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Exploring Predictors of Teamwork Performance in an Interprofessional Education Setting

A thesis submitted in partial fulfilment of the requirements for the degree of Master of Science at
Virginia Commonwealth University

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List of Abbreviations

ACPE:	Accreditation Council for Pharmacy Education
CIHC:	Canadian Interprofessional Health Collaborative
CINAHL:	Cumulative Index of Nursing and Allied Health Literature
IEPS:	Interdisciplinary Education Perception Scale
IP:	Interprofessional
IPE:	Interprofessional Education
IPECEP:	Interprofessional Education Collaborative Expert Panel
IPEPI:	Interprofessional Education and Practice Inventory
IPHC:	Interprofessional Health Care
IPQIPS:	Interprofessional Quality Improvement and Patient Safety
IPSR:	Interprofessional Self Reflection
IOM:	Institute of Medicine
IQR:	Inter Quartile Range
SD:	Standard Deviation
SPCQ:	Statistical Process Control Quiz
TAI:	Team-Assessment Inventory
TDM:	Team Development Measure
TOSCE:	Team Objective Structured Clinical Encounter

VCU: Virginia Commonwealth University

VCU IPE Center: VCU Centre for Interprofessional Education and Collaborative Care

WHO: World Health Organization

Abstract

EXPLORING PREDICTORS OF TEAMWORK PERFORMANCE IN AN INTERPROFESSIONAL EDUCATION SETTING

By Danah M. Alsane, MS.

A thesis submitted in partial fulfillment of the requirements for the degree of Master of
Pharmaceutical Science at Virginia Commonwealth University

Virginia Commonwealth University, 2016

Advisor: Patricia Slattum, Pharm.D., Ph.D.
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Objectives: The primary objective of this study was to explain how individual characteristics influence teamwork development. In addition, it evaluated how teamwork development, in conjunction with content knowledge, impact students' performance on a team-based project in an Interprofessional Quality Improvement and Patient Safety (IPQIPS) course.

Methods: This cross sectional study included medical, pharmacy, and nursing students enrolled in an IPQIPS course offered for the first time at VCU. Predictors of teamwork development examined included collective orientation (measured using the Collective Orientation Scale, which included dominance and affiliation subscales), and prior interprofessional teamwork experience (measured using self-report). The Team Development Measure (TDM) was used to measure teamwork development. The Statistical Process Control Quiz (SPCQ) was used to assess content knowledge acquired during the course. The final project score was used to evaluate students' performance on a team-based project. Structural equation modeling was used to test study hypotheses.

Results: Among the proposed predictors (dominance, affiliation, and interprofessional teamwork experience), only dominance was related to TDM. No significant relationship was found between teamwork development combined with content knowledge and successful accomplishment of team-based project.

Conclusion: This study was the first to our knowledge to simultaneously assess the impact of individual characteristics on teamwork development, and how teamwork development (combined with individual student knowledge) influences students' performance on team-based project in an interprofessional education setting. Although findings were not conclusive, several potential avenues for future study are highlighted.

Chapter 1: Introduction

Section 1.1 Background

In recent years, the health care system has been redesigned in order to improve the quality of health care and reduce medical cost and error. There are many factors that challenge the upgrading of the health care system, these factors include: an aging population, increased prevalence of chronic diseases, patient safety concerns, lack of health promotion and disease prevention, increased work load for health professionals, abundance of subspecialties, and technological improvements (Buring et al., 2009). Delivery of complex health care requires teamwork and collaborative practice (J. Thistlethwaite, 2012). The Institute of Medicine (IOM) 2001 report “CROSSING THE QUALITY CHASM,” discusses the rationale behind restructuring the health care system in order to improve patient safety and quality of health care and to achieve patient centered and evidence-based practice. The report highlights the important factors that could help improve the quality of the health care delivery system. One important factor that could help improve the quality of health care is collaborative practice (Institute of Medicine, 2001). The Canadian Interprofessional Health Collaborative (CIHC) defines collaborative practice as “partnership between a team of health providers and clients in participatory collaborative and coordinate approaches to share decision-making around health and social issues.” (Canadian Interprofessional Health Collaborative, 2010). Since health education is connected to the health professional system, health profession educators have

recognized the importance of incorporating interprofessional education (IPE) in the health education curriculum (Schmitt, Blue, Aschenbrener, & Viggiano, 2011).

