] The adapted ATHCTS [8, 10] contains 14 items, which are divided into two subscales: 11 items that correspond to the quality of care subscale and three items that correspond to the time constraints subscale. The response for each item was scored using a 5-point Likert scale (1=strongly disagree, 5=strongly agree). The total possible score has a value that ranges from 14 to 70. A higher score represents more positive attitudes toward the value of interprofessional teamwork. The adapted ATHCTS is a reliable and a valid measure to be used among health professions students. The internal reliability was assessed using the Cronbach's alpha, which has value of 0.92 and 0.86 corresponding to quality of care and time constraints subscales respectively. The construct validity was assessed using the discriminant validity approach with the remodeled subscale of the Interdisciplinary Education Perception Scale [11] (IEPS). The correlation analysis showed that both the quality of care and time constraints subscales have a statically significant relationship with IEPS subscales.[10]

The post-survey included the same geriatric knowledge questions and attitudinal measure.

Clinic Recording Script

The recording scripts collected information related to interprofessional student teams and were completed by the researcher. The information includes the date of the recording, recording sites, number of participating students, student professions, and topic for the morning clinic discussion that day.

During the semester, various topics related to interprofessional geriatric competencies were discussed with the students at the beginning of the clinic. The discussion topics were mapped to the Partnership for Health in Aging's multidisciplinary competencies in the care of older adults at the completion of the entry-level health professional degree.[12] All topics were collapsed under one of the five domains: health promotion and safety, evaluation and assessment, care planning and coordination across the care spectrum, interdisciplinary and team care, and healthcare systems and benefits. The caregiver support domain was not applicable to the independent living nature of RHWP. Thus, no topic was assigned to this domain. Refer to Table 4.4 for detailed information about mapping discussion topics onto interprofessional geriatric competencies.

Table 4.4 Mapping of Topic Discussion into Interprofessional Geriatrics Competencies

Health Promotion and Safety	Evaluation and Assessment	Care Planning and Coordination Across the Care Spectrum	Interdisciplinary and Team Care	Healthcare System and Benefits	Other
▪ Cholesterol ▪ Depression ▪ Diabetes ▪ Falls ▪ Hypertension ▪ Motivational Interviewing ▪ Nutrition ▪ Polypharmacy ▪ Smoking Cessation	▪ Adult Protective Services ▪ Cognitive Assessment ▪ Diabetes Management ▪ Geriatric Assessment ▪ Hypertension Management	▪ Advanced Care Planning ▪ Advanced Directives ▪ Health Equity ▪ Health Literacy ▪ Long Term Care	▪ Disabilities ▪ IP-Communication	▪ Medicaid ▪ Social Determinants of Health	▪ Genetic Research

Clinic Student Survey

Students who participated in the video recording sessions were asked to complete a brief survey after each recording. The survey consisted of two parts: the Team Performance Scale (TPS)[13] and information related to the student's experience. The TPS is a self-reported instrument developed by a team of experts to measure the quality of learning and team interaction in medical education settings. It is an 18-item survey with a 7-point response scale (0 = none of the time, 6 = all of the time). The individual level TPS score is calculated as a sum of the 18 items for each individual within the team. The team-level TPS score is calculated by averaging individual team member TPS scores. The total score has a value that ranges from 0-108. Higher scores represent higher quality of team interaction. TPS is a reliable and valid instrument. The Cronbach's alpha=0.97, suggesting good evidence of internal consistency. Construct validity was assessed using convergent validity, which has a significant p-value (<0.0001 for individual level, =0.003 for team level). [13] In this study, the TPS was utilized as an evaluation measure to assess team effectiveness based on student experience. The scale was

chosen based on validity evidence to be used as a self-reported measure to assess the quality of team performance.

The second part of the survey covered information related to student experience; for example, students were asked to identify their degree of study and prior working experience related to healthcare and interprofessional teamwork. Students were also asked to identify the number of times they participated in a half-day of clinic at RHWP, clinic time, and the number of clients each student had encountered in the half-day of clinic.

Clinic Client Survey

The ultimate goal of interprofessional education and collaborative practice is to provide client-centered healthcare. From this perspective, it is important to assess the client experience with the interprofessional student teams. In this study, the client survey was used as an evaluation measure to assess team effectiveness based on client experience with the student team. The measure was developed based on items presented in the Patient Perception of Patient-Centeredness (PPPC) scale.[14] The survey has 5 items and uses a 4 point-Likert Scale (1 = strongly disagree, 4 = strongly agree). The total score was calculated by averaging the client response across the 5 items. Clients who consented to participate in the study were asked to complete the survey after each team encounter. The survey is self-administered unless a client has literacy or vision issues, in which case the researcher assisted the client in completing the survey. Demographic information and self-reported diagnoses were obtained from RHWP client clinic records by the researcher. The demographic information included the client's age, race, type of insurance, and level of education. Information related to the total number of wellness and behavioral visits the client had to date with RHWP was also obtained.

The client-self report diagnoses were obtained from the RHWP problem list in the clinic record and covered 32 conditions. These conditions included Alzheimer's disease or problems with memory, ankle/leg swelling, arthritis, asthma, chronic obstructive pulmonary disease (COPD), cancer, coronary artery disease (CAD)/heart disease, myocardial infarction (MI)/heart attack (year), high blood pressure/hypertension, high cholesterol, stroke, schizophrenia, bipolar disorder, depression, diabetes/high blood sugar, seizures, visual impairment, glaucoma, cataracts, loss of feeling/numbness or burning in legs/feet, osteoporosis, Parkinson's disease, sciatica or chronic back pain, diarrhea, gastroesophageal reflux disease (GERD), constipation, urinary incontinence, inflammatory bowel syndrome, thyroid disease, weight loss > 10 lb. in the past year, headaches/migraines, insomnia, kidney impairment, hearing impairment, and other.

The RHWP client conditions were matched to the chronic conditions included in the Center for Medicare and Medicaid Services (CMS) Chronic Conditions Data Warehouse (CCW) list, including the Chronic Conditions and Chronic or Potentially Disabling Conditions. The conditions on the CCW Chronic Conditions list include: acquired hypothyroidism, acute myocardial infarction, Alzheimer's disease, asthma, cancer, cataracts, chronic kidney disease, COPD, depression, diabetes, glaucoma, hyperlipidemia, hypertension, ischemic heart disease, osteoporosis, rheumatoid arthritis, and stroke. The Other Chronic or Potentially Disabling Conditions include: bipolar disorder, human immunodeficiency virus/ acquired immunodeficiency syndrome (HIV/AIDS), liver conditions, migraines and chronic headaches, and schizophrenia.[15]

Team Care Plan Evaluation

In this study, the team care plan evaluation measure was used to assess the team effectiveness based on faculty rating of the quality of the healthcare plan. During the team-client

encounter, one of the team members was assigned to document information related to client visit, such as the client's chief complaint, updated medical and social history, vitals (BP, pulse, weight), and point of care test (BS, A1C, lipids) values. This information was used by the student team to document a subjective, objective, assessment and plan (SOAP) note that listed, in order, the client problems and subsequent student teams plan. As part of team debrief, faculty evaluated the overall healthcare plan by reviewing the SOAP notes with the students. In the healthcare setting the SOAP is used as an interdisciplinary communication tool to document patient progress. Most of the time, each discipline provides a note or adds to the note separately in healthcare settings. In RHWP, student teams work together to record and sign a team SOAP note. The faculty then add to the note as needed during the debriefing process.

During the study period, a grading rubric was utilized to evaluate student team effectiveness. The grading rubric contained elements adapted from the QNOTE [16] to evaluate the student assessment and plan of care. The QNOTE instrument was developed by a team of experts in clinical notes documentation. Originally, it consisted of 12 clinical elements that utilized seven evaluative components to assess the quality of the clinical note. Scoring criteria is determined based on the components score of each element: fully acceptable = 100, partially acceptable = 50, unacceptable = 0. Total element score is calculated by averaging its components' score. The overall instrument score is calculated by averaging the element scores; total score values range from 0-100. The QNOTE instrument exhibited high level of evidence supporting its validity and reliability.[16]

Due to the unique characteristics of the study setting and participants, only three elements were eligible to be to be used as an evaluative measure. These elements targeted the student team assessment, plan of care, and follow-up. Four components were used to evaluate each of the

elements. The components focus on the following: order of clinical importance, sufficient information for the issue, understandable to others, and conciseness. The total score was calculated using QNOTE scoring criteria.[16]

Observer Team Effectiveness Measure

In this study, the C-ICE instrument was chosen as a measure to evaluate team effectiveness based on its generalizability and ability to adapt to various IPE activities and settings. The C-ICE instrument was established by an expert interprofessional team in Creighton University. The C-ICE is a competency-based instrument that was developed to quantitatively assess collaborative student team performances in different IPE settings. The C-ICE consists of 26 items, each assigned to the corresponding Core Competencies for Interprofessional Collaborative Practice: 1) values/ethics for interprofessional practice, 2) roles/responsibilities, 3) interprofessional communication, and 4) teams and teamwork.[17] The response for each item is comprised of a dichotomous scale of zero or one; one indicates that the student team demonstrates IPE competency, while zero indicates that the student team does not demonstrate competency. There is a non-applicable option for selection if the item is not relevant to the scenario.

The C-ICE instrument demonstrated evidence for psychometric properties. Content validity was assessed based on expert opinions. Experts assessed each item within the instrument, as well as the overall effectiveness, comprehensiveness, and appropriateness of the C-ICE in evaluating student team performance in different IPE activities. The Scale Content Validity Index (S-CVI) for the C-ICE is equal to 0.93, indicating good evidence for the instrument's validity. Inter-rater reliability was assessed using Krippendorff`s nominal alpha (nKALPHA). The nKALPHA ranged from 0.558 to 0.887 for 5 raters who independently assessed student team performance in

five independently simulated IPE activities. A detailed description of validity and reliability can be founded in the cited articles.[3] The C-ICE total score is calculated by creating a sum of all the selected items, divided by the total number of the applicable items. The earned score has a value that ranges from 0 to 1.

In the current study, the C-ICE instrument was adapted to suit study objectives and setting. The instrument was used to intensely evaluate dynamic student team effectiveness. Thus, the response scale was modified to quantify how competent the student team was based on how many team members displayed each behavior (0 = none, ½ = some, 1 = all), or how well the student team displayed collaborative behavior (0 = not at all, ½ = somewhat/developing, 1 = competent).

4.6 Ethical Considerations

This study was approved by the Institutional Review Board (IRB) at VCU under the expedited category. Study participants, including students and clients, were placed at greater than minimal risk due to the nature of the video recording as a data collection tool. All participants signed the informed consent form before participating in the study. The consent form includes details about the study rationale and the voluntary nature of study participation. It also contains information about the benefits, risks, and cost associated with participation in the study. The informed consent includes a statement explaining that the participant may leave the study at any time without penalty. In addition, the participants were provided with contact information for the research team, as well as the VCU office of research information to contact in case of questions, complaints, or concerns about the study. All video recordings were conducted in RHWP wellness clinics, which were conducted in a private area.

Hard copies of participant data, including consent forms, surveys, and evaluation measures, were kept in a secure cabinet with the study principal investigator (PI). All data was de-identified and entered into the Research Electronic Data Capture application (REDCap). The video recording data was stored on encrypted hard drives kept in a secure cabinet in the PI's office. The video recorded data will be stored for a period of 5 years, after which it will be destroyed.

4.7 Statistical Analysis

In this study, the statistical analyses were carried out using SAS statistical software (version 9.4, SAS Institute, Cary, NC)[18] with two-tailed tests at a significance level of alpha = 0.05.

Study Variables

Figure 4.1 represents the conceptual framework for the study variables.

A. Student Factors

The following variables are related to individual student characteristics. Students were asked to fill out a response for each variable individually. Some of the variables were collected at baseline (stable), while others were collected after each team encounter (unstable).

Baseline (stable):

Student ID: a unique identifier assigned to each student.

Student age: a nominal variable with three categories representing the student's age group: 1) 20-29 years, 2) 30-39 years, 3) 40-49 years. The variable has a stable individualized value.

Student gender: a binary variable that represents student gender: 1) male, and 2) female. This variable has a constant individualized value.

Student race: a nominal variable with four categories corresponding to student race: 1) Asian, 2) black or African American, 3) white and 4) more than one race. This variable has a constant individualized value.

ATHCTS: a continuous variable that represents the mean score for the 14 items on the ATHCTS. The variable has a unique pre- and post-value corresponding to each student. Higher values suggest positive attitudes toward interprofessional teamwork.

Quality of care subscale: a continuous variable representing the mean score for the 11-item quality of care subscale of the ATHCTS. The variable has a unique pre- and post-value linked to each student.

Time constraints subscale: a continuous variable that represents the mean score for the 3-item time constraints subscale of the ATHCTS. The variable has a unique pre- and post-value linked to each student.

Knowledge domain score: a count variable that represents the individual score for geriatrics knowledge domains. The knowledge domains are divided into nine sections: 1) communication with older adults, 2) health literacy, 3) motivational interviewing, 4) diabetes, 5) hypertension, 6) cognition, 7) falls, 8) frailty, and 9) medication and polypharmacy. The score for each section has a value ranging from 0-2. This variable has a pre- and post-value linked to each student.

Knowledge score: a continuous variable representing the total score of geriatrics knowledge competencies questions. The variable has a value that ranges from 0-100. A higher score represents a great understanding of knowledge related to geriatrics competencies. Each student completes the knowledge questions at the beginning of the program, so the variable has a fixed value for each student among different team encounters.

Student program: a nominal variable with five categories representing the student's program of study: 1) BSN, 2) NP, 3) pharmacy, 4) social work, and 5) health science. This variable has a stable value corresponding to each student's participation in different team encounters.

Prior healthcare experience: an ordinal variable with five categories reflecting the amount of interprofessional healthcare experience the student encountered before RHWP:
1) none, 2) small amount (some shadowing or volunteer work), 3) short-term paid position, 4) long-term paid position, and 5) prior career in healthcare. This variable has a constant individualized value for each student across all team encounters.

Prior teamwork experience: an ordinal variable with four categories indicating the number of times students participated in an interprofessional team (including students or clinicians) before attending RHWP: 1) never, 2) once or twice, 3) several times, and 4) many times. This variable has a constant individualized value for each student across all team encounters.

Each Team Encounter (unstable):

RHWP experience: a discrete (count) variable that represents the number of times each student has participated in a half-day of the clinic at RHWP. The variable has a value that increases after each clinic day that the student participates in.

Number of client encounters: a discrete variable representing the number of clients encountered in the half-day of the clinic. The value varies from one to four.

TPS student: a continuous variable that represents the individual student's average score on the 18-item TPS. The variable has a possible value that ranges from 0-6 for each student. A higher score represents a higher quality of team performance as determined based on student perception. This variable has a unique value for each encounter.

B. Client Factors:

The following variables relate to the RHWP client characteristics. Clients were asked to fill out a survey related to their experience with the student team after each encounter. The researcher was responsible for filling out the demographics section based on information presented in the RHWP client chart. Some of the variables were stable through the study period (stable), while others were unstable.

Baseline (stable):

Client ID: a unique identifier assigned to each client.

Client age: a continuous variable that represents RHWP client age. The variable has a stable individual value.

Client gender: a binary variable representing client gender: 1) male and 2) female. This variable has a stable individual value.

Client race: a nominal variable with five categories that represent the RHWP client's race: 1) black, 2) white, 3) Asian, 4) Hispanic, and 5) other. The variable has a stable individual value.

Client insurance: a nominal variable with five categories indicating client insurance type: 1) Medicaid, 2) Medicare, 3) dual, 4) veteran, and 5) other. The client can have more than one insurance. The client insurance variable has a stable value through the study period.

Client education level: an ordinal variable with three categories representing the RHWP client's education level: 1) less than 12 years of education, 2) 12 years of education, and 3) more than 12 years of education. This variable has a stable individual value.

Client disease burden: a discrete variable representing the total number of chronic conditions. The value of the variable was determined based on matching the client's self-reported diagnosis with the chronic conditions from the CMS CCW list. A count of one was assigned for each

condition that appeared on the client's self-reported diagnosis list. The total value was determined by calculating a sum of the number of corresponding conditions. The variable has a value ranging from 0-19. Higher values indicate higher numbers of chronic conditions, which will ultimately increase the client's disease burden. The variable has a constant value throughout the research period.

Each Team Encounter (unstable):

Total number of wellness visits: a discrete variable reflecting the total number of RHWP visits the client has participated in. The variable has a value starting from one.

Wellness visit intensity: a continuous variable that represents the level of RHWP visit intensity. The variable was calculated for each participating client by dividing the total number of RHWP visits over the total duration in months. The duration was determined through subtraction of the latest RHWP visit from the first day of RHWP visit. The variable has an unstable value.

Ever had behavioral visit: a dichotomous variable where a value of one indicates that the client has had a dedicated behavioral health visit in addition to health and wellness visits, and a value of zero indicates that the client has never had any behavioral visit within RHWP. Behavioral health visits are led by a licensed clinical social worker or psychologist. The variable has a changeable value depending on the client need.

Client experience: a continuous variable represents the total average score of the 5-item client survey with 4 point-Likert scale. The variable has a total average score with minimum value of 1 and maximum value of 4. A higher score represents a higher level of client satisfaction with the interprofessional student team. Thus, the variable has a changing value depending on the client-team experience.

C. Team Factors:

The following variables represent factors related to the composition of interprofessional student teams. The response for each item is completed by an observer.

Team ID: a unique identifier assigned to the student team.

Student number: a discrete variable indicating the number of participating students in each team. It has a value ranging from 2-5. This variable has a different numeric value for each encounter.

Clinic time: a binary variable representing the clinic time: 1) morning clinic and 2) afternoon clinic. The variable has an unstable value depending on the clinic location.

Clinic site: a nominal variable with five categories that represent the clinic location. Each category was assigned a number representing the clinic site: 1) Building A, 2) Building B, 3) Building C, 4) Building D, 5) Building E. This variable has a different value in each encounter.