IPE Definitions and Competencies

According to the World Health Organization (WHO), IPE occurs “when students from two or more professions learn about, from and with each other to enable effective collaboration and improve health outcomes” (WHO, 2010). The United Kingdom’s Centre focusing on the advancement of interprofessional education defines IPE as it occurs “when two or more professions learn with, from and about each other to improve collaboration and the quality of care.” (“CAIPE | Resources › Defining IPE,” n.d.). The Accreditation Council for Pharmacy Education (ACPE) in the United State requires all the school and colleges of pharmacy to implement the IPE into their curriculum. Based on 2016 ACPE standards, all pharmacy graduates should be capable of delivering patient center care as a member of the interprofessional team practice as described in Standard 11 (Accreditation Council for Pharmacy Education, 2015).

The core competencies for IPE and collaborative practice were developed in the United States by health profession and higher education experts, based on linkage between CIHC and WHO of interprofessional competency framework and IOM core competencies for all the health professions (J. E. Thistlethwaite et al., 2014). The Interprofessional Education Collaborative Expert Panel (IPECEP) identifies the four IPE competencies as value and ethics for interprofessional practice, roles and responsibilities, interprofessional communication, and teams and teamwork (Schmitt et al., 2011). These competencies act as guides for health profession educators to design IPE curricula with appropriate activity and assessment that best achieve IPE competencies (J. E. Thistlethwaite et al., 2014).

Interprofessional education is an approach that helps prepare health profession students for collaborative, evidence based, and patient centered practice (Buring et al., 2009; J. Thistlethwaite, 2012). The main advantages of IPE over a single profession education program are that it provides an opportunity for health profession students to work in an interprofessional team, where they share their knowledge, expertise, and build teamwork skills. In addition, IPE helps improve communication skills, facilitate student learning and training, improve quality of health care, and improve professional attitudes (Feature, 2005; J. Thistlethwaite, 2012).

Teams and Teamwork

A team is a group of individuals working together to achieve specific goals. In the health care environment, teams are composed from either uni- or multidiscipline professions. The roles and responsibilities of members within and between teams vary depending on the team mission (WHO, 2011). Thus flexibility and adaptability are the main components of effective team performance. In order to establish an effective or successful health care team, team members should share common goals, define measurable goals, establish effective leadership, communicate effectively, and show good cohesion and mutual respect. In addition, effective team performance requires sharing of knowledge, skills and attitude. Involving patients as members of health care teams helps achieve patient centered practice and improve the safety and quality of the health care system (Baker, Day, & Salas, 2006; Clements, Dault, & Priest, 2007).

As mentioned earlier, teamwork is one of the essential components of current health care systems. Teamwork helps improve the quality of health care, reduce medical error, and reduce cost. Recent implementation of collaborative practice and effective teamwork addresses complex issues, thus it can improve the quality, safety, and reduces the medical cost and error. Assessing team performance is a fundamental step to improve team performance. Different approaches

have been developed to assess individual performance within a team as well as overall team performance (Baker et al., 2006; Clements et al., 2007).

Quality Improvement and Collaborative Practice

As mentioned earlier, the current health care system is complicated, and the delivery of complex health care requires teamwork and collaborative practice. One of the complex issues, as described earlier, is patient safety and quality improvement (J. Thistlethwaite, 2012). In IOM 1999 report “To ER is Human: Building a Safer Health System,” they recognize the importance of patient safety and quality improvement. There are various recommendations from IOM that could help improve the quality of health care and achieve safer health care systems (Kohn, Corrigan, & Molla, 1999). In 2001 the IOM published another report which highlighted the importance of collaborative practice in improving the quality of health care and patient safety (Institute of Medicine, 2001). A follow up report by IOM 2003 “Health Professions Education: A Bridge to Quality,” identifies five important competencies that should be taken into consideration while educating health profession students. These competencies can be summarized as follows: health professions students are capable of work in interdisciplinary teams, provide evidence based and patient centered practice, apply quality improvement knowledge and skills, and properly use available technology to provide optimal patient care (Blair, 2002).

Quality improvement and patient safety is a complex issue which requires teamwork and collaborative practice to achieve it. In terms of health profession education, quality improvement and patient safety can be better addressed by IPE. As a result, health professions educators in Virginia Commonwealth University (VCU) decided to offer an Interprofessional Quality Improvement and Patient Safety (IPQIPS) course to medical, pharmacy and nursing students.