Topic discussion: a nominal variable with six categories representing the competencies for interprofessional geriatrics for entry level health professionals: 1) health promotion and safety, 2) evaluation and assessment, 3) care planning and coordination across the care spectrum, 4) interdisciplinary and team care, 5) health care system and benefits, and 6) other. Since the topic discussion topic varies each day, this variable has an unstable value.

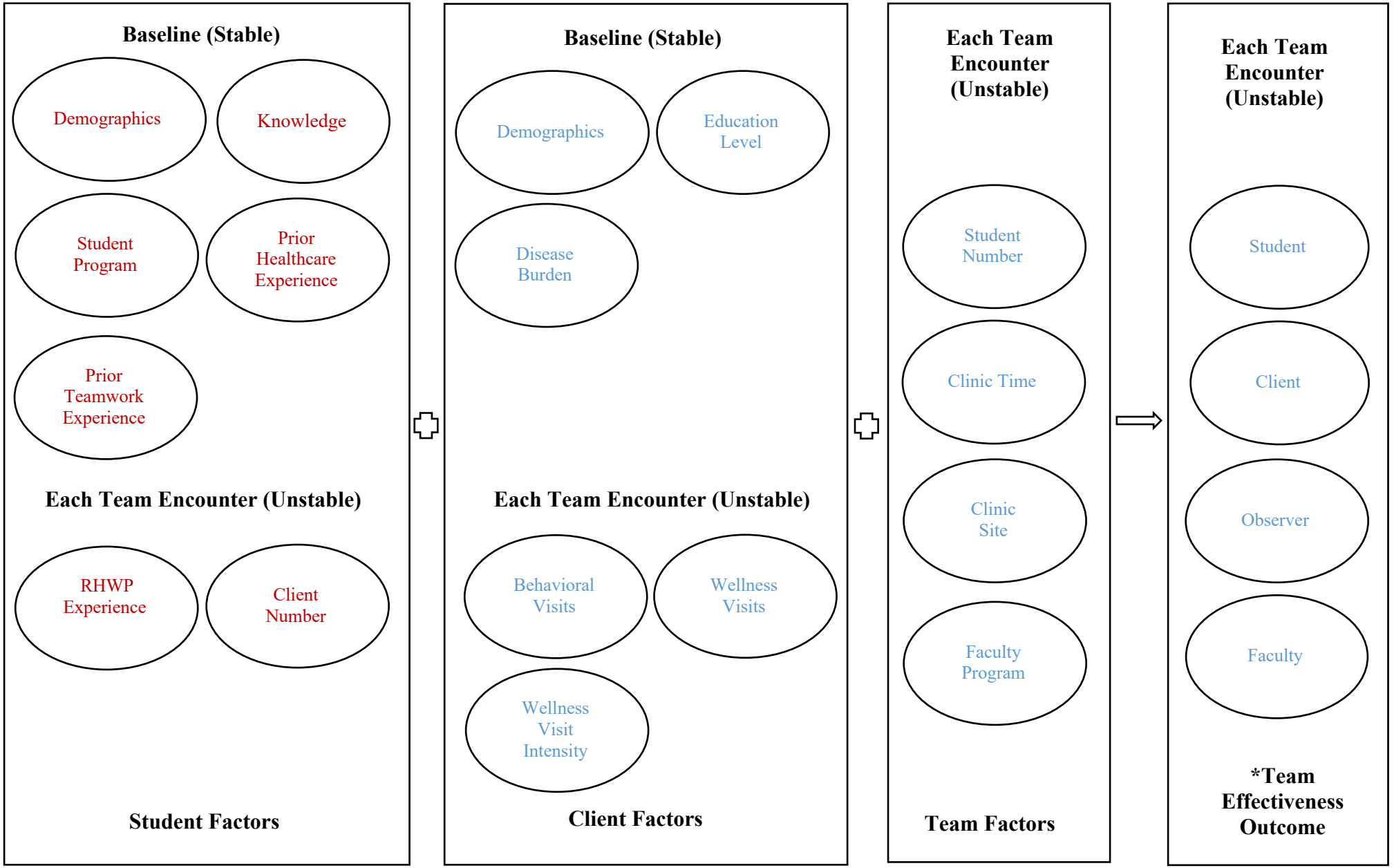
Faculty program: a nominal variable with three categories represents faculty department: 1) nursing, 2) pharmacy and 3) social work. This variable has a different value based on the faculty member who is debriefing the student team.

TPS team: a continuous variable that represents the TPS team score. The team TPS score is determined by averaging the individual TPS score of all the students within the team. This variable has a unique unstable value that ranges from 0-6.

C-ICE: a continuous variable that represents the total score of the modified C-ICE instrument. The total score is calculated by adding all the selected items, divided by the total number of the applicable items. The variable has a value ranging from 0-1. A higher score represents a higher quality of team performance. This variable has a unique unstable team value.

Team Care Plan Evaluation: a continuous variable representing the total score of the healthcare plan faculty rating. The variable has a value ranging from 0-100. A score of 100 represents an entirely acceptable healthcare plan. The variable has a unique unstable team value.

Figure 4.1 Conceptual Framework for the Study Variables



*Team effectiveness outcome measures:

1) Student Rating = TPS Team
2) Client Rating = Client Experience
3) Observer Rating = C-ICE
4) Faculty Rating = Team Care Plan Evaluation

Individual level variables
Team level variables

Objective One

Descriptive statistics

Frequency and percentage were used to summarize student demographics, including age, gender, and race. The same descriptive statistics were used to describe participating student programs, as well as prior healthcare and interprofessional teamwork experiences. Response rates were calculated for the pre- and post-study measures, including the ATHCTS and geriatrics knowledge questions.

The response rate was calculated by dividing the number of completed response surveys over the total number of participating students and multiplying by 100.

Main Analysis

Prior to the analysis, normality for the ATHCTS and the subsequent subscale scores were assessed. Likewise, the normality for knowledge domains and total knowledge scores were evaluated. Accordingly, the appropriate statistical tests were conducted.

ATHCTS:

The means (±SD) were reported for the pre- and post-scores for the ATHCTS and its subsequent subscales.

A paired *t*-test (Signed Rank test) was used to test the overall difference in ATHCTS score before and after participating in RHWP. The same test was used to assess differences in the quality of care and time constraints subscale scores.

Geriatrics Knowledge:

The medians (IQR) were used to summarize the pre- and post-scores for each domain within the geriatrics knowledge questions. The means (±SD) were used to summarize the pre- and post-total geriatrics knowledge scores.

The Wilcoxon Signed-Ranked test was used to assess the difference in each knowledge domain score before and after participating in RHWP. A paired *t*-test was used to test the difference in the overall knowledge score before and after participating in RHWP.

Objective Two

Descriptive and preliminary statistics

Descriptive statistics, including mean and standard deviation or frequency and percentage, were presented to summarize factors related to students and clients who participated in video recorded sessions.

One-way ANOVAs with Tukey comparisons were used to assess the difference in faculty ratings of the team healthcare plans.

Main statistics

The initial plan was to use the multi-level, cross-classified model approach to assess the study objective. The multi-level model is theorized as a liner regression model with variables that differ at more than one level. Such a model can occur in two conditions:

1) Macro-Micro: the outcome variable is measured at a lower level, while the predictor variables are measured at lower and higher levels.
2) Micro-Macro: the outcome variable is measured at a higher level, while the predictor variables are measured at lower or higher levels.

This study used a combination of individual-level (lower) and team-level (higher) variables to apprise predictors associated with team effectiveness (higher level). Thus, analysis can be conducted using the micro-macro multilevel model. The micro-macro multi-level model uses the higher-level variables as the main units of analysis and the lower level variables as indicators. Thus, it is recommended to first aggregate the lower level variables using the latent

variable approach. After that, the aggregate latent variables were fitted into a higher level model for analysis.[19]

Using such an approach was not feasible in the current study, because the majority of the predictors were categorical variables. Due to the exploratory nature of this study, aggregating the categorical variables may hinder the ability to deeply understand the effects of student and client heterogeneity on team effectiveness.

Another available option to analyze the higher-level outcome variable with the predictor variables measured at a lower or a higher level involves the disaggregation approach. In such an approach, all the variables are transformed into lower-level units to conduct the analysis at that level. Utilizing a disaggregated data approach can help to intensely assess the effect of students, clients, and team characteristics toward team effectiveness.[20, 21] For example, it helps to understand the effect of student programs and prior experience on team effectiveness. It also supports the understanding of student and client demographic information on team effectiveness.

In this study, the disaggregated data approach was selected to organize the data for analysis. Data was organized by using the students as the observation units. Each student received a score on a team-level variable by assigning them their team score on that variable.

Analysis

Linear regression analysis was selected to assess predictors associated with team effectiveness.

In this study, four possible outcome measures were used to evaluate team effectiveness, including team members' self-reported evaluation toward the quality of team performance, client satisfaction, observer rating of the quality of team performance and the offered healthcare plan,

and faculty rating of the healthcare plan. Consequently, four linear regression models were performed to identify variables that are associated with an effective team.

Model building

For the purpose of consistent interpretation of study results among different outcome measures, the scale response for each outcome measure was converted into a percentage. The percentage was calculated by dividing the perceived true score over the total possible score corresponding to each measure and multiplying by 100.

For example:

The % Student rating = perceived true score /6 *100

The % Client rating = (perceived true score) -1/3 *100

The % Observer rating = perceived true score/1 *100

The % Faculty rating = perceived true score/100 *100

The mean, standard deviation (±SD), and range values were reported for the outcome measures. Pearson's correlation was used to assess the relationship between the four possible outcome measures. Prior to the analysis, all the categorical variables were dummy coded. For some categorical variables, there was unequal distribution between the categories. As a result, the largest category was selected as a reference.

For each outcome measure, linear regression analyses were performed to identify significant predictors associated with team effectiveness. The analyses started with the unadjusted model, where all the predictors were tested using bivariate linear regression. These analyses have been performed to evaluate the assumption of the linear regression model and build the final adjusted model. Collinearity was assessed for all the predictors using a Variance Inflation Factor (VIF) with a cutoff value of VIF <10. The adjusted models were built using

backward elimination stepwise procedures with p-to-stay value of 0.2 or less. The backward elimination started with all the predictors in the model. The least significant predictors were dropped one at a time until reaching the parsimonious model.

For each outcome measure, the model-building procedures followed two approaches using the technique mentioned above to arrive at the final adjusted model:

1) One model was used to test the outcome with all the predictors related to student, client, and team.
2) Three separate models were created to reach the final model. The first model tested the outcome with the student factors, such as demographics, study program, and prior experiences. The second model examined the outcomes with the client factors related to demographics and health status. The third model assessed the team factors such as student numbers, supervising faculty, clinic time, and site. Based on the results obtained from the three models, the significant predictors were entered in one model.

The final model was approved based on R-Squared and adjusted R-Squared values. In all of the cases, the model that examined all the predictors simultaneously appeared to have better R-Square and adjusted R-Square values. Model assumption and collinearity (using VIF) were rechecked for the final adjusted model. The R-Squared, adjusted R-Squared, parameter estimates, standard errors (±SE), and p-value were reported for both unadjusted and adjusted models.

4.8 References

1. Health quality innovators. Richmond health and wellness program (RHWP): A patient-centered approach to better outcomes and appropriate utilization. 2017:1-28.

2. Parsons PL, Slattum PW, Bleich M. Mainstreaming health and wellness: The RHWP innovation model to complement primary care. *Nursing Forum*. 2019;54(2):263-269. doi:10.1111/nuf.12326

3. Iverson L, Todd M, Ryan Haddad A, et al. The development of an instrument to evaluate interprofessional student team competency. *Journal of Interprofessional Care*. 2018;32(5):531-538. doi:10.1080/13561820.2018.1447552

4. Resources. https://healthsciences.creighton.edu/interprofessional/center-interprofessional-practice-education-and-research/resources. Published April 23, 2018. Accessed July 12, 2019.

5. BM Corp. Released 2017. IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp

6. Shrout PE, Fleiss JL. Intraclass correlations: Uses in assessing rater reliability. *Psychological Bulletin*. 1979;86(2):pp.420-428. doi:10.1037/0033-2909.86.2.420

7. Heinemann GD, Schmitt MH, Farrell MP, Brallier SA. Development of an attitudes toward health care teams scale. *Evaluation & the Health Professions*. 1999;22(1):123–142. doi:10.1177/01632789922034202

8. Curran VR, Sharpe D, Forristall J, Flynn K. Attitudes of health sciences students towards interprofessional teamwork and education. *Learning in Health & Social Care*. 2008;7(3):146-156.

9. Hayashi T, Shinozaki H, Makino T, et al. Changes in attitudes toward interprofessional health care teams and education in the first- and third-year undergraduate students. *Journal of Interprofessional Care.* 2012;26(2):9. doi:10.3109/13561820.2011.644355

10. Kim K, Ko J. Attitudes toward interprofessional health care teams scale: a confirmatory factor analysis. *Journal of Interprofessional Care*. 2014;28(2):149-154. doi:10.3109/13561820.2013.857645

11. McFadyen AK, Maclaren WM, Webster VS. The interdisciplinary education perception scale (IEPS): An alternative remodelled sub-scale structure and its reliability. *Journal of Interprofessional Care*. 2007;21(4):433-443. doi:10.1080/13561820701352531

12. *Multidisciplinary competencies in the care of older adults at the completion of the entry-level health professional degree*. Partnership for health in aging; 2010.

13. Thompson BM, Levine RE, Kennedy F, et al. Evaluating the quality of learning-team processes in medical education: Development and validation of a new measure. *Acad Med*. 2009;84(10 Suppl):S124–7. doi:10.1097/ACM.0b013e3181b38b7a

14. Hudon C, Fortin M, Haggerty JL, Lambert M, Poitras M-E. Measuring patients' perceptions of patient-centered care: A systematic review of tools for family medicine. *Ann Fam Med*. 2011;9(2):155-164. doi:10.1370/afm.1226

15. Condition categories - Chronic conditions data warehouse. https://www.ccwdata.org/web/guest/condition-categories. Accessed March 14, 2019.

16. Burke HB, Hoang A, Becher D, et al. QNOTE: an instrument for measuring the quality of EHR clinical notes. *Journal of the American Medical Informatics Association*. 2014;21(5):910-916. doi:10.1136/amiajnl-2013-002321

17. Interprofessional educational collaborative, Practice IC, Values U. Core competencies for interprofessional collaborative practice : 2016 Update. *Interprofessional education collaborative*. 2016:10–11. doi:10.1097/ACM.0b013e3182308e39

18. SAS (Version 9.4) [Computer software]. (2014). URL: https://www.sas.com. Cary, NC: The SAS Institute.

19. Croon MA, van Veldhoven MJPM. Predicting group-level outcome variables from variables measured at the individual level: A latent variable multilevel model. *Psychological Methods*. 2007;12(1):45-57. doi:10.1037/1082-989X.12.1.45

20. Why data disaggregation is critical for advancing student success. https://visionresourcecenter.cccco.edu/sites/default/files/wp-content/uploads/2016/12/DD-Overview-v2.8.pdf.

21. Patel H. The importance of disaggregating student data. April 2012. http://www.educationnewyork.com/files/The%20importance%20of%20disaggregating_0.pdf.

Chapter 5: Results

5.1 Objective One

Descriptive Statistics

Eighty-two interprofessional students from nursing (BSN, NP), pharmacy, social work, and undergraduate health science participated in RHWP during the fall 2018 semester. Of those, 72 interprofessional students consented to participate in this study. Nursing students (BSN, NP) constituted 77.8% of the study sample. Most of the students were female (88.9%), white (70.8%) and aged 20-29 years (77.8%). Detailed descriptions of student demographics are displayed in Table 5.1.

Before participating in RHWP, (29.2%) of the students had small amounts of experience working in the healthcare environment, including some shadowing or volunteer work. In contrast, (38.03%) of the students reported that they had worked in an interprofessional team many times (Table 5.2).

Seventy-one participating students completed the pre-ATHCTS, with response rate = 98.6%. Only 61 students completed the post-ATHCTS, with response rate = 84.7%. All the participating 72 students completed the pre-geriatrics knowledge questions, response rate = 100%. However, 58 students completed the post-geriatrics knowledge questions, response rate = 80.6%.

Table 5.1 Description of the Students' Demographic Data (n = 72)

Demographic	**N (%)**
Student program	
BSN	31 (43.05)
NP	25 (34.72)
Pharmacy	10 (13.89)
Social Work	2 (2.78)
Health Science	4 (5.56)
Age	
20-29 years	56 (77.78)
30-39 years	9 (12.50)
40-49 years	7 (9.72)
Gender	
Male	8 (11.11)
Female	64 (88.89)
Race	
Asian	6 (8.33)
Black or African American	12 (16.67)
White	51 (70.83)
More than one race	3 (4.17)

Table 5.2 Student Prior Experience (n = 72)

Healthcare experience	**N (%)**
None	6 (8.33)
Small amount (some shadowing, volunteer work)	21 (29.17)
Some (paid, short-term position)	16 (22.22)
A lot (long-term, paid position)	13 (18.06)
Prior career in healthcare	16 (22.22)
Interprofessional teamwork experience	**N (%)**
Never	3 (4.22)
Once or twice	20 (28.17)
Several times	21 (29.58)
Many times	27 (38.03)

Main Analysis

ATHCTS

Prior to conducting the paired *t*-test, the response for each item within the survey was tested. In cases where subjects did not complete the entire survey item, the response for that item was omitted. Consequently, full response was matched for 56 students. Table 5.3 displays the paired *t*-test results corresponding to each item within the survey. Most of the significant differences in the pre- and post-mean scores were found in items related to the quality of care subscale.

There was a significant difference in the overall pre-mean score 57.21 (±5.28) and post-mean score 59.88 (±5.05) for ATHCTS ($p = 0.0002$). Similarly, there was a significant difference in pre-mean score 46.29 (±4.71) and post-mean score 49.02 (±4.44) for the quality of care subscale ($p <. 0001$). On the contrary, there was not a significant difference in pre-mean score 10.93 (±2.29) and post-mean score 10.86 (±2.73) for the time constraints subscale ($p = 0.8649$). Results are shown in Table 5.4.