The IPQIPS is a new course that was first offered in the spring semester of 2016. It was a one-credit pass or fail course, that developed by the VCU Centre for Interprofessional Education and Collaborative Care (VCU IPE Center). During this course, students worked in multidisciplinary teams to apply what they learned during the course and to solve various assignments that related to patient safety and quality improvement. In addition, students were asked to evaluate the team skills and contributions of their teammates.

Section 1.2 Objectives

The main objectives of this project were to explore how individual characteristics affect teamwork development, and to assess the relationship between teamwork development and team performance in an IPE course.

Section 1.3 Significance

The results of this study contribute to the body of literature on IPE by extending the study of the role of teamwork from a clinical setting to a didactic one. The healthcare literature highlights the important factors that influence teamwork development and, ultimately, team performance. These factors can be grouped under three main categories: individual, group and organizational characteristics (Baker et al., 2006; Clements et al., 2007). In the literature specific to health professional education, there are fewer studies examining factors which influence teamwork development, particularly in an IPE context. The current study focuses on exploring how individual characteristics influence teamwork development, and how teamwork development impacts the overall team performance. The results of this study will help to adapt IPE delivery to ensure that students with a range of individual characteristics are able to develop teams that will achieve course and program outcomes.

This study occurred in a didactic IPE setting where all the data was collected using individual level measures and the outcome of interest was collected using a team-based project. This use of individual level data to predict group level outcomes is a relatively novel analytical approach that has rarely been examined in prior IPE literature. This represents an important area

of study because the ability to predict group outcomes from individual characteristics may offer a less resource-intensive way to study teamwork development.

Chapter 2: Literature Review

This chapter is composed of two parts. The first part highlights current strategies used to evaluate teamwork development in IPE settings. In addition, it identifies predictors that contribute to better teamwork development. The second part summarizes the availability of a suitable instruments used to assess teamwork development. It also reviews the availability of instruments used to measure collective orientation.

Section 2.1: Literature Review Part One

Objective

The objectives of this part of the literature review are to:

- identify studies that evaluate teamwork development in IPE settings.
- identify studies that assess predictors of better teamwork development in IPE settings.
- identify studies that measure the relationship between teamwork development and team performance.
- identify instruments that have been used to measure teamwork development and predictors of teamwork in IPE settings.

- identify gaps in literature to design a new study that measures the relationship between teamwork development and task accomplishment, taking into consideration factors associated with better teamwork development.

Search Methodology

Two databases capturing a large amount of health professional education literature, PubMed/MEDLINE and Cumulative Index of Nursing and Allied Health Literature (CINAHL), were searched using a combination of MeSH terms or subheadings and keywords. Search terms were summarized in Table 2.1. The literature review was conducted on April 1st 2016. Titles, abstracts and relevant references were screened using predefined inclusion and exclusion criteria to identify studies that met the literature review objectives.

Inclusion criteria:

- studies published in English.
- studies evaluated teamwork development in IPE settings.
- studies identified predictors of teamwork in IPE settings.

Exclusion criteria:

- studies focused solely on assessing perception of collaboration.
- studies evaluated teamwork development in clinical care settings rather than educational settings.
- studies evaluated IPE and collaborative practice competencies in general.
- studies evaluated teamwork development among a single profession/discipline.
- studies focused mainly on evaluating the psychometric properties of the research instrument used.
- studies focused primarily on describing the curriculum.

Table 2.1 Literature review search terms using PubMed/MEDLINE and CINAHL databases.

Data base	Search terms
PubMed/MEDLINE	("Interprofessional Relations"[Mesh]) AND ("Education, Professional"[Mesh]) OR "interprofessional education" OR "interprofessional curriculum" OR "interprofessional learning" OR "interdisciplinary education" AND ("Program Evaluation"[Mesh]) OR assessment OR evaluation AND ("Cooperative Behavior"[Mesh]) OR "collaborative practice" OR collaboration OR teamwork AND ("Data Collection"[Mesh]) OR "data collection" OR measure* OR tool*
CINAHL	(MH "Interprofessional Relations/ED") OR "interprofessional education" OR "interdisciplinary education" AND (MH "Program Evaluation/ED" OR assessment OR evaluation AND (MH "Cooperative Behavior/ED") OR collaboration OR "collaborative practice" OR "interprofessional collaboration" OR teamwork AND (MH "Data Collection/ED") OR "data collection" OR measure* OR tool*

Results of Search

The original search that combined both databases produced 514 articles. After applying inclusion and exclusion criteria and removing duplicates, 40 articles remained for full review. Of those 40 articles, 7 articles were selected to be discussed in the literature review as they matched inclusion criteria, and were more relevant to the literature review objectives. A summary of the 7 articles is provided in Table 2.2.