Table 5.3 Detailed ATHCTS Paired t-test Results

Item	N	Pretest mean (±SD)	Posttest mean (±SD)	Mean difference (±SD)	P-value
1. Patients/clients receiving interprofessional care are more likely than others to be treated as whole persons.	60	4.12 (±0.76)	4.58 (±0.53)	0.46 (±0.75)	<0.0001*
2. ^Developing an interprofessional patient/client care plan is excessively time consuming.	60	3.32 (±0.89)	3.20 (±1.10)	-0.12 (±1.19)	0.4523
3. The give and take among team members help them make better patient/client care decisions.	60	4.25 (±0.54)	4.57 (±0.53)	0.32 (±0.72)	0.0013*
4. The interprofessional approach makes the delivery of care more efficient.	60	4.35 (±0.68)	4.42 (±0.72)	0.07 (±0.63)	0.4188
5. Developing a patient/client care plan with other team members avoids errors in delivering care.	60	4.02 (±0.79)	4.25 (±0.75)	0.23 (±0.81)	0.0295*
6. ^Working in an interprofessional manner unnecessarily complicates things most of the time.	59	3.83 (1±.00)	3.90 (±1.03)	0.07 (1±.27)	0.6836
7. Working in an interprofessional environment keeps most health professionals enthusiastic and interested in their jobs.	59	3.88 (±0.72)	4.05 (±0.71)	0.17 (±0.81)	0.1146
8. The interprofessional approach improves the quality of care to patients/clients.	59	4.54 (±0.50)	4.61 (±0.49)	0.07 (±0.61)	0.3984
9. ^In most instances, the time required for interprofessional consultations could be better spent in other ways.	59	3.83 (±0.87)	3.80 (±0.98)	-0.03 (±1.30)	0.8419
10. Health professionals working as teams are more responsive than others to the emotional and financial needs of patients/clients.	60	4.07 (±0.80)	4.28 (±0.67)	0.21 (±0.86)	0.0572
11. The interprofessional approach permits health professionals to meet the needs of family caregivers as well as patients.	60	4.07 (±0.71)	4.32 (±0.72)	0.25 (±0.91)	0.0383*
12. Having to report observations to a team helps team members better understand the work of other health professionals.	60	4.25 (±0.60)	4.63 (±0.49)	0.38 (±0.67)	<0.0001*
13. Hospital patients who receive interprofessional team care are better prepared for discharge than other patients.	60	4.22 (±0.69)	4.55 (±0.50)	0.33 (±0.82)	0.0025
14. Team meetings foster communication among team members from different professions or disciplines.	60	4.52 (±054)	4.67 (±0.51)	0.15 (±0.61)	0.0599

* Significant p-value < 0.05

^ Reverse coded item

Table 5.4 ATHCTS Paired t-test Results (n = 56)

Item	Presurvey Mean (±SD)	Postsurvey Mean (±SD)	Mean difference (±SD)	P-value
SC1	46.29 (±4.71)	49.02 (±4.44)	2.73 (±4.53)	<0.0001*
SC2	10.93 (±2.29)	10.86 (±2.73)	-0.07 (±3.13)	0.8649
Total	57.21 (±5.28)	59.88 (±5.05)	2.67 (±4.98)	0.0002*

* Significant p-value < 0.05
SC1 = quality of care; SC2 = time constraints

Geriatrics Knowledge:

For geriatrics competencies knowledge questions, full response was matched for 58 students. The difference in geriatrics competencies knowledge after participating in RHWP is presented in Table 5.5. There was a significant change in the overall geriatrics competencies knowledge score 4.03 (±8.30), after participating in RHWP (p = 0.0005). The significant change was observed in the frailty and medication knowledge domains (p = 0.0051, p = 0.0172 respectively).

Table 5.5 Geriatrics Knowledge Signed-Rank Test Results (n = 58)

Overall Score	Presurvey Mean (±SD)	Postsurvey Mean (±SD)	Difference (Post-Pre) Mean (±SD)	P-value
	72.67 (±9.88)	76.69 (±9.69)	4.03 (±8.30)	0.0005
Knowledge Domain	**Presurvey Median (IQR)**	**Postsurvey Median (IQR)**	**A Rank of Difference (Post-Pre) Median (IQR)**	**P-value**
Communicating with Older Adults	3.00 (3.00-3.00)	3.00 (3.00-3.00)	0 (0-0)	0.7744
Health Literacy	3.00 (2.00-3.00)	3.00 (2.00-3.00)	0 (0-1.00)	0.0708
Motivational Interviewing	2.00 (2.00-2.00)	2.00 (1.00-2.00)	0 (0-0)	0.8333
Diabetes	2.00 (2.00-3.00)	2.00 (2.00-3.00)	0 (0-1.00)	0.6099
Hypertension	1.00 (1.00-2.00)	2.00 (1.00-3.00)	0 (0-1.00)	0.2392
Cognition	2.00 (2.00-3.00)	3.00 (2.00-3.00)	0 (0-1.00)	0.1601
Falls	3.00 (3.00-3.00)	3.00 (3.00-3.00)	0 (0-0)	0.6072
Frailty	2.00 (1.00-2.00)	2.00 (2.00-3.00)	0 (0-1.00)	0.0051*
Medication and Polypharmacy	2.00 (1.00-3.00)	2.00 (2.00-3.00)	0 (0-1.00)	0.0172*

* Significant p-value < 0.05

5.2 Objective Two

Descriptive Statistics

RHWP Students

Sixty-four interprofessional students participated in the video recording sessions during their RHWP clinical experience. The mean geriatrics knowledge score for the participating students was 74.13 (±9.57) with a minimum score of 51.85 and a maximum score of 92.59. Full details of the students' demographic information are listed in Table 5.6.

Table 5.6 Demographic Information of Interprofessional Students Participating in RHWP Clinical Experience (n = 64)

Demographic	N (%)
Student program	
BSN	27 (42.19)
NP	22 (34.38)
Pharmacy	10 (15.63)
Social Work	2 (3.13)
Health Science	3 (4.69)
Age	
20-29 years	51 (79.69)
30-39 years	7 (10.94)
40-49 years	6 (9.38)
Gender	
Male	8 (12.50)
Female	56 (87.50)
Race	
Asian	5 (7.81)
Black or African American	11 (17.19)
White	45 (70.31)
More than one race	3 (4.69)

To outline the students' prior healthcare experience, most of BSN students had short-term paid positions working in the healthcare system (44.4%). In contrast, majority of NP students had a prior career within the healthcare system (63.6%). More than half of pharmacy students (60%), had small amount of experience working in the healthcare system, including some shadowing and volunteer work.

In regard to the interprofessional teamwork experience, most of the BSN students (44.4%) had some experience working in interprofessional teams, while majority of the NP students had much experience working within interprofessional teams (54.5%). Half of the pharmacy students (50%) had some experience working in interprofessional teams. Table 5.7 represents detailed information regarding prior healthcare and interprofessional teamwork experience among different student programs.

Table 5.7 Student Prior Experience by Student Program (n = 64)

Healthcare experience:	**Student Program N (%)**				
	BSN	**NP**	**Pharmacy**	**Social Work**	**Health Science**
None	5 (7.81)	-	-	1 (1.56)	-
Small amount	9 (14.06)	-	6 (9.38)	1 (1.56)	3 (4.69)
Some	12 (18.75)	-	2 (3.13)	-	-
A lot	-	8 (12.50)	2 (3.13)	-	-
Prior career	1 (1.56)	14 (21.88)	-	-	-
Total	27 (42.19)	22 (34.38)	10 (15.63)	2 (3.13)	3 (4.69)
Teamwork experience:	**Student Program N (%)**				
	BSN	**NP**	**Pharmacy**	**Social Work**	**Health Science**
Never	1 (1.56)	1 (1.56)	-	1 (1.56)	-
Once or twice	4 (6.25)	6 (9.38)	4 (6.25)	-	3 (4.69)
Several times	12 (18.75)	3 (4.69)	5 (7.81)	-	-
Many times	10 (15.63)	12 (18.75)	1 (1.56)	1 (1.56)	-
Total	27 (42.19)	22 (34.38)	10 (15.63)	2 (3.13)	3 (4.69)

The average number of students participating in each recording session was 3.60 (±0.86), with a minimum number of two students and a maximum number of five students. Due to the repeated nature of students' involvement within the dynamic teams, a total of 27 unique BSN students participated 111 (30.9%) times in the total recording sessions. The 22 NP students participated 87 (24.2%) times. Likewise, a total of 10 unique pharmacy students joined the interprofessional teams 94 (26.2%) times. The two social work students were involved in the team encounters 58 (16.2%) times. The three health science students engaged in 9 (2.5%) team encounters. The mean total number of times each student had participated in a half-day of the

clinic was 9.85 (±12.04) with minimum value of zero and maximum value of 75. The mean total number of client encounters during a half-day clinic was 1.67 (±0.73), with minimum number of one client and maximum member of four clients.

Out of the 100 video recordings, 31 occurred in building A, 21 in building C, 18 in building D, 16 in building E, and 14 in building B. Most (57) of the recordings occurred during morning clinic sessions, while 43 happened in afternoon clinic sessions. The majority of the morning topic discussions were provided to enhance student learning mapped directly to the Partnership for Health in Aging multidisciplinary competencies in the care of older adults at the completion of the entry level health professions degree. Most of the topic discussions fell under the Health Promotion and Safety domain (51), followed by the Care Planning and Coordination Across the Care Spectrum (17), Evaluation and Assessment (12), Interdisciplinary and Team Care (9), and Healthcare System and Benefits domains (8). Three fell under a miscellaneous category not directly associated with one of the competency domains.

In this study, the TPS was used to assess individual student ratings of team effectiveness. The mean for the individual student and team TPS scores were 5.58 (±0.50) and 5.59 (±0.29) respectively. The corresponding range was (3.17-6.00), and (4.62- 6.00) for the individual and team level TPS scores, respectively.

In the current study, the modified C-ICE instrument was used to obtain an observer rating of team effectiveness. The mean score for the modified C-ICE instrument was 0.81 (±0.10), with minimum score of 0.50 and a maximum of 1. Likewise, a modified version of QNOTE was used to assess faculty ratings of team effectiveness. The mean score for modified QNOTE was 91.29, (±10.45), with minimum score of 54.16 and maximum of 100.

RHWP Clients

A total of 48 RHWP clients consented to participate in this study. All of them completed the client experience survey that been used to assess the client ratings of team effectiveness and were part of the video recordings. In the current study, the mean RHWP client age was 67.19 (±9.45), with minimum age of 38 and maximum of 88 years. Half of the participating clients were male (50%). Most of the clients were African American (87%), and most had an education level less than high school (52.1%). Most of the clients were covered by Medicare alone (41.7%). There were 16 (33.3%) participants with dual insurance covered by Medicare and Medicaid. Table 5.8 presents detailed RHWP client characteristics.

The mean for the client disease burden was 5.23 (±2.53), with a minimum number of one and maximum of 11 diseases/conditions. Hypertension was the most common self-reported condition (87.2%), followed by arthritis (68.1%), high cholesterol (61.7%), and visual impairment (44.7%) such as glaucoma or cataract. A full description of the clients' self-reported diagnoses is presented in Table 5.9.

During the study period, only 20.8% of the participating clients had a behavioral visit. The mean for the number of wellness visits a client participated in was 24.15 (±20.19), with minimum number of 1 and maximum of 78 visits. The mean for the visit intensity was 1.56 (±1.09), with minimum number of 0.16 and maximum of 4.33.

Regarding the client experience survey, only 5 (10.4%) clients completed the survey without any source of assistance. The mean for the client experience survey (which used to determine the client rating of student team effectiveness) was 3.74 (±0.39), with minimum score of 2.80 and maximum of 4.

Table 5.8 RHWP Client Demographic Data (n = 48)

Demographic	**Mean (±SD)**
Age	67.19 (±9.45)

Demographic	**N (%)**
Gender	
Male	24 (50)
Female	24 (50)
Race	
Black or African American	42 (87)
White	5 (10.42)
Other	1 (2.08)
Education	
Less than 12 years	25 (52.08)
12 years	15 (31.25)
More than 12 years	8 (16.67)
Insurance (client can have more than one insurance)	
Medicaid	6 (12.50)
Medicare	20 (41.67)
Dual	16 (33.33)
Veteran	4 (8.33)
Other	8 (16.67)

Table 5.9 RHWP Client Comorbidities (n = 47)

RWHP clients self-report diagnosis	**N (%)**
Alzheimer disease	
Yes	3 (6.38)
No	44 (93.62)
Arthritis	
Yes	32 (68.09)
No	15 (31.91)
Asthma	
Yes	7 (14.89)
No	40 (85.11)
COPD	
Yes	12 (25.53)
No	35 (74.47)
Cancer	
Yes	2 (4.26)
No	45 (95.74)
Heart disease	
Yes	10 (21.28)
No	37 (78.72)
MI	
Yes	5 (10.64)
No	42 (89.36)
Hypertension	
Yes	41 (87.23)
No	6 (12.77)
High cholesterol	
Yes	29 (61.70)
No	18 (38.30)
Stroke	
Yes	12 (25.53)
No	35 (74.47)
Schizophrenia\Bipolar	
Yes	6 (12.77)
No	41 (87.23)
Depression	
Yes	12 (25.53)
No	35 (74.47)
Diabetes	
Yes	18 (38.30)
No	29 (61.70)
Visual impairment	
Yes	21 (44.68)
No	26 (55.32)

RWHP clients self-report diagnosis	N (%)
Osteoporosis	
Yes	5 (10.64)
No	42 (80.36)
Thyroid problem	
Yes	6 (12.77)
No	41 (87.23)
Headaches\Migraines	
Yes	11 (23.40)
No	36 (76.60)
Kidney impairment	
Yes	5 (10.64)
No	42 (89.36)
Other	
Yes	8 (17.02)
No	39 (82.98)

Preliminary Results

During the data collection period, ten RHWP faculty were involved in the evaluation of the care plan offered by different student teams. Most of the faculty were from the school of nursing (50%), followed by school of pharmacy (40%), and school of social work (10%). A majority of the healthcare plans (57%) were evaluated by the nursing faculty. The pharmacy and social work faculty evaluated (33%) and (10%) of the healthcare plans, respectively.

The mean for the team care plan evaluation measure was 91.29 (±10.45), with a minimum value of 54.16 and maximum of 100. The mean for the team care plan evaluation measure evaluated by nursing faculty was 96.41 (±5.43), with minimum value of 75 and maximum of 100. For pharmacy faculty the mean was 84.58 (±11.16), with minimum value of 66.46 and maximum of 100. The mean for social work faculty was 84.16 (±13.72), with minimum value of 54.16 and maximum of 100. There was a significant difference in the healthcare plan evaluation scores among different faculty programs ($p < 0.0001$). Faculty in school of nursing had a significantly higher evaluation mean score than school of pharmacy faculty (confidence interval: 7.30-16.36). Similarly, faculty in the school of nursing had a significantly higher evaluation score than social

work faculty (confidence interval: 5.16-19.34). There were no differences in healthcare plan evaluations between pharmacy and social work faculty (confidence interval: -7.05-7.89). Table 5.10 summarizes healthcare plan evaluation patterns across different faculty professions.

Table 5.10 Comparison between Faculty Program in Care Plan Evaluation

Faculty comparison	Means difference	95% Confidence Interval
Nursing – Pharmacy	11.83	7.30 – 16.36 *
Nursing – Social work	12.25	5.16 –19.34 *
Pharmacy – Social work	0.42	-7.05 – 7.89

*Significance at the 0.05 level

Main Analysis Results

The sample size of the disaggregated data consists of 359 observations. Four outcome measures were used to assess student team effectiveness. The average student rating score has a percentage mean value of 93.06 (±4.64). The percentage mean score for the client rating was 93.50 (±11.44). Likewise, the percentage mean score for the observer rating of team effectiveness was 81.45 (±10.32), The mean percentage score for faculty ratings of healthcare plan was 90.64 (±10.85). The summary of the outcome measures descriptive statistics are presented in Table 5.11.

Table 5.11 Summary of Outcome Measures

Measure	Mean (±SD)	Minimum - maximum
Student rating	93.06 (±4.64)	77 - 100
Client rating	93.50 (±11.44)	60 - 100
Observer rating	81.45 (±10.32)	50 - 100
Faculty rating	90.64 (±10.85)	54.16 - 100

The correlation tests revealed that there was a significant negative association between the faculty rating and observer rating of team effectiveness (r = -0.23). Likewise, faculty rating was negatively correlated with the client rating of team effectiveness (r = -0.14) . Also, there was a positive linear relationship between the client rating and observer rating of team effectiveness

(r = 0.15). On the other hand, the student rating had no significant correlation with the other measure of team effectiveness. Table 5.12 summarizes the correlation matrix results.

Table 5.12 Outcome Measures Correlation Results

	Pearson Correlation Coefficient (P-Value)			
Measure	**1**	**2**	**3**	**4**
1. Student rating	-	0.07 (0.2001)	0.01 (0.8396)	-0.03 (0.5548)
2. Client rating	-	-	0.15 (0.0046)*	-0.14 (0.0092)*
3. Observer rating	-	-	-	-0.23 (<.0001)*
4. Faculty rating	-	-	-	-

*Significance at the 0.05 level

Model assumptions were evaluated in the unadjusted model by examining the relationship between each predictor with the outcomes in term of linearity, normality, equal variance, and the presence of outliers. These assumptions were met for all the predictors used in the unadjusted model among the four outcome measures of team effectiveness. In addition, model assumptions were met for the final adjusted model for each of the outcome measures. There was no source of collinearity among the predictors that were used in the final adjusted model for all of the outcome measures.

Student rating

The unadjusted model showed that number of times each student participated in an RHWP clinic session, client race, clinic site, and the number of students in a team were the only significant predictors of the self-reported evaluation of team effectiveness. For each student, as the number of times attending RHWP clinic increased by one, the team effectiveness score decreased by an average of 0.04% ($p = 0.0452$). Compared to black clients, white clients improved the team effectiveness score by 3.37% ($p < 0.0001$). On the other hand, other clients lowered the team effectiveness score by 11.47%. ($p < 0.0001$). As the number of students in a team increase by one, the team effectiveness score decreased by 0.66% ($p = 0.0315$). Compared to student teams who participated in building A clinic, student teams who participated in building B, C, and D clinics had a lower rate of team effectiveness score by an average of 2.51%, 2.18% and 2.01%, respectively ($p = 0.0022$, 0.0010, and 0.0049, respectively).

The final adjusted model accounted for 26.30% of variation in the self-reported evaluation of team effectiveness. The model was made using the following predictors:

1) Student factors: student race, prior healthcare experience, prior teamwork experience and RHWP experience
2) Client factors: client gender, race, number of wellness visits, behavioral visits, and disease burden
3) Team factors: number of students in each team, clinic time, clinic site and supervising faculty

The results of the final model are presented in Table 5.13. Holding all other predictors constant, Asian students had a 2.5% lower rate of team effectiveness than white students ($p = 0.0137$). However, white clients presented an improvement in the team effectiveness score by an

average of 2.7% compared to black clients ($p = 0.0057$). In contrast, clients within the other race category showed a decline in the team effectiveness score by an average of 15% compared to black clients ($p < 0.0001$). Clients who participated in behavioral health visits had a lower team effectiveness score by an average of 2.47% compared to those who did not ($p = 0.0008$). As the disease burden score increased by one unit, there was a corresponding increase in the team effectiveness score by an average of 0.24% ($p = 0.0231$). On the other hand, as the number of students increased, the team effectiveness score was reduced by 0.71% ($p = 0.0392$). Students who participated in building C clinic rated the effectiveness of their team 2.20% lower than students who participated in building A clinic ($p = 0.0192$).

Table 5.13 Unadjusted and Adjusted Linear Regression models of Student Rating of Team Effectiveness

	Unadjusted Model		Adjusted Model	
	Parameter Estimate (SE)	**p-value**	**Parameter Estimate (SE)**	**p-value**
Student Factors				
Student Program				
BSN	-	-		
NP	-0.58 (0.66)	0.3791		
Pharmacy	0.06 (0.64)	0.9219		
Social work	-1.20 (0.75)	0.1088		
Health science	-1.95 (1.59)	0.2221		
Student Age				
20-29 years old	-	-		
30-39 years old	-0.74 (0.96)	0.4446		
40-49 years old	0.62 (0.77)	0.4210		
Student Gender				
Male	-0.23 (0.91)	0.8016		
Female	-	-		
Student Race				
Asian	-1.70 (1.07)	0.1110	-2.50 (1.01)	0.0137*
Black	0.47 (0.63)	0.4531	0.06 (0.62)	0.9195
White	-	-	-	-
More than one race	1.22 (1.36)	0.3682	1.01 (1.27)	0.4301
Student Prior Healthcare Experience				
None	-0.84 (0.80)	0.2899	-0.16 (1.00)	0.8694
Small amount	-	-	-	-
Some	0.59 (0.69)	0.3914	0.10 (0.68)	0.8881
A lot	0.77 (0.66)	0.2378	0.40 (0.65)	0.5395
Prior career	-1.64 (0.84)	0.0511	-1.40 (0.84)	0.0987
Student Prior Teamwork Experience				
Never	-0.98 (0.87)	0.2588	0.51 (1.16)	0.6587
Once or twice	-0.91 (0.86)	0.2918	-1.20 (0.81)	0.1418
Several times	0.11 (0.55)	0.8438	0.13 (0.52)	0.8052
Many times	-	-	-	-
Student Knowledge Score	0.02 (0.2)	0.3120	-	-
Student RHWP Experience	-0.04 (0.02)	0.0452*	-0.04 (0.02)	0.1237
Number of Client Encounter	-0.29 (0.34)	0.3955	-	-

	Unadjusted Model		Adjusted Model	
	Parameter Estimate (SE)	p-value	Parameter Estimate (SE)	p-value
Client Factors				
Client Age	-0.04 (0.03)	0.1813		
Client Gender				
Male	-0.65 (0.50)	0.1933	-0.65 (0.50)	0.1945
Female	-	-		
Client Race				
Black	-	-		-
White	3.37	<0.0001*	2.70 (0.97)	0.0057*
Other	-11.47	<0.0001*	-15.00 (2.58)	<0.0001*
Client Education Level				
Less than 12 years	-	-	-	
12 years	-0.40 (0.54)	0.4605	-0.91 (0.58)	0.1232
More than 12 years	-0.59 (0.70)	0.4033	-0.85 (0.88)	0.3352
Ever Had Behavioral Visits				
No	-	-	-	-
Yes	1.17 (0.65)	0.0706	-2.47 (0.73)	0.0008*
Total Number of Wellness Visits	-0.02 (0.01)	0.1022	-0.02 (0.01)	0.0784
Wellness Visit Intensity	0.18 (0.20)	0.3669		
Disease Burden	0.04 (0.10)	0.6964	0.24 (0.10)	0.0231*
Team Factors				
Student Number	-0.66 (0.30)	0.0315*	-0.71 (0.35)	0.0392*
Clinic Time				
Morning	-	-	-	-
Afternoon	0.22 (0.49)	0.6614	1.89 (1.04)	0.0691
Clinic Site				
Building A	-	-	-	-
Building B	-2.51 (0.82)	0.0022*	-1.29 (1.25)	0.3015
Building C	-2.18 (0.66)	0.0010*	-2.20 (0.93)	0.0192*
Building D	-2.01 (0.71)	0.0049*	-1.39 (1.18)	0.2386
Building E	-1.08 (0.74)	0.1443	-0.59 (1.22)	0.6287
Faculty Program				
Nursing	-	-	-	-
Pharmacy	-0.66 (0.52)	0.2042	-0.92 (0.56)	0.1037
Social Work	1.31 (0.84)	0.1197	1.26 (0.87)	0.1466

Client rating

In the unadjusted model, none of the student factors significantly predicted the client rating of team effectiveness. In contrast, a majority of client and team factors were significant predictors of team effectiveness. For one-year increase in client age, the client rating of team effectiveness dropped by 0.37% ($p < 0.0001$). Male clients had a lower rating of team effectiveness by an average of 6.23% compare to female clients ($p < 0.0001$). Similarly, clients within the other race category had a lower rating of team effectiveness by an average of 26.56% compared to clients within the black race category ($p < 0.0001$). Also, clients who participated in a behavioral health visit had a lower rating of team effectiveness by an average of 3.89% than others who did not ($p = 0.0146$). For every unit increase in the wellness visit intensity and disease burden scores, the team effectiveness score improved by 1.29% ($p = 0.0089$) and 0.75% ($p = 0.0017$) respectively.

Clients in afternoon clinics rated the effectiveness of the student teams 4.61% lower than clients in morning clinics ($p = 0.0001$). Likewise, clients in building E clinic evaluated the effectiveness of student teams 9.93% lower than clients in building A clinic ($p < 0.0001$). The client rating for team effectiveness improved by an average of 4.04% for student teams debriefed by pharmacy faculty compared to student teams debriefed by nursing faculty ($p = 0.0016$). The complete unadjusted model results are displayed in Table 5.14.

The final adjusted model accounted for 41.69% of variation in team effectiveness as evaluated by the client. The model was constructed using a combination of student, client and team factors as follows:

1) Student factors: student program, race, prior healthcare and teamwork experience
2) Client factors: client age, race, education level and total number of wellness visits

3) Team factors: number of students participating in each team and clinic site

Controlling for all other predictors used in the final model, students with a prior career in the healthcare system had an improved team effectiveness score by an average of 6.16%, compared to students who never experienced working in a healthcare system ($p = 0.0151$). As the number of clients each student encountered increased by one, the team effectiveness score raised by 1.77% ($p = 0.0154$). The client rating of team effectiveness declined by an average of 0.36% for each one-year increase in the client's age ($p < 0.0001$). Similarly, as the total number of wellness visits that the client had with RHWP increased, the team effectiveness score decreased by an average of 0.07% ($p = 0.0154$). Male clients had 6.70% lower rating of team effectiveness than female clients ($p < 0.0001$). Also, clients within the other race category had a 25.43% lower rating of team effectiveness than black clients ($p < 0.0001$). Clients with more than 12 years education had 6.56% better rating of team effectiveness compared to clients with less that 12 years education ($p = 0.0008$). As the number of students in the team increased by one, the client rating of team effectiveness reduced by 1.53% ($p = 0.0354$). Clients in building E clinics assessed the effectiveness of student teams 8.97% lower than clients in building A clinics ($p < 0.0001$). On the other hand, clients in building D clinic had 6.38% improved rating of student team effectiveness ($p = 0.0016$), compared to clients in building A clinics.

Table 5.14 Unadjusted and Adjusted Linear Regression models of Client Rating of Team Effectiveness

	Unadjusted Model		Adjusted Model	
	Parameter Estimate (SE)	**p-value**	**Parameter Estimate (SE)**	**p-value**
Student Factors				
Student Program				
BSN	-	-	-	-
NP	-1.64 (1.63)	0.3137	-3.82 (2.23)	0.0877
Pharmacy	0.34 (1.59)	0.8295	-0.67 (1.52)	0.6596
Social work	-0.61 (1.84)	0.7423	0.92 (1.92)	0.6312
Health science	-5.91 (3.94)	0.1339	-3.61 (3.47)	0.2998
Student Age				
20-29 years old	-	-		
30-39 years old	1.97 (2.38)	0.4063		
40-49 years old	-1.13 (1.90)	0.5508		
Student Gender				
Male	2.92 (2.24)	0.1935		
Female	-	-		
Student Race				
Asian	3.74 (2.64)	0.1560	4.48 (2.23)	0.0452
Black	-1.73 (1.55)	0.2646	1.21 (1.51)	0.4266
White	-	-	-	-
More than one race	0.85 (3.36)	0.7992	1.43 (2.92)	0.6254
Student Prior Healthcare Experience				
None	2.72 (1.99)	0.1722	1.08 (2.24)	0.6317
Small amount	-	-	-	-
Some	0.48 (1.73)	0.7824	0.02 (1.56)	0.9905
A lot	1.35 (1.64)	0.4096	3.19 (1.92)	0.0980
Prior career	2.38 (2.11)	0.2585	6.16 (2.52)	0.0151*
Student Prior Teamwork Experience				
Never	1.96 (2.14)	0.3600	3.22 (2.57)	0.2111
Once or twice	-2.40 (2.12)	0.2574	0.15 (1.91)	0.9358
Several times	2.39 (1.35)	0.0765	1.88 (1.20)	0.1167
Many times	-	-	-	-
Student Knowledge Score	-0.04 (0.06)	0.5174		
Student RHWP Experience	-0.03 (0.05)	0.6031		
Number of Client Encounter	0.67 (0.83)	0.4230	1.77 (0.73)	0.0154*

	Unadjusted Model		Adjusted Model	
	Parameter Estimate (SE)	**p-value**	**Parameter Estimate (SE)**	**p-value**
Client Factors				
Client Age	-0.37 (0.07)	<0.0001*	-0.36 (0.08)	<0.0001*
Client Gender				
Male	-6.23 (1.19)	<0.0001*	-6.70 (1.11)	<0.0001*
Female	-	-	-	-
Client Race				
Black	-	-	-	-
White	4.67 (1.90)	0.0140*	-0.06 (2.25)	0.9792
Other	-26.56 (6.42)	<0.0001*	-25.43 (5.49)	<0.0001*
Client Education Level				
Less than 12 years	-	-	-	-
12 years	1.12 (1.31)	0.3929	-0.87 (1.30)	0.5056
More than 12 years	4.91 (1.72)	0.0043*	6.56 (1.94)	0.0008*
Ever Had Behavioral Visits				
No	-	-		
Yes	-3.89 (1.59)	0.0146*		
Total Number of Wellness Visits	-0.04 (0.02)	0.0887	-0.07 (0.03)	0.0154*
Wellness Visit Intensity	1.29 (0.49)	0.0089*		
Disease Burden	0.75 (0.24)	0.0017*		
Team Factors				
Student Number	-0.44 (0.75)	0.5638	-1.53 (0.73)	0.0354*
Clinic Time				
Morning	-	-		
Afternoon	-4.61 (1.19)	0.0001*		
Clinic Site				
Building A	-	-	-	-
Building B	1.67 (1.91)	0.3811	-2.58 (2.62)	0.3247
Building C	1.98 (1.54)	0.2003	-0.46 (1.81)	0.7977
Building D	2.88 (1.67)	0.0837	6.38 (2.00)	0.0016*
Building E	-9.93 (1.72)	<0.0001*	-8.97 (1.92)	<0.0001*
Faculty Program				
Nursing	-	-		
Pharmacy	4.04 (1.28)	0.0016*		
Social Work	3.72 (2.06)	0.0716		

Observer rating

In the unadjusted model, student factors age, knowledge score, and number of client encounters were the significant predictors of team effectiveness as it is evaluated by external observers. The team effectiveness score decreased by 4.37% for students aged 40-49 years compared to those aged 20-29 years ($p = 0.0103$). For one unit increase in the knowledge score, the team effectiveness score decreased by 0.12% ($p = 0.0287$). As the number of client encounters increased, the team effectiveness score increased by 1.55% ($p = 0.0390$). Client factors including age, gender, race, total number of wellness visits and disease burden were the significant predictors of team effectiveness in the bivariate analyses. For every one-year increase in the client age, the team effectiveness score decreased by 0.38% ($p < 0.0001$). The team effectiveness score had a lower value for male clients by 4.10% compared to female clients ($p = 0.0002$). Compare to those clients who were classified under the black race category, those clients within the other race category improved the team effectiveness score by 12.82% ($p = 0.0307$). For one visit increase in the total number of wellness visits, the team effectiveness score value declined by 0.07% ($p = 0.0014$). On the other hand, as the disease burden score increased by one, the team effectiveness score improved by 0.95% ($p < 0.0001$). All of the team factors were significant predictors of the external rating of team effectiveness. As the number of participating students increased by one, the team effectiveness score improved by 1.53% ($p = 0.0238$). The team effectiveness score had a lower value by 4.27% for student teams participating in afternoon clinics compared to those who participated in morning clinics. For the clinic site, the team effectiveness score had a 3.80% higher value among student teams engaged in building C clinic, compared to those teams engaged in building A clinic ($p = 0.0077$). On the other hand, student teams in building D clinic had lower team effectiveness score by 6.15%

compared to those teams participated in building A clinic ($p < 0.0001$). Compared to those teams debriefed by nursing faculty, those debriefed by pharmacy and social work faculty had a higher team effectiveness score of 2.35% ($p = 0.0414$) and 6.55% ($p = 0.0004$), respectively.

The final adjusted model was built using the following predictors:

1) Student factors: student program, knowledge score, and number of times each student participated in RHWP clinics
2) Client factors: client age, gender, race, education level, total number of wellness visits and disease burden
3) Team factors: clinic site and evaluating faculty

These predictors accounted for 29.16% of variance in the team effectiveness score as it was determined by external observer judgments. Table 5.15 presents the adjusted final model results. Holding all other predictors constant, pharmacy students had 3.04% higher team effectiveness score compared to BSN students ($p = 0.0401$). As the student knowledge score and RHWP experience increased by a factor of one, the team effectiveness score reduced by 0.18% ($p = 0.0050$) and 0.17% ($p = 0.0128$), respectively. Similarly, for every one-year increase in client age, the team effectiveness score decreased by 0.38% ($p < 0.0001$). However, clients within the other race category showed higher team effectiveness scores by 17.69% compared to black clients ($p = 0.0012$). Also, the team effectiveness score was higher by 3.76% among clients with an educational level of more than 12 years compared to those clients with an educational level of less than 12 years ($p = 0.0489$). Moreover, for one visit increase in the total number of wellness visits, the team effectiveness score increased by 0.07% ($p = 0.0203$). Student teams who were involved in building D clinics had a team effectiveness score that was significantly lower by 6.15% than student teams who were involved in building A clinics ($p =$

0.0015). Compared to teams debriefed by nursing faculty, the team effectiveness score was higher by 4.59% ($p = 0.0002$) and 5.25% ($p = 0.0040$) when debriefed by pharmacy and social work faculty, respectively.