Table 2.2 Literature review summary

Study	Objective and study design	Setting, sample size, profession involved	Identify predictors of teamwork	Identify approach to evaluate teamwork development	Identify IPE activity evaluation tool	Main statistical analysis	Results
(Blue, - Kern, Shrader, & Zoller, 2013)	<ul style="list-style-type: none"> - Determined the influence of teamwork performance and positive teamwork attitude on clinical outcome -Quantitative survey study 	<ul style="list-style-type: none"> -Experiential IPE module using simulated patient -N= 120; n for medicine= 25; n for pharmacy = 76; n for physician assistant= 19 	<ul style="list-style-type: none"> -Used Interdisciplinary Education Perception Scale (IEPS) to assess student perception toward teamwork 	<ul style="list-style-type: none"> -Used modified version of TeamSTEPPS, team performance observation tool to rate teamwork performance using video recording of simulated rounding experience -Rating was done by two trained blinded faculty after watching video record of IPE activity 	<ul style="list-style-type: none"> -Used clinical outcome checklist developed by expert faculty using modified Delphi technique -Team grading was conducted by a pair of faculty from different disciplines 	<ul style="list-style-type: none"> - Regression analyses - Dependent variable: clinical outcome score - Independent variables: IPES and teamwork score -The study analysis was carried out on the team level 	<ul style="list-style-type: none"> -Teamwork score was a significant predictor of clinical outcome ($p<0.001$), while IPES was not a significant predictor of clinical outcome ($p=0.054$)

(Lie et al., 2015)	<p>-Assessed the feasibility of using newly developed behavioral anchors with adapted tool to measure both individual and teamwork performance</p> <p>-Identified ability of faculty to use such tool to differentiate between various levels of individual and teamwork performance</p> <p>-Exploratory study</p>	<p>-Experiential IPE module using simulated patient</p> <p>-N= 16 faculty (dentistry, medicine, occupational therapy, pharmacy and physician assistant)</p>	No	<p>-Used modified McMaster-Ottawa Team Observed Structured Clinical Encounter (TOSCE) scale to assess individual and teamwork performance</p> <p>-Faculty were trained to use the tool, blinded to study objective and student performance level and never experienced teamwork performance rating in IPE setting</p> <p>-Students were trained to perform in different individual and</p>	No	<p>-Descriptive analysis was performed to determine ability of faculty to differentiate between various performance levels among individual students and teams of students</p> <p>-A generalizability study was conducted to identify source of score variation (faculty error vs. other source of error)</p>	<p>-Faculty expressed the feasibility of modified tool to rate teamwork performance</p> <p>-There was variation in faculty rating accuracy: 50-100% for teams 38-81% for individual</p> <p>-Rating error occurred in individual performance in the direction of over-rating</p>
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				teamwork performance levels -Faculty administered post survey to evaluate tool feasibility			
(Ekmekci , Plack, Lelacheu r, Lewis, & Schlumpf , 2015)	-Determined key factors that influence learning and performance of interprofession al health care (IPHC) team -Three phase study: 1-Delphi method 2- Survey development 3- Test of survey using mixed method approach	-Phase 1 &2: N= 25 Delphi participants: physical therapy (10 , medicine (5), nursing (5), physician assistant (2), pharmacology (1), dentistry (1) and management (1) -Phase 3: N = 27 students: medicine (7) nursing (8) physician assistant (4) and physical therapy (8)	-Two rounds Delphi processes were conducted to identify factors that influenced IPHC team learning and performance	-An online survey was created, the Interprofession al Education and Practice Inventory (IPEPI), based on Delphi process identified factors - Multiple teams of Students were asked to rate their team performance using the developed survey, after participating in the simulated	None	-Phase 1 & 2: Data was coded and analyzed by researcher to determine common factors -Delphi participants ranked the importance of factors -Phase 3: Cronbach's alpha was used to evaluate internal validity	-The developed tool can assess key factors that influence team learning and performance at individual, group, organizational and task levels -Proper communicatio n and trust play a huge role in team performance -Lowest Cronbach's alpha = 0.84 , all other alphas >0.9