Table 5.15 Unadjusted and Adjusted Linear Regression Models of Observer Rating of Team Effectiveness

	Unadjusted Model		Adjusted Model	
	Parameter Estimate (SE)	**p-value**	**Parameter Estimate (SE)**	**p-value**
Student Factors				
Student Program				
BSN	-	-	-	-
NP	-0.77 (1.47)	0.6038	0.82 (1.41)	0.5593
Pharmacy	-0.67 (1.44)	0.6409	3.04 (1.47)	0.0401*
Social work	0.34 (1.67)	0.8385	3.26 (2.24)	0.1454
Health science	-0.72 (3.57)	0.8409	3.66 (3.61)	0.3109
Student Age				
20-29 years old	-	-		
30-39 years old	-1.09 (2.13)	0.6084		
40-49 years old	-4.37 (1.70)	0.0103*		
Student Gender				
Male	2.82 2.02)	0.1634		
Female	-	-		
Student Race				
Asian	-1.60 (2.39)	0.5044		
Black	0.38 (1.40)	0.7869		
White	-	-		
More than one race	0.42 (3.04)	0.8889		
Student Prior Healthcare Experience				
None	0.76 (1.79)	0.6724		
Small amount	-	-		
Some	0.02 (1.55)	0.9884		
A lot	-2.07 (1.47)	0.1594		
Prior career	-1.86 (1.90)	0.3255		
Student Prior Teamwork Experience				
Never	3.24 (1.94)	0.0941		
Once or twice	2.19 (1.92)	0.2522		
Several times	0.15 (1.22)	0.9035		
Many times	-	-		
Student Knowledge Score	-0.12 (0.05)	0.0287*	-0.18 (0.06)	0.0050*
Student RHWP Experience	-0.06 (0.05)	0.2117	-0.17 (0.06)	0.0128*
Number of Client Encounter	1.55 (0.75)	0.0390*	1.39 (0.72)	0.0533

	Unadjusted Model		Adjusted Model	
	Parameter Estimate (SE)	P-Value	Parameter Estimate (SE)	P-Value
Client Factors				
Client age	-0.38 (0.06)	<0.0001*	-0.38 (0.07)	<0.0001*
Client Gender				
Male	-4.10 (1.09)	0.0002*	-2.06 (1.10)	0.0621
Female	-	-		
Client Race				
Black	-	-	-	-
White	1.53 (1.76)	0.3828	-2.93 (2.21)	0.1854
Other	12.82 (5.93)	0.0307*	17.69 (5.41)	0.0012*
Client Education Level				
Less than 12 years	-	-	-	-
12 years	0.07 (1.19)	0.9550	-1.01 (1.25)	0.4191
More than 12 years	0.16 (1.57)	0.9203	3.76 (1.90)	0.0489*
Ever Had Behavioral Visits				
No	-	-		
Yes	1.89 (1.44)	0.1908		
Total Number of Wellness Visits	-0.07 (0.02)	0.0014*	0.07 (0.03)	0.0203*
Wellness Visit Intensity	0.41 (045)	0.3587	-	-
Disease Burden	0.95 (0.21)	<0.0001*	0.36 (0.22)	0.1009
Team Factors				
Student Number	1.53 (0.68)	0.0238*		
Clinic Time				
Morning	-			
Afternoon	-4.27 (1.07)	<0.0001*		
Clinic Site				
Building A	-	-	-	-
Building B	-1.38 (1.77)	0.4340	-4.17 (2.58)	0.1063
Building C	3.80 (1.43)	0.0077*	1.34 (1.75)	0.4450
Building D	-6.15 (1.54)	<0.0001*	-6.18 (1.93)	0.0015*
Building E	0.14 (1.60)	0.9283	1.62 (1.82)	0.3752
Faculty Program				
Nursing	-	-	-	-
Pharmacy	2.35 (1.51)	0.0414*	4.59 (1.20)	0.0002*
Social Work	6.55 (1.85)	0.0004*	5.25 (1.81)	0.0040*

Faculty Rating

The bivariate analyses showed that among the student factors, the only significant predictor was the number of clients each student encountered in the half day of clinic ($p = 0.0139$). As the number of the client encounters increased, the team effectiveness score decreased by 1.94%. For the client factors, age, education level, behavioral and wellness visits, and disease burden were significant predictors of team effectiveness. The team effectiveness score increased by 0.24% for every one-year increase in the client age ($p = 0.0002$). Compared to those clients with less than 12 years of education, those with 12 years of education had a lower team effectiveness score by an average of 3.56% ($p = 0.0040$). The team effectiveness score increased by 5.52% among the clients who had behavioral health visits compared to those who never had a behavioral health visit ($p = 0.0002$). As the total number of wellness visits increased by one visit, the team effectiveness score improved by 0.1% ($p < 0.0001$). For a one unit increase in the disease burden (number of chronic diseases), the team effectiveness score reduced by 0.85% ($p = 0.0002$). In the unadjusted model, all of the team factors were significant predictors of team effectiveness. As the number of students within the team increased by one, the team effectiveness score decreased by 3.49% ($p < 0.0001$). The team effectiveness score increased by 3.41% among student teams who participated in the afternoon clinics compared to those who participated in the morning clinics ($p = 0.0028$). Student teams who joined building C clinics had a team effectiveness score that was significantly lower by 10.53% than student teams who joined building A clinics ($p < 0.0001$). The team effectiveness score decreased by an average of 12.75% and 13.49% when debriefed by pharmacy and social work faculty, respectively, compared to nursing faculty.

The adjusted final model explained 53.59% of variation in the team effectiveness score. The significant predictors that were used to build the final model were:

1) Student factors: student age, race and prior healthcare experience
2) Client factors: client age, gender, race, education level, behavioral health and wellness visits
3) Team factors: student number, clinic time, clinic site and supervising faculty

Controlling for other predictors, students ages 40-49 years had a lower team effectiveness score by 3.96% compared to students ages 20-29 years ($p = 0.0072$). For a one-year increase in the client age, the team effectiveness score increased by 0.28% ($p < 0.0001$). Compared to black clients, white clients had a higher team effectiveness score by 5.91% ($p = 0.0033$). The team effectiveness score decreased among clients with an education level of 12 years or more by 3.48% ($p = 0.0020$) and 3.68% ($p = 0.0332$), respectively. However, the team effectiveness score increased by 3.37% between the clients who had a behavioral health visit compared to those who never had a behavioral health visit ($p = 0.0142$). For one visit increase in the total number of wellness visits, the team effectiveness score decreased by 0.06% ($p = 0.0157$). Similarly, as the number of participating students increased, the team effectiveness score decreased by 1.51% ($p = 0.0182$). Student teams who were involved in building D clinics had a team effectiveness score that was significantly higher by 8.30% than student teams who engaged in building A clinics ($p = 0.0002$). In contrast, the team effectiveness score was 3.81% lower for student teams who participated in building C clinics ($p = 0.0255$) compared to student teams who participated in building A clinics. The team effectiveness score declined by 13.28% and 10.71% when debriefed by pharmacy and social work faculty compared to nursing faculty respectively (p

< 0.0001). Detailed description of unadjusted and adjusted model results are presented in Table 5.16.

Table 5.16 Unadjusted and Adjusted Linear Regression Models of Faculty Rating of Team Effectiveness

	Unadjusted Model		Adjusted Model	
	Parameter Estimate (SE)	**p-value**	**Parameter Estimate (SE)**	**p-value**
Student Factors				
Student Program				
BSN	-	-		
NP	1.15 (1.55)	0.4577		
Pharmacy	1.52 (1.51)	0.3164		
Social work	0.69 (1.75)	0.6922		
Health science	4.23 (3.75)	0.2582		
Student Age				
20-29 years old	-	-	-	-
30-39 years old	-3.54 (2.25)	0.1161	-2.15 (1.69)	0.2044
40-49 years old	-1.19 (1.80)	0.5087	-3.96 (1.46)	0.0072*
Student Gender			-	-
Male	-2.29 (2.13)	0.2832		
Female	-	-		
Student Race				
Asian	3.55 (2.51)	0.1564	2.54 (1.84)	0.1681
Black	0.98 (1.47)	0.5067	1.68 (1.18)	0.1539
White	-	-	-	-
More than one race	1.81 (3.19)	0.5694	3.26 (2.33)	0.1631
Student Prior Healthcare Experience				
None	-3.58 (1.88)	0.0567	-2.32 (1.41)	0.1021
Small amount	-	-	-	-
Some	-0.80 (1.63)	0.6241	-2.05(1.20)	0.0884
A lot	-1.96 (1.54)	0.2040	-0.97 (1.18)	0.4137
Prior career	1.80 (1.98)	0.3633	0.63 (1.49)	0.6734
Student Prior Teamwork Experience				
Never	-1.87 (2.04)	0.3582		
Once or twice	1.68 (2.02)	0.4043		
Several times	-1.00 (1.29)	0.4360		
Many times	-	-		
Student Knowledge Score	0.07 (0.06)	0.2362		
Student RHWP Experience	0.01 (0.05)	0.7923		
Number of Client Encounter	-1.94 (0.78)	0.0139*		

	Unadjusted Model		Adjusted Model	
	Parameter Estimate (SE)	p-value	Parameter Estimate (SE)	p-value
Client Factors				
Client Age	0.24 (0.07)	0.0002*	0.28 (0.07)	<0.0001*
Client Gender				
Male	0.25 (1.17)	0.8310	-1.63 (0.93)	0.0807
Female	-	-		
Client Race				
Black	-	-	-	-
White	3.57 (1.84)	0.0529	5.91 (2.00)	0.0033*
Other	9.82 (6.23)	0.1152	3.43 (4.78)	0.4726
Client Education Level				
Less than 12 years	-	-	-	-
12 years	-3.56 (1.24)	0.0040*	-3.48 (1.11)	0.0020*
More than 12 years	1.03 (1.62)	0.5258	-3.68 (1.72)	0.0332*
Ever Had Behavioral Visits				
No	-	-	-	-
Yes	5.52 (1.50)	0.0002*	3.37 (1.37)	0.0142*
Total Number of Wellness Visits	0.10 (0.02)	<0.0001*	-0.06 (0.03)	0.0157*
Wellness Visit Intensity	-0.11 (0.47)	0.8154		
Disease Burden	-0.85 (0.22)	0.0002*		
Team Factors				
Student Number	-3.49 (0.69)	<0.0001*	-1.51 (0.64)	0.0182*
Clinic Time				
Morning	-	-	-	
Afternoon	3.41 (1.14)	0.0028*	-2.85 (1.92)	0.1385
Clinic Site				
Building A	-	-	-	-
Building B	0.09 (1.77)	0.9580	2.66 (2.49)	0.2878
Building C	-10.53 (1.43)	<0.0001*	-3.81 (1.70)	0.0255*
Building D	-2.64 (1.54)	0.0877	8.30 (2.17)	0.0002*
Building E	1.97 (1.60)	0.2169	2.91 (2.26)	0.1985
Faculty Program				
Nursing	-	-		-
Pharmacy	-12.75 (0.99)	<0.0001*	-13.28 (1.05)	<0.0001*
Social Work	-13.49 (1.60)	<0.0001*	-10.71 (1.61)	<0.0001*

Summary Results:

The study results indicate that, among the four adjusted regression models, higher R-squared values were associated with the models that assessed team effectiveness based on faculty and client rating (R-squared = 53.6% and 41.7% respectively). Table 5.17 presents the summary results of the significant predictors among the four team effectiveness measures.

In this study, predictors of dynamic team effectiveness vary among the different measures that were utilized to evaluate team effectiveness. Predictors related to student factors were varied between the outcome measures. Race was the only significant student characteristic predictor of team effectiveness using the student evaluation of team effectiveness. In contrast, student gender, prior healthcare experience, and number of clients each student encountered in a half day of clinic were the significant predictors of client rating of team effectiveness. For the observer rating, student age, geriatrics knowledge score, and number of times each student participated in RHWP clinics were the significant predictors of team effectiveness. Student age was the only significant predictor of faculty rating of team effectiveness.

In contrast to student factors, predictors related to client factors were more consistent between the outcome measures. For example, client race was a significant predictor for all of the team effectiveness measures. Client factors such as age, education level, and total number of wellness visits were the significant predictors of faculty, observer, and client rating of team effectiveness. Client behavioral health visits significantly predicted team effectiveness as evaluated by the faculty and students. Client disease burden was a solo predictor of student ratings of team effectiveness.

Similar to the client factors, predictors associated with the team factors overlapped between the team effectiveness measures; for example, the clinic site significantly predicted

team effectiveness for all of the team effectiveness measures. Team size significantly predicted team effectiveness as evaluated by faculty, clients and students. Faculty program significantly predicted team effectiveness when it was rated by faculty and observers.

Table 5.17 Outcome Measures Summary Results

	Student Rating	Client Rating	Observer Rating	Faculty Rating
Adjusted Model R-squared Value	26.03%	41.69%	29.16%	53.59%
Student Factors		**Parameter Estimate (p-value)**		
Student Program				
BSN				
NP				
Pharmacy			3.04 (0.0401)	
Social work				
Health science				
Student Age				
20-29 years old				
30-39 years old				
40-49 years old				-3.96 (0.0072)
Student Gender				
Male		-6.70 (<0.0001)		
Female				
Student Race				
Asian	-2.50 (0.0137)			
Black				
White				
More than one race				
Student Prior Healthcare Experience				
None				
Small amount				
Some				
A lot				
Prior career		6.16 (0.0151)		
Student Prior Teamwork Experience				
Never				
Once or twice				
Several times				
Many times				
Student Knowledge Score			-0.18 (0.0050)	
Student RHWP Experience			-0.17 (0.0128)	
Number of Client Encounters		1.77 (0.0154)		

	Parameter Estimate (p-value)			
Client Factors	**Student Rating**	**Client Rating**	**Observer Rating**	**Faculty Rating**
Client age		-0.36 (<0.0001)	-0.38 (<0.0001)	0.28 (<0.0001)
Client Gender				
Male				
Female				
Client Race				
Black				
White	2.70 (0.0057)			5.91 (0.0033)
Other	-15.00 (<0.0001)	-25.43 (<0.0001)	17.69 (0.0012)	
Client Education Level				
Less than 12 years				
12 years				-3.48 (0.0020)
More than 12 years		6.56 (0.0008)	3.76 (0.0489)	-3.68 (0.0332)
Ever Had Behavioral Visits				
No				3.37 (0.0142)
Yes	-2.47 (0.0008)			
Total Number of Wellness Visits		-0.07 (0.0154)	0.07 (0.0203)	-0.06 (0.0157)
Wellness Visit Intensity				
Disease Burden	0.24 (0.0231)			
Team Factors				
Student number	-0.17 (0.0392)	-1.53 (0.0354)		-1.51 (0.0182)
Clinic Time				
Morning				
Afternoon				
Clinic Site				
Building A				
Building B				
Building C	-2.20 (0.0192)			-3.81(0.0255)
Building D		6.38 (0.0016)	-6.18 (0.0015)	8.30 (0.0002)
Building E		-8.97 (<0.0001)		
Faculty Program				
Nursing				
Pharmacy				-13.28 (<0.0001)
Social Work				-10.71 (<0.0001)

Chapter 6: Discussion

6.1 Discussion

We believe that this is the first study to evaluate team effectiveness among dynamic student teams participating in a practice-based IPE setting. Additionally, it utilizes a variety of approaches to assess dynamic team effectiveness. Using the same data, it also evaluates predictors associated with dynamic team success. This study adds numerous findings to the IPE literature. First, it supports the impact of a practice-based IPE setting in improving student learning outcome related to attitude, knowledge and skills. Second, it utilizes a video recording approach as a data collection measure to assess team effectiveness among dynamic student teams participating in practice-based IPE settings. Third, it uses the C-ICE instrument as an observational tool to analyze the quality of dynamic team effectiveness. Fourth, among the evaluation approaches, faculty and client ratings are robust to evaluate dynamic student team effectiveness in practice-based IPE settings. Fifth, the significant team factors such that the number of participating students, clinic sites, and supervising faculty can be targeted when designing a team training model focus on team success.

This study was conducted in one of the practice-based IPE models offered at VCU. The Richmond Health and Wellness Program was established as an interprofessional model to enhance the learning experience at VCU and to improve health and system outcomes.[1] As part of the program's evaluation process, different studies indicated a positive impact of RHWP on client health outcomes, as well as cost reduction in subsequent utilization of healthcare facilities.[2] The results of this cross-sectional study showed a significant improvement in student attitude toward the value of interprofessional teams in providing care for complex cases, such as

older adults with multiple chronic conditions. Additionally, the student level of knowledge related to the interprofessional geriatrics competencies improved after participating in RHWP. Such findings support the effectiveness of RHWP as an IPE educational model to train different health professions students how to apply clinical knowledge and teamwork skills to deliver optimum team-based care for complex patients. These findings are consistent with literature focused on assessing student attitudes, knowledge, and skills in different IPE settings,[3, 4] as well as community-based geriatric care settings.[5] Interprofessional education interventions have been shown to have a positive impact on improving student attitudes, knowledge, and skills toward the value of a team-based approach to delivering healthcare plans. Utilizing the results of this study in conjunction with results published in previous studies[2] could help to strengthen the overall experience at RWHP. Thus, RHWP can serve as a practice-based IPE model with proven evidence of the impact of IPE on learning, as well as health and system outcomes.

Recently, the video recording approach has been utilized as a formative assessment strategy to draw evidence of student learning. In this study, the video recording approach was used as a data collection measure to evaluate dynamic student teams' effectiveness in real-life settings. This approach was selected due to the ability to conduct a repeated analysis by one or more observers. The video recording also helps to precisely evaluate team effectiveness by capturing multi-level factors associated with team success.[6] These factors can be targeted to improve the educational experience, which will ultimately affect performance in practice. It is also possible to conduct additional work, such as qualitative analyses of teamwork, using the video recordings collected. In the current study, different factors facilitated the video recording process. First, the utilization of a high-quality portable camera facilitated the video recording process across different study sites. Second, appropriate coordination and collaboration between

the research team and RHWP clinic staff facilitated the smooth flow of the recording process without disturbing the clinic's routine. All 100 unique encounters were videotaped within a period of 10 weeks. In summary, it is feasible to use the video recording approach as a data collection measure in a practice-based educational setting.

The utilization of video analysis in health education has different applications, such as performance evaluation, improvement of teaching and professional skills, documenting evidence of clinical outcomes, and enhancement of student skills.[7] In this study, the primary reason for the video coding was to directly assess the team effectiveness using a quantitative observational tool.

The C-ICE instrument was developed to assess collaborative performance among interprofessional student teams based on IPEC competency domains.[8] The instrument was selected based on our stated rationale that teamwork is one of the IPE competencies that overlaps with the other competencies, including values and ethics, roles and responsibilities, and communication.[9] In this research, the C-ICE instrument was modified to suit its use as an evaluation tool to assess dynamic student team effectiveness in a practice-based IPE setting. In the RHWP, each client encounter was unique, in that the student team composition, client, and setting were different each time. Additionally, each encounter had its own objectives, goals, and consequent care plan. The C-ICE instrument is flexible and practical to adapt to different client scenarios. Overall, the C-ICE instrument showed good evidence of inter-rater reliability, suggesting homogeneity of team effectiveness ratings among the two observers. The low ICC score was associated with 11 videos that were re-reviewed to discuss the reasons for disagreement. The majority of disagreements were related to unfamiliarity with the scoring guide, which was resolved over time by building up a stable anchor to rate each item. Besides,

the uniqueness of the encounters may have also influenced the ratings. Over time, the scoring consistency improved, and the score of ICC improved dramatically with values higher than 0.8.