		-Test of survey occurred in experiential IPE module using simulated patient		rounding experience - Students were participated in focus group to evaluate the developed survey		-Exploratory factor analysis was used to evaluate internal consistency -Qualitative analysis was used to evaluate external validity and transferability of results	
(Ekmekci et al., 2013)	-Examined the effect of IPE experience that used executive coaching and simulation on interprofessional teamwork development -Mixed method approach	-N= 12 students divided into 3 teams; each team consisted of students from physician, physician assistant, nursing and physical therapist classes -IPE Experiential module using	None	-Used Team Assessment Inventory (TAI) to assess team performance -TAI was administered pre-post each simulation activity by students, observer faculty, standardized patient and	-As part of program evaluation, students were asked to provide a reflective essay, and to join in a focus group session	-A t-test was conducted to assess difference in pre-post TAI score -Qualitative method was performed to analyze focus group and reflective essay data	-There was significant increase in TAI post score compared to pre score ($p<0.05$) -Three major themes appeared: 1-helpful aspect of process 2-better understanding of their own and others'

		3 simulation scenario was implemented		executive coach			professional role 3-better understanding of leadership meaning in the context of interprofessional teams
(Dobson et al., 2009)	<ul style="list-style-type: none"> -Development and evaluation of quality improvement activity in IPE setting -Quantitative study 	<ul style="list-style-type: none"> -IPE didactic module occurred in two separate courses (fall, winter) -N for fall= 121 students; pharmacy (45), nursing (46) and physical therapy (30) -N for winter= 102 students; pharmacy (37) nursing (39) and nutrition (26) 	None	<ul style="list-style-type: none"> -Used McMaster tool to evaluate teamwork performance -Students were asked to administer survey after completion of group assignments -In addition, they completed a pre-post Interprofessional Self Reflection (IPSR) survey to evaluate change in their attitude toward interprofession 	<ul style="list-style-type: none"> -Three course assignments (2 individual and 1 group) were used to assess students' understanding and application of quality improvement competencies -Assignment grading was done by quality improvement experts 	<ul style="list-style-type: none"> -Wilcoxon signed-rank test was used to evaluate change in student attitude (pre-post IPSR) -Kruskal-Wallis and Bonferonni's tests were used to assess change in group process across different groups (McMaster survey) 	<ul style="list-style-type: none"> -N for students who complete pre-post IPSR survey = 134 N for students who complete McMaster tool = 132 -Overall, there was significant improvement in student attitude toward interprofessional team (p-value was significant for 12 out of 16 items) -There were no significant differences in

				al team after exposed to QI activity			<p>group evaluation score</p> <p>-Students were satisfied with their experience as reflected by group evaluation tool</p> <p>-Mark for both individual assignments = 85.6% and 80.8%</p> <p>-All groups passed the third assignment</p>
(Emmert & Cai, 2015)	<p>-Tested the ability of modified assessment tool to evaluate teamwork performance</p> <p>-Tested the effectiveness of IPE activity</p>	<p>-IPE Experiential module used standardized patient</p> <p>-N intervention = 24 students; dentistry (6), medicine (6),</p>	None	<p>-Used modified TOSCE tool to assess teamwork performance</p> <p>-Three raters were assigned to evaluate teamwork performance:</p>	None	<p>-Multiple ANOVA tests were conducted to evaluate:</p> <p>1-difference in teamwork score between intervention and control groups</p>	<p>-Overall, there were significant differences in teamwork score between the control and the intervention groups (p=0.0031)</p>

	<p>-Quasi-experimental pilot study</p>	<p>pharmacy (6) and P physical therapy (6)</p> <p>-N control =22 students; medicine (6), pharmacy (6) and physical therapy (10)</p> <p>-Intervention group had previous IPE exposure while control group never had any IPE exposure</p>		<p>Live, video and standardized patient caregiver</p>		<p>2-differencess in teamwork score between students' program within each group</p> <p>3-differncess in teamwork score between gender within each group</p> <p>-Cronbach's alpha, t-tests and Pearson correlation were conducted to evaluate reliability and validity of instrument</p>	<p>-There was no significant difference in teamwork score across different programs</p> <p>-There was no significant difference in teamwork score between male and female</p> <p>-Modified tool was reliable and valid since Cronbach's alpha =0.81 and the correlations between raters were significant (p-value ranged from 0.0001 to 0.0050)</p> <p>-IPE activity showed significant</p>
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							improvement in students' teamwork skill (p=0.0003)
(Rotz & Dueñas, 2016)	<p>-Explored factors that impact collaboration in IPE</p> <p>-Qualitative exploratory study</p>	<p>-IPE student-run-clinic N= 18 students</p> <p>Divided into 3 teams (6 students in each team)</p>	<p>-Students participated in three focus groups (Medical, Pharmacy and mixed) to report their experience in IPE courses</p> <p>-Focus group was audio-recorded and transcribed verbatim</p>	None	None	-Qualitative thematic analysis	<p>-Factors that facilitated collaboration: Showing mutual respect, understanding roles and responsibilities of other professions, using technology to facilitate communication, demonstrating teamwork and problem solving skills, adapting to change and sharing patient-centered goals</p>

Summary of Literature

This literature summary is divided into three sections that address our literature review objectives. The first section addresses the identified studies that evaluate teamwork development in IPE settings. The second section addresses the identified studies that evaluate predictors of teamwork. The last section addresses the identified studies that measure the relationship between teamwork development and program outcomes.

1- Identify studies that evaluate teamwork development in IPE settings.

Based on the literature results that were presented in Table 2.2, six studies were found to evaluate teamwork development in IPE settings (Blue et al., 2013; Lie et al., 2015; Ekmekci et al., 2015; Ekmekci et al., 2013; Dobson et al., 2009; Emmert & Cai, 2015). Different study designs were employed to evaluate teamwork development. Despite variation in the study design, survey was the most common instrument used to evaluate teamwork development. Most of the instrument that have been used to assess teamwork development were either observational tools or self-assessment instruments. The majority of the identified studies showed that assessment of teamwork development occurring in experiential IPE settings using simulated patient approaches (Blue et al., 2013; Lie et al., 2015; Ekmekci et al., 2015; Ekmekci et al., 2013; Emmert & Cai, 2015). Only one study evaluated teamwork development in a didactic IPE setting (Dobson et al., 2009). Assessment of teamwork development was done by either faculty or students. Evaluation of teamwork development was done by faculty using direct observation tools as shown by some of the identified studies (Blue et al., 2013; Lie et al., 2015; Emmert & Cai, 2015). Other studies evaluated teamwork development by asking students to complete a post or pre-post survey (Ekmekci et al., 2015; Dobson et al., 2009). In addition, some studies evaluated teamwork development by both students and faculty (Ekmekci et al., 2013). Different

instruments were used to evaluate teamwork development. None of these studies used the same instruments. The majority of these instruments were adapted and modified to suit various course settings. The psychometric properties (such as reliability and validity) of the modified instruments were tested and the results were favorable.

2- Identify the study that assessed predictors of teamwork in IPE settings.

According to the literature review results in Table 2.2, three studies revealed factors which were associated with better teamwork development (Blue et al., 2013; Ekmekci et al., 2015; Rotz & Dueñas, 2016) . A study by (Rotz & Dueñas, 2016) used the focus group approach to explore factors associated with better teamwork. In addition, a study by (Ekmekci et al., 2015) used a Delphi process to develop tools that can measure predictors of better teamwork. Common factors across both studies include: 1) proper communication, 2) understanding the role and responsibilities of other professions, 3) working in a safe and trustful environment, 4) sharing the same goals, 5) exhibiting problem solving and leadership skills, and 6) flexibility to changing situations. In addition, a study by (Blue et al., 2013) assumes that a positive attitude toward teamwork, as measured by IEPS, was associated with better teamwork development.

3- Identify studies that reported IPE activity evaluation tools.

Based on the results presented in Table 2.2, three of the identified studies reported IPE course evaluation approaches (Blue et al., 2013; Ekmekci et al., 2013; Dobson et al., 2009). Only one study measured the effect of teamwork development on clinical outcomes (Blue et al., 2013). The results of this study were significant, which supports the hypothesis that better teamwork development predicts better clinical outcomes in that course. Clinical outcomes were evaluated by faculty using a checklist. Teamwork development was assessed by using a modified TeamSTEPPS tool (Blue et al., 2013).