The study results indicated that there was variability between the faculty disciplines on assessing the client healthcare plan. This finding is expected since different expertise has different perspectives on grading the quality of the healthcare plan offered by student teams. Pharmacy faculty concentrated on assessing problems related to medication and polypharmacy. In contrast, social work faculty were oriented to assess social aspects related to the clinical visit, such as depression and anxiety. Nursing faculty were oriented toward the general assessment of clinical visit elements such as the recording of medical history and symptoms, performing health screening, providing patient education, and support.

The current study uses various approaches to evaluate the effectiveness of dynamic student teams in a practice-based community setting. These approaches were grouped under three domains covering the team outputs, the effect the team has on its members, and enhancement of a team's ability to perform effectively in the future.[10] Team-produced outputs are related but not limited to the quality or quantity of service, speed, and customer satisfaction. In this study, team-produced outputs have been conceptualized to be evaluated using the observer and client rating of team effectiveness. The observer rating evaluates the quality of team effectiveness based on the observed team interaction and subsequent healthcare plan offered. The client rating focuses on measuring the client experience with the student teams. The effect the team has on its member has been assessed using the self-reported student rating of team effectiveness. Such an approach helps to evaluate the effects of dynamic team interaction on the participating students. The faculty rating of team effectiveness focuses on assessing the quality of clinical notes and the healthcare plan. Faculty feedback provided in the debriefing

session will help the students to learn proper skills in documenting clinical notes and delivering a healthcare plan. Both the observer and client directly assessed the team effectiveness through their direct presence during the team encounter. Faculty indirectly assessed teamwork through the debriefing phase based on student presentations of the client case and the offered healthcare plan using the SOAP notes. The correlation test results indicate that there is a positive relationship between the observer and client rating of team effectiveness. Such a relationship is expected, because the two measures are intended to evaluate the same construct of team effectiveness targeting the team output. Additionally, both measures depend on direct evaluation of team effectiveness. In contrast, the faculty rating is inversely related with both the observer and the client rating of team effectiveness. Such results are expected, since faculty ratings used the indirect evaluation approach to assess different constructs of team effectiveness related to enhancement in the clinical notes and delivery of care. The student self-reported team evaluation had no significant relationship with the observer, client, and faculty ratings. This may be explained by the fact that self-reported evaluation does not always match the evaluation results as observed by others. A weakness of the self-reported evaluation is related to its limitation to capture the complexity of teamwork in the healthcare setting. In contrast, observational measures are potent to capture and measure the complexity of team interaction and effecivness.[6] Overall, results of the correlation tests were consistent with the literature findings on teamwork evaluation methods. Different evaluation approaches, such as direct vs. indirect, or observational vs. self-reported, had inconsistent results when applied to the evaluation of team effectiveness.[11, 12] Based on these findings, we conclude that team effectiveness can be evaluated using a variety of approaches depending on the anticipated aim. Accordingly, it is recommended that a multi-measure approach could be used to evaluate the impact of collaborative practice on achieving the

quadruple aim. An evaluation approach that focuses on team outputs may be useful to assess the effect of collaborative practice on improving client satisfaction and outcomes. Evaluation approaches that focus on evaluating the effect that the team has on its members can be used to measure provider satisfaction. Evaluation approaches focusing on team effectiveness aspects related to the enhancement of a team's capability to perform effectively in the future can be used to assess the impact on cost and quality of care.

Among the evaluation approaches used, the faculty and client ratings are robust in explaining factors related to team effectiveness among dynamic student teams participating in practice-based IPE setting. This could be explained by the duration and level of RHWP engagement across different raters. Both the faculty and clients regularly attended the RHWP clinics, building their familiarity with RHWP concepts, objectives, goals, and expected outcomes, which is anticipated by the high mean score value of both raters. On the other hand, the observer rating was conducted by researchers who were not a part of RHWP, thus they could miss some concepts that both the client and faculty could conceptualize. Similarly, a new cohort of students participates in RHWP every semester. In summary, these results support the importance of faculty in guiding and mentoring interprofessional student teams in practice-based IPE settings. Additionally, it reflects the importance of measuring client observations and satisfaction to assess team outputs. Moreover, it suggests that observational tools may be more useful in simulated settings where the details of the case can be kept constant minimizing the variability in scenario.[13]

The study produced inconsistent findings on team effectiveness predictors across different evaluation measures. Overall, this could be supported by the correlation test results, as each evaluation measure appears to evaluate different aspects of team effectiveness through

different methods. Another explanation could be linked to the differences in expectations of team effectiveness among the different raters; for example, faculty raters concentrated mainly on the quality of clinical notes and healthcare plan delivered by the student teams. The main concern for the observer rater was to assess the quality of dynamic team interaction through their communication and delivery of a healthcare plan to the client. Client ratings focused on the overall experience with the student team in terms of understating and addressing the client's needs. The student ratings focused on the student perception about the quality of team interaction and performance.

The results of this study indicated that there was little overlap between the predictors across different team effectiveness measures. Concentrating on faculty and client ratings, student factors such as student age, gender, prior healthcare experience, and number of client encounters in a half-day of the clinic were significant predictors of team effectiveness. These factors could be linked to team diversity, suggesting that team diversity has an impact on team effectiveness. Such results were anticipated by the literature specific to teamwork in IPE and in broader settings, as group diversity has an impact on the group's process and development. Unfortunately, results were inconsistent, as some studies support the existence of positive or negative relationships, while others found no effect at all.[10, 14, 15, 16] Another possible explanation could be linked to the effect of stereotypes on team effectiveness. As is documented in literature, patients perceive more caring behavior from female nurses compared to male nurses.[17] Similarly, the presence of a female on a team is associated with improvement in collaboration, which affects team effectiveness.[18] The effect of age was documented to be correlated with team effectiveness in performing complex decision-making tasks.[19] A study by Kent et al. indicated that familiarity with the system and setting contributes to enhanced leadership skills, which

ultimately contributes to raised levels of team success.[20] Regarding client factors, client's age, race, education level, and behavioral and wellness visits were significant predictors of team effectiveness as it was evaluated by the faculty and client. Such results support the literature's findings on the effect of patient demographics on patient satisfaction with their clinical experience.[21] A study by Young et al. [21] indicates that increasing patient age and better health status were significantly associated with patient satisfaction with hospital care. Additionally, the study indicates that nonwhite patients were less satisfied with hospital care compared to white patients. In the current study, as the client age increased, the client rating of student team effectiveness decreased. Also, a client who is neither black or white had a lower rating of team effectiveness compared to black clients. As the number of wellness visits increased, the client rating of team effectiveness decreased. The inconsistent relationship direction is anticipated due to the difference in patient or client expectation and the utilized satisfaction measures between both studies. In summary, both studies support the effects of patient demographics on client satisfaction. More studies are needed to confirm the causational relationship. Another explanation could be linked to the presence of cultural disparities in healthcare, which affect the patient's treatment and offered healthcare plan.[22] The IOM 2003 reports "Unequal Treatment: Confronting Racial and Ethnic Disparities in Health Care" highlight the existence of racial and ethnic disparities in healthcare. These disparities are regular through a full range of medical conditions and services and are related to poor health outcomes. Team factors related to number of participating students and clinic site were significant predictors of the faculty and client ratings of team effectiveness. Such results were expected due to the fact that working in small teams is associated with enhanced communication and collaboration among team members, which raise team success.[10, 23] Regarding the clinic site, each building has unique characteristics

that could influence the quality of the student teams' performance. These factors related to the duration of RHWP involvement, number of participating students, clients, and faculty; for example, buildings A & B are the most stable buildings in terms of RHWP engagement and participating staff. In contrast, clinics in buildings C & E are still emergent with sometimes chaotic atmospheres.

In this study, the majority of students were female and white with age 20-29 years, while most of the clients were black with a mean age of 67 years. The significant predictors related to client race indicate that non-black clients had better team effectiveness scores. Although there were relatively low numbers of non-black clients and minority students taking part in this study, this is an intriguing finding that requires further evaluation. Discordance between student team member, faculty and client demographics suggest that students may need additional training and experience to learn to build rapport with clients who are unlike themselves or that implicit bias of faculty is influencing the assessment of the team care plans. It may add support to the imperative to recruit more minority faculty and students into the health professions degree programs as well.

6.2 Study Limitations

To the best of our knowledge, this is the first study that used a multi-method and multi-measure approach to assess team effectiveness among dynamic student teams participating in providing care coordination for health disparate older adults in real-world settings. As with all research, this study has limitations. The voluntary nature of study participation and utilization of a convenience sampling strategy may lead to limited generalizability and selection bias. The missing data pattern that occurred between the pre- and post-measures could influence the nonsignificant results among the majority of geriatrics knowledge domain (i.e., communicating with older adults, health literacy, motivational interviewing, diabetes, hypertension, and

cognition). Additionally, the unique characteristics of study participants and the repeated nature of study participation lead to homogeneity among the study sample that could influence the study results and limit its generalizability. In addition, the study used the video recording as a data collection tool, and the Hawthorne effect is a concern with such observational data, as it could lead to response bias. Using an observational approach to evaluate team effectiveness could also be accompanied by observer bias, which the researcher attempted to minimize through the involvement of two coders. Due to the exploratory nature of the study design, it relied mainly on a quantitative approach to assess team effectiveness and its corresponding factors. Also, the study did not account for the mediation effect that could be introduced through the quality of dynamic team interaction. Moreover, most of the outcome measures were modified to suit the study objectives and setting. The psychometric properties for the modified measures were not assessed. This could influence the inconsistency of significant team effectiveness predictors across various outcome measures.

The current study used the disaggregated data approach to evaluate multi-level predictors associated with team effectiveness. Utilizing disaggregated data could lead to an inaccurate estimate of the standard errors of the model parameters. To account for that, the model-building procedures followed two approaches to arrive at the final model. Also, all of the predictors were assessed using adjusted and unadjusted regression analyses. Another statistical limitation related to the unequal distribution of study observation across categorical variable groups. To overcome this limitation, the group with higher observation was selected as a reference group. There was also variation in faculty ratings of team effectiveness. To account for this, faculty program was added as a predictor variable to all four models that were used to assess predictors of team effectiveness.

6.3 Future Directions

Future studies focusing on teamwork assessment should be directed toward a qualitative or mixed methods approach to assess the quality of dynamic team interaction. Such approaches will focus on intensely understanding the mechanisms of dynamic team processes and corresponding multi-level factors associated with improvement in team success, from which the relationship between team effectiveness (output) and multi-level factors (input) can be assessed, accounting for the mediation effect introduced by the quality of team interaction (process).

Another interesting area for future teamwork evaluation studies is to focus on testing quantitative instruments to assess validity and applicability for evaluating team effectiveness. In this study, most of the instruments used to assess team effectiveness were modified for the study objectives and setting. It will be worthwhile to replicate this work using validated and rigorous quantitative measures. The quantitative measures offer a less resource-intensive approach to evaluate team effectiveness as well as to evaluate programs focused on teamwork intervention. An important point should be highlighted based on our study results: evaluators must select the appropriate assessment strategy that best reflects underlying outcomes or factors they seek to better understand.

An additional area for possible future research will be concentrating on using the video recording approach to collect data related to teamwork in practice-based settings. The video-recorded data can be used as a teaching resource where students can learn through reflection and feedback. Students can precisely critique the quality of the team interaction and learn alternative ways to improve collaborative behavior. Additionally, video-recorded data can be utilized by an evaluator to evaluate team performance and/or effectiveness with or without an instrument.

Results from this study can be used in combination with results presented in other similar studies to guide health educators in designing team training models focused on improving team performance and effectiveness. Based on results anticipated from this study, modifiable significant team factors can be targeted in a dynamic team training model focused on improving team effectiveness and performance in clinical practice-based IPE setting. The size of the student teams should not exceed four members to facilitate team communication and coordination. Besides, interprofessional faculty should move beyond assessing individual student performance and target the overall interprofessional team performance and effectiveness. Interprofessional faculty must agree on a standard evaluation approach to assess the anticipated interprofessional team performance and effectiveness. Moreover, clinical sites should be carefully selected to ensure uniformity of student learning. Addressing these factors can play a critical role in improving the effectiveness of the practice-based IPE model in preparing the student to work in a collaborative practice environment.

Future research in RHWP can benefit from further analysis of the video recordings to more deeply understand the dynamic team process and factors associated with team effectiveness. One possible approach for the qualitative video analysis can be to assess the quality of the clinical encounters to understand how the student teams initiate the visits, how the students engage with the client, how goals are established with the client, how the student teams communicate with the client, when teams ask for help from the faculty, whether all team members contribute, how the leader of the team is established, and how cultural factors and visit length affect team effectiveness. Another possible area for qualitative analysis is to understand how different teams work with the same client. Moreover, qualitative analysis can be conducted to understand the high variability between the faculty disciplines on assessing the healthcare

plans developed by the student teams. Faculty rating of team effectiveness can be reassessed based on the video recorded data to identify factors associated with inconsistency in faculty grading. Such factors are helpful to establish a method such as a scoring rubric to minimize variability in assessment of care plans.

The videos can also be used for demonstrations and as an educational resource to educate future student cohorts on how effective student teams operate in RHWP. Additionally, it will be worthwhile to evaluate the effect of the student program, including medicine and occupational therapy students (usually participate in RHWP during the spring semester) on team effectiveness.

Implications

The findings of this study can be used to improve the learning experience in RHWP. Health professions educators at RHWP can target the significant predictors revealed by this study to develop a team training model as part of the RHWP experience. Such models can be introduced through the introductory session alongside the motivational interviewing workshop. The session can be initiated with a demonstration video to help the students understand how interprofessional student teams operate in RHWP. Interprofessional students should be oriented on how to manage the client encounter. Student teams should focus on identifying and verbalizing the visit's goal, which is driven by the client and the team perspective. Such goals act as the road map for the client visit, from which the students can rotate their roles and responsibilities, perform appropriate vital sign tests, identify predisposing client factors, and identify appropriate referral and needed expertise, all of which can help to improve the quality of the offered healthcare plan and facilitate the delivery of an appropriate healthcare plan. This can be done by summarizing and prioritizing the visit goals and subsequent plans with the client. In addition to that, this study indicated an effect of cultural disparities on team effectiveness. Thus,

the student should be trained on how to address health disparities by incorporating aspects of the cultural competency framework into their training.[24, 25, 26]

On the clinic day, faculty can help in structuring the student teams based on client needs to maximize the team effectiveness. Faculty can outline the roles and responsibilities within dynamic teams and inform students on how to seek expert guidance. Moreover, they can set a necessary foundation to facilitate team coordination and communication. This may help to improve team effectiveness resulting in a better team plan for the client and improved client satisfaction with the team encounter.

6.4 Conclusion

A practice-based IPE setting is an excellent opportunity for advanced students to improve their skills, knowledge, and attitudes toward interprofessional teamwork by preparing them for a collaborative-practice environment. In such settings, students are rotated to work in dynamic teams where they can evaluate and help real clients under the supervision of clinical experts. Given the complex nature of practice-based settings emerging from setting and dynamic team characteristics, video recording can be utilized as a data collection method to assess dynamic team effectiveness. The results of this study indicate that in community-based IPE settings, team effectiveness can be evaluated as part of the faculty debriefing process and by measuring client satisfaction toward their experience with the student teams. In this study, predictors such as student demographics and prior experience, client demographics and number of clinic visits, team size, and clinic site were significant factors for predicting team effectiveness. There is a need for additional research using video-based analysis to precisely evaluate dynamic team performance and identify factors corresponding to team success.

6.5 References

1. Parsons PL, Slattum PW, Bleich M. Mainstreaming health and wellness: The RHWP innovation model to complement primary care. *Nursing Forum*. 2019;54(2):263-269. doi:10.1111/nuf.12326

2. Health quality innovators. Richmond health and wellness program (RHWP): A patient-centered approach to better outcomes and appropriate utilization. 2017:1–28.

3. Guraya SY, Barr H. The effectiveness of interprofessional education in healthcare: A systematic review and meta-analysis. *The Kaohsiung Journal of Medical Sciences*. 2018;34(3):160-165. doi:10.1016/j.kjms.2017.12.009

4. Fox L, Onders R, Hermansen-Kobulnicky CJ, et al. Teaching interprofessional teamwork skills to health professional students: A scoping review. *Journal of Interprofessional Care*. 2018;32(2):127-135. doi:10.1080/13561820.2017.1399868

5. Reilly JM, Aranda MP, Segal-Gidan F, et al. Assessment of student interprofessional education (IPE) training for team-based geriatric home care: Does IPE training change students' knowledge and attitudes? *Home Health Care Services Quarterly*. 2014;33(4):177-193. doi:10.1080/01621424.2014.968502

6. Jeffcott SA, Mackenzie CF. Measuring team performance in healthcare: Review of research and implications for patient safety. *Journal of Critical Care*. 2008;23(2):188–196. doi:10.1016/j.jcrc.2007.12.005

7. Pinsky LE, Wipf JE. A picture is worth a thousand words. *Journal of General Internal Medicine*. 2000;15:6.

8. Iverson L, Todd M, Ryan Haddad A, et al. The development of an instrument to evaluate interprofessional student team competency. *Journal of Interprofessional Care*. 2018;32(5):531-538. doi:10.1080/13561820.2018.1447552

9. *Core competencies for interprofessional collaborative practice: 2016 Update*.; 2016:22.

10. Guzzo RA, Dickson MW. Teams in organizations: Recent research on performance and effectiveness. *Annual Review of Psychology*. 1996;47(1):307-338. doi:10.1146/annurev.psych.47.1.307

11. Bacon DR. Comparing direct versus indirect measures of the pedagogical effectiveness of team testing. *Journal of Marketing Education*. 2011;33(3):348-358. doi:10.1177/0273475311420243

12. Andersson D, Rankin A, Diptee D. Approaches to team performance assessment: A comparison of self-assessment reports and behavioral observer scales. *Cogn Tech Work*. 2017;19(2-3):517-528. doi:10.1007/s10111-017-0428-0

13. Shapiro MJ, Gardner R, Godwin SA, et al. Defining team performance for simulation-based training: Methodology, metrics, and opportunities for emergency medicine. *Academic Emergency Medicine*. 2008;15(11):1088-1097. doi:10.1111/j.1553-2712.2008.00251.x

14. James B. Shaw, Barrett-Power E. The effects of diversity on small work group process and performance. *Human Relation*. 1998;51(10):pp.1307-1325. doi:10.1177/001872679805101005

15. Horwitz SK, Horwitz IB. The effects of team diversity on team outcomes: A meta-analytic review of team demography. *Journal of Management*. 2007;33(6):987-1015. doi:10.1177/0149206307308587

16. Mitchell R, Parker V, Giles M, White N. Review: Toward realizing the potential of diversity in composition of interprofessional health care teams: An examination of the cognitive and psychosocial dynamics of interprofessional collaboration. *Med Care Res Rev*. 2010;67(1):3-26. doi:10.1177/1077558709338478

17. Ekstrom DN. Gender and perceived nurse caring in nurse–patient dyads. *Journal of Advanced Nursing*. 1999;29(6):1393-1401. doi:10.1046/j.1365-2648.1999.01026.x

18. Bear JB, Woolley AW. The role of gender in team collaboration and performance. *Interdisciplinary Science Reviews*. 2011;36(2):146-153. doi:10.1179/030801811X13013181961473

19. Wegge J, Roth C, Neubach B, Schmidt K-H, Kanfer R. Age and gender diversity as determinants of performance and health in a public organization: The role of task complexity and group size. *Journal of Applied Psychology*. 2008;93(6):1301-1313. doi:10.1037/a0012680

20. Kent F, Francis-Cracknell A, McDonald R, Newton JM, Keating JL, Dodic M. How do interprofessional student teams interact in a primary care clinic? A qualitative analysis using activity theory. *Advances in Health Sciences Education*. 2016;21(4):749-760. doi:10.1007/s10459-015-9663-4

21. Young GJ, Meterko M, Desai KR. Patient satisfaction with hospital care: effects of demographic and institutional characteristics. *Medical Care*. 2000;38(3):325-334.

22. *Unequal treatment: Confronting racial and ethnic disparities in health care (with CD)*. Washington, D.C.: National academies press; 2003. doi:10.17226/12875

23. Cooper H, Spencer-dawe E, Mclean E. Beginning the process of teamwork: Design, implementation and evaluation of an inter-professional education intervention for first year undergraduate students. *Journal of Interprofessional Care*. 2009;1820. doi:10.1080/13561820500215160

24. Betancourt JR, Green AR, Carrillo JE, Ananeh-Firempong O. Defining cultural competence: A practical framework for addressing racial/ethnic disparities in health and health care. *Public Health Reports*. 2003;118(4):pp.293-302. doi:10.1093/phr/118.4.293

25. Truong M, Paradies Y, Priest N. Interventions to improve cultural competency in healthcare: a systematic review of reviews. *BMC Health Serv Res*. 2014;14(1):99. doi:10.1186/1472-6963-14-99

26. McElfish PA, Moore R, Buron B, et al. Integrating interprofessional education and cultural competency training to address health disparities. *Teach Learn Med*. 2018;30(2):213-222. doi:10.1080/10401334.2017.1365717

Appendix 1:

Consent Forms

VCU IRB PROTOCOL NUMBER: HM20013283

RESEARCH PARTICIPANT INFORMATION AND CONSENT FORM

STUDY TITLE: Determining Successful Factors in Interprofesional Practice with Dynamic Teams

VCU INVESTIGATOR: Krista L. Donohoe, Assistant Professor

ABOUT THIS CONSENT FORM

You are being invited to participate in a research study. **It is important that you carefully think about whether being in this study is right for you and your situation.**

This consent form is meant to assist you in thinking about whether or not you want to be in this study. **Please ask the investigator or the study staff to explain any information in this consent document that is not clear to you. You may take home an unsigned copy of this consent form to think about or discuss with family or friends before making your decision.**

Your participation is voluntary. You may decide to not participate in this study. If you do participate, you may withdraw from the study at any time. Your decision not to take part or to withdraw will involve no penalty or loss of benefits to which you are otherwise entitled.

PURPOSE OF THE STUDY

The purpose of this study is to understand teamwork performance in a practice-based IPE setting where interprofessional student teams are dynamic. Results of the study will help us identify key factors that contribute to teamwork performance. Understanding the nature of student interactions in this setting will help faculty design a more effective learning experience to better prepare health professions students to work effectively in dynamic teams, which will facilitate their transition to practice.

You are being asked to participate in this study because you are student participating in the Richmond Health and Wellness Program (RHWP).

DESCRIPTION OF THE STUDY AND YOUR INVOLVEMENT

If you decide to be in this research study, you will be asked to sign this consent form after you have had all your questions answered and understand what will happen to you. We will be video recording 80-100 wellness visits conducted through the Richmond Health and Wellness Program between August and December to explore how the interprofessional student teams interact with the clients. The visits are randomly selected for video recording. No information that will identify you personally will be included in the study data. After your session you will be asked to complete a short survey which is estimated to take 5-10 minutes to complete. The survey will ask

questions about team composition, prior RHWP experience, number of client encounter and teamwork perceptions.

ALTERNATIVE

Students will be able to continue participation with the RHWP regardless of study participation.

BENEFITS TO YOU AND OTHERS

You may not get any direct benefit from this study, but the information we learn from people in this study may help us improve how we prepare future students to provide team-based care.

RISK AND DISCOMFORTS

Risk associated with participation in this study is no greater than what you may experience in your clinical courses. You may feel some emotional discomfort interacting with students and clients or providing personal information. While precautions have been taken to protect your data, there is risk for breach of confidentiality and loss of privacy. You may choose not to answer a question or request to have the recording stopped at any point you feel uncomfortable.

COSTS

There are no costs for participating in this study.

WITHDRAWAL

You can stop being in this research study at any time. Leaving the study will not affect your course grade. Tell the study staff if you are thinking about stopping or decide to stop.

CONFIDENTIALITY

VCU and the VCU Health System have established secure research databases and computer systems to store information and to help with monitoring and oversight of research. Your information may be kept in these databases but are only accessible to individuals working on this study or authorized individuals who have access for specific research related tasks.

Identifiable information in these databases are not released outside VCU unless stated in this consent or required by law. Although results of this research may be presented at meetings or in publications, identifiable personal information about participants will not be disclosed.

Personal information about you might be shared with or copied by authorized representatives from the following organizations for the purposes of managing, monitoring and overseeing this study:

- Representatives of VCU and the VCU Health System
- Officials of the Department of Health and Human Services

QUESTIONS

If you have any questions, complaints, or concerns about your participation in this research, contact:

Krista Donohoe, Pharm.D., BCPS, BCGP
Email: Kldonohoe@vcu.edu
Phone: 804-628-4551

Patricia Slattum, PhD, PharmD, BCGP
Email: pwslattu@vcu.edu
Phone: 804-828-6255

Danah Alsane, MS, BS
Email: alsanedm@vcu.edu

The researcher/study staff named above is the best person(s) to call for questions about your participation in this study.

If you have general questions about your rights as a participant in this or any other research, you may contact:

Virginia Commonwealth University Office of Research
800 East Leigh Street, Suite 3000
Box 980568
Richmond, VA 23298
Telephone: (804) 827-2157

Contact this number to ask general questions, to obtain information or offer input, and to express concerns or complaints about research. You may also call this number if you cannot reach the research team or if you wish to talk to someone else. General information about participation in research studies can also be found at http://www.research.vcu.edu/irb/volunteers.htm.

Do not sign this consent form unless you have had a chance to ask questions and have received satisfactory answers to all of your questions.

STATEMENT OF CONSENT

I have been provided with an opportunity to read this consent form carefully. All of the questions that I wish to raise concerning this study have been answered. By signing this consent form, I have not waived any of the legal rights or benefits to which I otherwise would be entitled. My signature indicates that I freely consent to participate in this research study. I will receive a copy of the consent form for my records.

_____ Participant Name (Printed)	
_____ Participant's Signature	_____ Date
_____ Name of Person Conducting Consent Discussion (Printed)	
_____ Signature of Person Conducting Consent Discussion	_____ Date
_____ Principal Investigator Signature (if different from above)	_____ Date

VCU IRB PROTOCOL NUMBER: HM20013283

RESEARCH PARTICIPANT INFORMATION AND CONSENT FORM

STUDY TITLE: Determining Successful Factors in Interprofesional Practice with Dynamic Teams

VCU INVESTIGATOR: Krista L. Donohoe, Assistant Professor

ABOUT THIS CONSENT FORM

You are being invited to participate in a research study. **It is important that you carefully think about whether being in this study is right for you and your situation.**

This consent form is meant to assist you in thinking about whether or not you want to be in this study. **Please ask the investigator or the study staff to explain any information in this consent document that is not clear to you.**

Your participation is voluntary. You may decide to not participate in this study. If you do participate, you may withdraw from the study at any time. Your decision not to take part or to withdraw will involve no penalty or loss of benefits to which you are otherwise entitled.

PURPOSE OF THE STUDY

The purpose of this study is to understand teamwork performance in a practice-based IPE setting where interprofessional student teams are dynamic. Results of the study will help us identify key factors that contribute to teamwork performance. Understanding the nature of student interactions in this setting will help faculty design a more effective learning experience to better prepare health professions students to work effectively in dynamic teams, which will facilitate their transition to practice.

You are being asked to participate in this study because you currently participate in the Richmond Health and Wellness Program (RHWP).

DESCRIPTION OF THE STUDY AND YOUR INVOLVEMENT

If you decide to be in this research study, you will be asked to sign this consent form after you have had all your questions answered and understand what will happen to you. We will be video recording 80-100 wellness visits conducted through the Richmond Health and Wellness Program between August and December to explore how the interprofessional student teams interact with the clients. The visits are randomly selected for video recording. No information that will identify you personally will be included in the study data. After your session you will be asked to complete a survey which is estimated to take 5-10 minutes to complete. The survey will ask questions about your interaction with the student-provider team. We will also review and collect

information from your RHWP records including demographics (year of birth, gender, race, education, insurance status), self-reported diagnosis, and dates of your visits to the RHWP.

ALTERNATIVE

Clients will be able to continue participation with the RHWP regardless of study participation.

BENEFITS TO YOU AND OTHERS

You may not get any direct benefit from this study, but the information we learn from people in this study may help us improve how we prepare students to provide team-based care.

RISK AND DISCOMFORTS

Risk associated with participation in this study is no greater than a typical visit with the Richmond Health and Wellness Program. You may experience some emotional discomfort providing personal health information. While precautions have been taken to protect your data, there is risk for breach of confidentiality and loss of privacy. You may choose not to answer a question or request to have the recording stopped at any point you feel uncomfortable. Furthermore, receiving payment for participation in study this may impact your eligibility for social services benefits (see Payment for Participation section below for more information).

COSTS

There are no costs for participating in this study.

PAYMENT FOR PARTICIPTATION

You will be paid $5 in cash when you participate into the video record session and complete the survey.

WITHDRAWAL

You can stop being in this research study at any time. Leaving the study will not affect your medical care. Tell the study staff if you are thinking about stopping or decide to stop.

CONFIDENTIALITY

VCU and the VCU Health System have established secure research databases and computer systems to store information and to help with monitoring and oversight of research. Your information may be kept in these databases but are only accessible to individuals working on this study or authorized individuals who have access for specific research related tasks.

Identifiable information in these databases are not released outside VCU unless stated in this consent or required by law. Although results of this research may be presented at meetings or in publications, identifiable personal information about participants will not be disclosed.

Personal information about you might be shared with or copied by authorized representatives from the following organizations for the purposes of managing, monitoring and overseeing this study:

- Representatives of VCU and the VCU Health System
- Officials of the Department of Health and Human Services

USE AND DISCLOSURE OF PROTECTED HEALTH INFORMATION

As part of this research study, we will ask you to share identifiable health information with us and/or permit us to access existing information from your healthcare records. New health information may also be created from visits, and/or questionnaires. This type of information is considered "Protected Health Information" that is protected by federal law.

Type of health information that may shared

The following types of information may be used for the conduct of this research:

☐ Complete health record
☐ Diagnosis & treatment codes
☐ Discharge summary
☐ History and physical exam
☐ Consultation reports
☐ Progress notes
☐ Laboratory test results
☐ X-ray reports
☐ X-ray films / images
☒ Photographs, videotapes
☐ Complete billing record
☐ Itemized bill
☐ Information about drug or alcohol abuse
☐ Information about Hepatitis B or C tests
☐ Information about mental health
☐ Information about sexually transmitted diseases
☒ Other physical or mental health information (specify age, gender, race, insurance status, education level, self-reported diagnosis from RHWP history and intake form, RHWP clinic visit dates.

Authority to Share Protected Health Information

VCU and VCU Health are required by law to protect your identifiable health information. By consenting to this study, you authorize VCU/VCU Health to use and/or share your health information for this research. The health information listed above may be used by and/or shared with the following people and groups to conduct, monitor, and oversee the research:

- Principal Investigator and Research Staff
- Health Care Providers at VCU Health
- Institutional Review Boards
- Government/Health Agencies
- Others as Required by Law
- Data Coordinators
- Research Collaborators
- Data Safety Monitoring Boards

Once your health information has been disclosed to anyone outside of this study, the information may no longer be protected under this authorization.

Expiration of This Authorization
This authorization will expire when the research study is closed, or there is no need to review, analyze and consider the data generated by the research project, whichever is later.

Statement of Privacy Rights
You may change your mind and revoke (take back) the right to use your protected health information at any time. However, even if you revoke this authorization, the researchers may still use or disclose health information they have already collected about you for this study. If you revoke this Authorization you may no longer be allowed to participate in the research study. To revoke this Authorization, you must write to the Principal Investigator.

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QUESTIONS
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Danah Alsane, MS, BS
Email: alsanedm@vcu.edu

The researcher/study staff named above is the best person(s) to call for questions about your participation in this study.

If you have general questions about your rights as a participant in this or any other research, you may contact:

Virginia Commonwealth University Office of Research
800 East Leigh Street, Suite 3000
Box 980568
Richmond, VA 23298
Telephone: (804) 827-2157

Contact this number to ask general questions, to obtain information or offer input, and to express concerns or complaints about research. You may also call this number if you cannot reach the research team or if you wish to talk to someone else. General information about participation in research studies can also be found at http://www.research.vcu.edu/irb/volunteers.htm.

Do not sign this consent form unless you have had a chance to ask questions and have received satisfactory answers to all of your questions.

STATEMENT OF CONSENT

I have been provided with an opportunity to read this consent form carefully. All of the questions that I wish to raise concerning this study have been answered. By signing this consent form, I have not waived any of the legal rights or benefits to which I otherwise would be entitled. My signature indicates that I freely consent to participate in this research study. I will receive a copy of the consent form for my records.

_____	
Participant Name (Printed)	
_____	_____
Participant's Signature	Date
_____	
Name of Person Conducting Consent Discussion (Printed)	
_____	_____
Signature of Person Conducting Consent Discussion	Date
_____	_____
Principal Investigator Signature (if different from above)	Date

VCU IRB PROTOCOL NUMBER: HM20013283

SCRIPT FOR STUDENT RECRUITMENT
Version #1, June 5, 2018

STUDY TITLE: Determining Successful Factors in Interprofessional Practice with Dynamic Teams

[Note: In order to minimize potential coercion, consent will be collected by Danah Alsane or Kelly Lockeman, who are not involved in the curriculum or assessment process at RHWP.]

Thank you for giving me a few minutes of your time. My name is [name]. I am [state role], and I am here today because I am involved in a research study being conducted to understand teamwork performance in a practice-based IPE setting like the Richmond Health and Wellness Program, and I would like to request your participation. Results of the study will help us identify key factors that contribute to teamwork performance and will help faculty design a more effective learning experience to prepare students to work effectively in dynamic teams.

We will be video recording 80-100 wellness visits between August and December to explore how the interprofessional student teams interact with the clients. The visits are randomly selected for video recording and will be reviewed by a researcher who is not involved in grading for this clinical experience. Participation is voluntary. If you choose to participate, you will be asked to complete a short survey after each video-recorded session. The survey will ask questions about team composition, your prior RHWP experience, number of client encounters and teamwork perceptions. We will also use data collected electronically through the RHWP pre- and post- evaluation survey. Your participation in this study will take place for the time that you participate in the RHWP clinic. You have a copy of the consent form, which fully explains the study. I will give you a few minutes to read the form, and then I will be happy to answer any questions you may have before you sign the form.

[Pause for 2-3 minutes or until all students have finished reading.]

Are there any questions?

[Once all questions have been answered.] If you are willing to participate, please go to the last page of the consent form, print and sign your name, and write today's date. After the form has been signed, I will give you a copy for your records.

Appendix 2:

Study Measures

Determining Successful Factors in Interprofessional Practice with Dynamic Teams

STUDENT PRE/POST SURVEY

NAME _____

V NUMBER _____

DATE _____

Dear Student:

You are invited to complete this survey involving research entitled, **"Determining Successful Factors in Interprofessional Practice with Dynamic Teams"** conducted by investigators in the VCU School of Nursing, Pharmacy, Medicine. The survey consists of questions about your perceptions about working in a health care team and knowledge about geriatric competencies. If you choose to participate, we will ask that you complete a brief survey at the beginning and end of this course. The results of this survey will help to provide information about your views about interprofessional education and teamwork and will help with curriculum design.

It is estimated that the survey will **take less than 15 minutes to complete**. **Completing the survey is completely voluntary and will not affect your course grade**. Your answers to the survey will remain anonymous and confidential. No compensation will be provided for participation and the risk associated with this study is no greater than everyday life. If you feel uncomfortable answering a survey question, you may choose to not answer that question. If you wish to stop your participation in this research study, you may stop the survey at any time. Please completely circle your response.

If you have any questions about the study, want additional information, or wish to receive results of the study, please contact the primary researcher, Dr. Krista Donohoe, conducting this study. You may keep this survey cover letter for your information. If you choose to participate in this study, please proceed to the next page to begin the survey. Thank you for your time and participation!

If you have questions about the survey, please contact:

Krista Donohoe, Pharm.D., BCPS, BCGP
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If you have any questions about your rights as a participant in this study, you may contact:

Office for Research, VCU
800 East Leigh Street
P.O. Box 980568
Richmond, VA 23298
Telephone: 804-827-2157

Please return completed survey to the survey administrator.