In conclusion, these studies led to the development of a new study design to explore the relationship between teamwork development and team performance and to test the effect of certain predictors on teamwork development. To our knowledge, no standardized instrument has been used to measure teamwork development in IPE settings. The majority of the identified instruments that were used to evaluate teamwork development were suitable to IPE experiential settings. Only one instrument was used in the IPE didactic setting. None of the identified instruments that have been used to evaluate teamwork development were applicable to our research project. Examples of instruments and reasons for rejection are summarized in Table 2.3. None of the studies identified a suitable instrument that can be used to collect or measure predictors of teamwork. However, based on the identified factors, we conclude that collective orientation, defined as “propensity to work in a collective manner in team settings” (Driskell, Salas, & Hughes, 2010), has a significant impact on teamwork development. Only one study evaluated the effect of teamwork development (as measured by TeamSTEPPS) and positive attitude toward teamwork (as measured by IEPS) on clinical outcomes using a regression analysis model. The results of this study showed that higher TeamSTEPPS score was a significant predictor of clinical outcomes, while IEPS score was not a significant predictor of clinical outcome (Blue et al., 2013) .

Table 2.3 Teamwork evaluation instruments and reasons for their rejection

Instruments	Reasons for rejection
TeamSTEPPS (Blue et al., 2013)	-Observational tool not suitable for didactic IPE setting
TOSCE scale (Emmert, et al., 2015; Lie, et al., 2015)	

IPEPI (Ekmekci, et al., 2015)	-Not appropriate for a classroom setting (contained questions specific to organizational setting)
TAI (Ekmekci, et al., 2013)	(contained questions specific to leadership skills)
McMaster tool (Dobson, et al., 2009)	(mainly used to assess group characteristics)

Section 2.2: Literature Review Part Two

Two comprehensive literature reviews were conducted to evaluate the instruments that have been used to measure teamwork development and identify predictors of better teamwork. The objective for this search is to identify available questionnaires that have been used to measure team development, as well as collective orientation of individuals, and to adapt the most appropriate instruments for the proposed research project. The PubMed/MEDLINE database was screened using specific search terms:

- 1- “team development measure questionnaire” to evaluate tools that were used to measure team development.
- 2- “collective orientation” to identify tools that were used to measure collective orientation of individuals.

Choosing the best questionnaire was performed using our earlier specified criteria which possess the following standards:

- Items on questionnaires are specific to measure both teamwork development and collective orientation, and are applicable to didactic classroom setting.
- Questionnaires should be easy to administer and should contain less than 40 items.

Assuming that students will be administered two questionnaires and their participation in completing the questionnaires is voluntarily, instruments that are easy to complete and do not require too much time might increase the sample size.

- Questionnaires should be applicable to measure teamwork development of teams of five to seven individuals.
- Questionnaires should be self-administered by students.
- Questionnaires should be able to measure many aspects of teamwork development.
- Questionnaires should have evidence for reliability and validity of the measure.

The first search, for instruments to evaluate team development, yielded two reviews and one article (Valentine, Nembhard, & Edmondson, 2012; Havyer et al., 2015; Stock, Mahoney, & Carney, 2013). The reviews identified several instruments, however, none of these were found to be suitable for use in our study. Reasons for the rejection of each instrument are included in Table 2.4. The (Stock et al., 2013) discussed a tool, the Team Development Measure (TDM) questionnaire, which was found to meet our criteria and chosen for use in this study. The second search, for instruments to measure collective orientation, yielded one article that discussed the Collective Orientation Scale (Driskell et al., 2010). This scale was found to be suitable for our study requirements and was adapted as our measure for individual collective orientation.

Table 2.4 Other teamwork assessment instruments evaluated and reasons for their rejection

Instruments	Reasons for rejection
Psychological Safety and Team Learning (Edmonson, 1999)	- Teamwork development was a subcategory of the survey, not designed for independent use
Team Effectiveness Audit Tool (Bateman, Wilson, & Bingham, 2002)	- Evaluated subdomains of team effectiveness, but did not directly measure teamwork development itself
Team Process (L.Doolen, 2001)	- Designed for an organizational setting, contained questions not applicable to a classroom context - Long survey (more than 70 items)

Team Survey (Millward & Jeffries, 2001)	- The measure used to evaluate team development was very short (four questions) and did not capture the elements of teamwork development needed for this study.
Team Effectiveness (Pearce & Sims, 2002)	- Not appropriate for a classroom setting (contained questions specific to a corporate setting)
Cross-Functional Team Process (Alexander et al., n.d.)	- Not appropriate for a classroom setting (contained questions specific to a hospital setting)
Teamwork Quality Survey (Hoegl & Gemuenden, 2001)	- Not appropriate for a classroom setting (contained questions specific to a corporate setting)
Team Climate Inventory (Anderson & West, 1998)	- Not appropriate for a classroom setting (designed for larger teams within organizations)
Attitudes Toward Health Care Teams Collaborative Healthcare Interdisciplinary Relationship Planning Scale Group Growth Evaluation Form Interdisciplinary Education Perception Scale Interprofessional Attitudes Questionnaire Interprofessional Socialization and Valuing Scale Jefferson Scale of Attitudes Toward Physician–Nurse Collaboration Perceptions of Effective Interprofessional Teams Scale Readiness for Interprofessional Learning Scale Self-Assessment Form Scale of Attitudes Towards Physician–Pharmacist Collaboration Team Orientation and Behavior Inventory	- These instruments were mainly designed to assess perceptions or attitudes towards teamwork, and would not capture the information we needed about teamwork performance