Demographics and Prior Experience		
1. Age in years:	A. 19 and under B. 20 - 29 years C. 30 - 39 years	D. 40 - 49 years E. 50 - 59 years F. 60 and over
2. Gender:	A. Male B. Female	
3. Race	A. American Indian or Alaska Native B. Asian C. Black or African American D. Native Hawaiian or Pacific Islander E. White F. More than one race	
4. Ethnicity	A. Hispanic/Latino B. Non-Hispanic/Non-Latino	
5. Do you come from a family with an annual income below federal low income thresholds?		A. Yes B. No
6. Do you come from an environment that has inhibited you from obtaining the knowledge, skills, and abilities required to enroll in and graduate from a health professions school or from a program providing education or training in an allied health profession?		A. Yes B. No
7. In which kind of community did you grow up? Choose the area in which you spent the most time before age18. *Frontier is a remote area in which weather and distance can prevent severely injured or ill patients from getting immediate transport to an acute care hospital		A. Urban/Inner city B. Suburban C. Rural D. Frontier
8. Health care experience prior to starting in your program:		A. None B. Small amount (some shadowing, volunteer work) C. Some (paid, short-term position) D. A lot (long-term, paid position) E. Prior career in healthcare
9. Interprofessional teamwork experience (included student or clinicians) prior to participating into the program:		A. Never B. Once or twice C. Several times D. Many times
10. Program/degree of study:		A. BSN B. APRN-FM/AG C. APRN- Psychiatry D. Pharmacy E. Social Work F. Medicine G. Dentistry H. Gerontology I. Psychology J. Other_____

Please select the most appropriate answer for the following questions.

Communicating with Older Adults

1. Which of the following are barriers that can affect the older adult's ability to communicate effectively?
   a. Use of medical terminology
   b. Not taking into consideration cultural and/or religious differences
   c. Both a and b
   d. Neither a or b

2. True or False: When communicating with the older adult, be sure to stick to one topic at a time and keep sentences and questions short.
   a. True
   b. False

3. Which of the following would best assist you in good communication during a conversation with an older adult?
   a. Avoid critical topics at the beginning of the conversation
   b. Give extra time for responding to questions
   c. Be an active listener
   d. All of the above

Health Literacy

4. True or False: A person can be literate and still have limited health literacy.
   a. True
   b. False

5. Which one of the following is an individual factor that affects how people understand and use health information
   a. Public health workforce
   b. Income-level
   c. Health knowledge
   d. Public health infrastructure

6. According to the National Assessment of Adult Literacy, adults that have the skills necessary to perform simple, everyday activities such as reading and understanding information in short, uncomplicated descriptions, are classified as:
   a. Below Basic
   b. Basic
   c. Intermediate
   d. Proficient

Motivational Interviewing

7. Which of the following is true regarding Motivational Interviewing? (Select all that apply.)
   a. Is provider-centered
   b. Involves more listening by the provider than talking.
   c. Is non-judgmental
   d. First explores patient motivations, then barriers

8. Blaming, disagreeing, refusing, arguing, making excuses, minimizing, and becoming hostile are all examples of:
   a. Resistance
   b. Ambivalence
   c. Conflict
   d. Doubt

Motivational Interviewing Continued

9. Which of the following is **NOT** one of the 5 principles of motivational interviewing?
- a. Express empathy
- b. Avoid argumentation
- c. Encourage aggression
- d. Roll with resistance

Diabetes

10. Which of the following is a risk factor associated with Type 2 Diabetes Mellitus?
- a. Obesity
- b. Caucasian race
- c. Exercise
- d. High cholesterol

11. Which one of the following pharmacologic treatments has a greater risk of hypoglycemia in the older adult?
- a. Sliding scale insulin
- b. Oral medications

12. A reasonable hemoglobin A1C goal for an older adult with multiple co-existing chronic illnesses or mild to moderate cognitive impairment would be:
- a. < 6%
- b. < 7%
- c. < 8%
- d. < 10%

Hypertension

13. Which of the following is an example of target organ damage?
- a. Left ventricular hypertrophy
- b. Retinopathy
- c. Renal failure
- d. All of the above

14. Which is the appropriate tool for assessing an individual's risk for developing cardiovascular disease?
- a. Framingham Risk Calculation
- b. Total cholesterol / HDL ratio
- c. BMI calculator
- d. GFR calculator

15. What do the JNC-VIII guidelines recognize as an appropriate blood pressure control target goal in the older adult?
- a. < 150/90
- b. < 140/90
- c. < 130/80
- d. No goal

Cognition

16. What are the three most significant cognitive disorders occurring in older adults?
- a. Depression, dementia, delirium
- b. Bipolar disorder, depression, delirium
- c. Schizophrenia, dementia, depression
- d. Anxiety, dementia, delirium

Cognition Continued

17. Identify two screening tools that may be used to screen for depression or cognitive impairment:
- a. Frailty index and VES-13
- b. Mini-cog and GDS-15
- c. MMSE and ADLs
- d. None of the above

18. An 80-year-old woman comes to your office for initial evaluation. She is accompanied by her daughter, who is concerned about the patient's memory. During the past year she has been repeating questions and statements; about 6 months ago she began to have infrequent problems "getting her words out." She is sometimes sad when talking about deceased relatives. The patient lives alone and does most of her own IADLs. She completed the 10th grade. Her Mini-Mental State Examination (MMSE) score is 26/30, with two errors in orientation and two in short-term recall. Physical exam and laboratory testing is normal. Which of the following is the most likely diagnosis?
- a. Normal aging
- b. Mild cognitive impairment
- c. Major depression
- d. Delirium
- e. Alzheimer's disease

Falls

19. Which of the following is considered the best predictor of falls?
- a. Previous fall
- b. Postural hypotension/dizziness
- c. Poor-fitting footwear
- d. Polypharmacy

20. Which assessments are important when completing a falls evaluation?
- a. Medication review
- b. Skin changes
- c. Orthostatic blood pressure
- d. Both a and c

21. Which members of the multidisciplinary team may initiate a functional and environmental assessment?
- a. Nurse
- b. Social Worker
- c. PT or OT
- d. NP, PA or MD
- e. All of the above

Frailty

22. Which of the following statements is true regarding frailty?
- a. It is a chronic progressive condition that increases the older adult's vulnerability to adverse outcomes
- b. It is an acute syndrome of sudden onset that often results in death
- c. An approach with one discipline is best when treating frailty
- d. Older adults with frailty often report that they have gained weight

23. Criteria for frailty includes which of the following?
- a. Advanced age
- b. Fatigue
- c. Poor sleeping pattern
- d. None of the above

Frailty Continued

24. Which weight loss indicator is a red flag for frailty?
- a. Unintentional weight loss of greater than 10 pounds in the past year.
- b. Intentional weight loss of greater than 20 pounds in the past year.
- c. Unintentional weight loss of greater than 5 pounds in the past 6 months.
- d. There is no weight loss indicator for frailty

Medications & Polypharmacy

25. This term refers to a situation when a provider prescribes a medication to treat a side-effect of another.
- a. Polypharmacy
- b. Prescribing Cascade
- c. Transcription
- d. Deprescribing

26. Which of the following tools provides a list of medications that may be deemed potentially inappropriate if used for an older adult?
- a. Medication Appropriateness Index
- b. STOPP-START
- c. Beers Criteria
- d. Medication Tool

27. As it relates to medication management, which of the following organ systems is most affected by aging?
- a. Renal
- b. Hepatic
- c. Cardiovascular
- d. Endocrine

Using the 5-point scale provided, please indicate the extent to which you agree with the following statements by circling the appropriate responses.	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
1. Patients/clients receiving interprofessional care are more likely than others to be treated as whole persons.	1	2	3	4	5
2. Developing an interprofessional patient/client care plan is excessively time consuming.	1	2	3	4	5
3. The give and take among team members helps them make better patient/client care decisions.	1	2	3	4	5
4. The interprofessional approach makes the delivery of care more efficient.	1	2	3	4	5
5. Developing a patient/client care plan with other team members avoids errors in delivering care.	1	2	3	4	5
6. Working in an interprofessional manner unnecessarily complicates things most of the time.	1	2	3	4	5
7. Working in an interprofessional environment keeps most health professionals enthusiastic and interested in their jobs.	1	2	3	4	5
8. The interprofessional approach improves the quality of care to patients/clients.	1	2	3	4	5
9. In most instances, the time required for interprofessional consultations could be better spent in other ways.	1	2	3	4	5
10. Health professionals working as teams are more responsive than others to the emotional and financial needs of patients/clients.	1	2	3	4	5
11. The interprofessional approach permits health professionals to meet the needs of family caregivers as well as patients.	1	2	3	4	5
12. Having to report observations to a team helps team members better understand the work of other health professionals.	1	2	3	4	5
13. Hospital patients who receive interprofessional team care are better prepared for discharge than other patients.	1	2	3	4	5
14. Team meetings foster communication among team members from different professions or disciplines.	1	2	3	4	5

End of survey. Thank you for your participation!

Clinic Recording Script

Date: _____

Site:
□ A
□ B
□ C
□ D
□ E

Topic Discussion: _____
Client ID: _____

Student IDs: 1. _____ 3. _____

2. _____ 4. _____

Recording ID: _____

Determining Successful Factors in Interprofessional Practice with Dynamic Teams

STUDENT CLINIC SURVEY

NAME _____

V NUMBER _____

DATE _____

Dear Student:

You are invited to complete this survey involving research entitled, **"Determining Successful Factors in Interprofessional Practice with Dynamic Teams"** conducted by investigators in the VCU School of Nursing, Pharmacy, Medicine. The survey consists of questions about your perceptions toward team interaction and your experience during each client session. If you choose to participate, we will ask that you complete a brief survey after the client session. The results of this survey will help to provide information about your views about interprofessional education and teamwork and will help with curriculum design.

It is estimated that the survey will **take less than 15 minutes to complete**. **Completing the survey is completely voluntary and will not affect your course grade**. Your answers to the survey will remain confidential. No compensation will be provided for participation and the risk associated with this study is no greater than everyday life. If you feel uncomfortable answering a survey question, you may choose to not answer that question. If you wish to stop your participation in this research study, you may stop the survey at any time. Please completely circle your response.

If you have any questions about the study, want additional information, or wish to receive results of the study, please contact the primary researcher, Dr. Krista Donohoe, conducting this study. You may keep this survey cover letter for your information. If you choose to participate in this study, please proceed to the next page to begin the survey. Thank you for your time and participation!

If you have questions about the survey, please contact:

Krista Donohoe, Pharm.D., BCPS, BCGP
Assistant Professor
Department of Pharmacotherapy and Outcomes Sciene
Virginia Commonwealth University
410 N. 12th Street, Rm 656A, Box 980533
Richmond, VA 23298-0533
(804)628-4551 FAX 828-0343
kldonohoe@vcu.edu

If you have any questions about your rights as a participant in this study, you may contact:

Office for Research, VCU
800 East Leigh Street
P.O. Box 980568
Richmond, VA 23298
Telephone: 804-827-2157

Please return completed survey to the survey administrator.

Based on your **OVERALL** experience with your team during the Health Mentor's Program, please estimate **HOW OFTEN** the following events occurred using the scale: 0=None of the time; 3=Some of the time; 6=All of the time.		None of the time			Some of the time			All of the time
1 .	All team members made an effort to participate in discussions.	0	1	2	3	4	5	6
2.	When team members had different opinions, each member explained his/her point of view.	0	1	2	3	4	5	6
3.	Team members encouraged one another to express their opinions and thoughts.	0	1	2	3	4	5	6
4.	Team members shared and received criticism without making it personal.	0	1	2	3	4	5	6
5.	Different points of view were respected by team members.	0	1	2	3	4	5	6
6.	Often members helped a fellow team member to be understood by paraphrasing what he/she was saying.	0	1	2	3	4	5	6
7.	My team used several techniques for problem solving (such as brainstorming) with each team member presenting his/her best ideas.	0	1	2	3	4	5	6
8.	Team members worked to come up with solutions that satisfied all members.	0	1	2	3	4	5	6
9.	All team members consistently paid attention during group discussions.	0	1	2	3	4	5	6
10.	My team actively elicited multiple points of view before deciding on a final answer.	0	1	2	3	4	5	6
11.	Team members listened to each other when someone expressed a concern about individual or team performance.	0	1	2	3	4	5	6
12.	Team members willingly participated in all relevant aspects of the team.	0	1	2	3	4	5	6
13.	Team members resolved differences of opinion by openly speaking their mind.	0	1	2	3	4	5	6
14.	Team members used feedback about individual or team performance to help the team be more effective.	0	1	2	3	4	5	6
15.	Team members seemed attentive to what other team members were saying when they spoke.	0	1	2	3	4	5	6
16.	My team resolved many conflicts by compromising between team members, with each one giving in a little.	0	1	2	3	4	5	6
17.	Members who had different opinions explained their point of view to the team.	0	1	2	3	4	5	6
18.	Team members were recognized when something they said helped the team reach a good decision.	0	1	2	3	4	5	6

Please Proceed to Page 2

Prior Experience	
Health care experience prior to starting in your program (RHWP):	A. None B. Small amount (some shadowing, volunteer work) C. Some (paid, short-term position) D. A lot (long-term, paid position) E. Prior career in healthcare
Interprofessional teamwork experience (included student or clinicians) prior to participating into the program (RHWP):	E. Never F. Once or twice G. Several times H. Many times
Program/degree of study:	A. BSN B. APRN-FM/AG C. APRN- Psychiatry D. Pharmacy E. Social Work F. Medicine G. Dentistry H. Gerontology I. Psychology J. Other _____
Richmond Health and Wellness Program experience: How many times this semester have you participated in a half-day of clinic?	_____ (# of half-day clinics attended)
Clinic time:	A. Morning B. Afternoon
Number of patient encounter in half-day of clinic:	A. First B. Second C. Third D. Fourth

End of survey. Thank you for your participation!

Determining Successful Factors in Interprofessional Practice with Dynamic Teams

CLINIC CLIENT SURVEY

NAME _____

DATE _____

ID# _____
T ID# ____

This questionnaire contains items that are related to your visits with the **Richmond Health and Wellness Program**. Providers have different styles in dealing with their clients, and we would like to know more about how you have felt about your encounters with the student-provider teams. Your responses are confidential. Please be honest and candid.

Directions: Please indicate your feelings about each statement on a scale of 1 to 4 (with 1 indicating strong disagreement, and 4 indicating strong agreement). Circle your choice.

1. The team understood my concern.			
1	**2**	**3**	**4**
strongly disagree	disagree	agree	strongly agree

2. The team discussed my concerns with me and developed a plan about how to address them.			
1	**2**	**3**	**4**
strongly disagree	disagree	agree	strongly agree

3. The team worked well together during the clinic visit.			
1	**2**	**3**	**4**
strongly disagree	disagree	agree	strongly agree

ID# _____
T ID# ____

4. The team communicated clearly to me during the clinic visit.			
1	**2**	**3**	**4**
strongly disagree	disagree	agree	strongly agree

5. I feel satisfied with the visit.			
1	**2**	**3**	**4**
strongly disagree	disagree	agree	strongly agree

ID# _____
T ID# ____

ADMINISTRATIVE USE ONLY

Client ID:

Recording ID:

Self-administered: Yes No

From RHWP Records:

Year of Birth:

Gender:

Insurance: Medicaid Medicare Dual Private Other

Years of Education:

Race/Ethnicity: Black White Asian Hispanic Other

Date of first RHWP visit:

Total wellness visits to date:

Ever had behavioral health visit at RHWP? Yes No

Self-reported diagnosis:

Alzheimer's disease or problems with your memory
Ankle/leg swelling
Arthritis
Asthma
COPD
Cancer
CAD / Heart disease
MI / heart attack (year)
High blood pressure/hypertension
High cholesterol
Stroke
Schizophrenia/Bipolar
Depression
Diabetes/high blood sugar
Seizures
Visual impairment: Glaucoma/Cataract
Loss of feeling/numbness burning in legs/feet
Osteoporosis
Parkinson's disease
Sciatica or chronic back pain
Diarrhea
GERD
Constipation
Urinary incontinence
Inflammatory Bowel
Thyroid problems
Weight loss > 10 lb in last year (intentional)
Headaches / Migraines
Insomnia
Kidney impairment
Hearing Impairment
Other:_____

Team Care Plan Evaluation by RHWP Faculty **T ID# ____**

A. Assessment (diagnosis; differential): Missing ☐

	Fully	Partially	Unacceptable
1- Prioritized (displayed in order of importance; signs, symptoms, test, procedures organized properly, includes care plan)	☐	☐ Explain:	☐ Explain:
2- Sufficient information (enough information for purpose; includes pertinent details)	☐	☐ Explain:	☐ Explain:
3- Clear (understandable to provider and other)	☐	☐ Explain:	☐ Explain:
4- Concise (focused, brief, not redundant)	☐	☐ Explain:	☐ Explain:

B. Plan of care (with goals and objectives): Missing ☐

	Fully	Partially	Unacceptable
1- Prioritized (displayed in order of importance; signs, symptoms, test, procedures organized properly, includes care plan)	☐	☐ Explain:	☐ Explain:
2- Sufficient information (enough information for purpose; includes pertinent details)	☐	☐ Explain:	☐ Explain:
3- Clear (understandable to provider and other)	☐	☐ Explain:	☐ Explain:
4- Concise (focused, brief, not redundant)	☐	☐ Explain:	☐ Explain:

T ID# ____

C. **Follow-up information (instructions for the patient; consults; orders; prescriptions):** Missing ☐

1- Prioritized (displayed in order of importance)	Fully	Partially	Unacceptable
	☐	☐ Explain:	☐ Explain:
2- Sufficient information (enough information for purpose; includes pertinent details)	☐	☐ Explain:	☐ Explain:
3- Clear (understandable to provider and other)	☐	☐ Explain:	☐ Explain:
4- Concise (focused, brief, not redundant)	☐	☐ Explain	☐ Explain:

Filled by:_____

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