Team Performance Scale Value of Teams Survey Weekly Team Inventory (Havyer et al., 2015)	
Team Knowledge Test TeamSTEPPS Knowledge Exam (Havyer et al., 2015)	- Designed to measure team knowledge, would not capture the desired information about teamwork development
Team Skills Checklist Video Rating Team Skills Scale (Havyer et al., 2015)	- Designed to evaluate team skills, would not capture the desired information about teamwork development

Team Development Measure (TDM)

The TDM helps measure the development of health care teams. Based on a study by (Stock et al., 2013) the TDM can be used to evaluate different sizes of teams ranging from 3 to 39 members from various health care disciplines. The TDM is a 31-item Likert scale survey which can be administered at any phase of team development. Each statement of the survey has four possible answers (strongly disagree, disagree, agree, and strongly agree). Each member of the team can complete the survey within 10 minutes. The survey targets four elements of team development: cohesion, communication, clarity of team roles, and clarity of team goals. The score on the TDM ranges from 0-100, and the higher the number, the better the teamwork development. In addition, the score is divided into 8 intervals with each interval representing the phase that corresponds to teamwork development (Stock et al., 2013).

The psychometric properties of the TDM were evaluated by testing the survey on

different team sizes and compositions, in various health care settings. Evaluation was conducted by performing exploratory factor analysis using Mplus (Los Angeles: Muthen & Muthen, 2001), followed by the Rasch rating scale measurement model (Stock et al., 2013). Results of the first test showed that the majority of TDM items target communication, followed by roles and goals clarity, then cohesion, and lastly the priority of the team (Stock et al., 2013; Team & Measure, 2010). The Rasch model helped to transform the ordinal response of the Likert scale into an interval score. Eight intervals of team development stages were identified with cohesion as primary elements in each stage of team development, followed by communication, then roles and goals clarity, and finally team priority (Stock et al., 2013).

TDM showed evidence for validity and reliability, as it was tested on different team sizes in various health care settings (Cronbach's $\alpha = 0.97$ and Rasch/IRT : person reliability = 0.96) (Stock et al., 2013).

A copy of TDM survey is attached in appendix A.

Collective Orientation Scale

A study by (Driskell et al., 2010) aimed to test the effect of collective orientation of team members on team performance. Collective orientation was assessed through the use of a Collective Orientation Scale, which was developed by the study authors in order to measure individual variances in collective orientation. The developed scale was specific to evaluate collective orientation factors which helped in predicting team interdependence and team task performance. The development procedure of that scale has undergone several steps in order to get the final version of Collective Orientation Scale. The approved Collective Orientation Scale

consists of 15-likert scale items which are divided into two main factors. The first factor, composed of 10 items, is used to measure affiliation and the second factor, composed of 5 items, evaluates dominance. Each statement has five possible answers: definitely agree, somewhat agree, no opinion, somewhat disagree and definitely disagree. A collectively oriented person is one who has a high affiliation score and a low dominance score (Driskell et al., 2010).

Regarding the psychometric properties of the scale, it displayed evidence for reliability based on Cronbach's alpha value which was equal to 0.85 for the overall Collective Orientation Scale, 0.85 for the affiliation subscale, and 0.75 for the dominance subscale. In addition, the scale presented evidence for validity as it has both convergent and discriminant validity. Convergent validity was determined by the positive relationship between Collective Orientation Scale and various other scales: Group Productiveness/Working Cooperativeness Scale (Group Productiveness/Working Together factor) and Social Interdependence Scale (Cooperative Interdependence factor), used to measure the same construct. In addition, discernment validity was established based on the negative relationship between the Collective Orientation Scale and other scales: Individualism-Collectivism Scale (Interdependence/Self-Reliance subscale) and Preference for Solitude Scale, intended to evaluate opposite construct. The predictive validity of the scale was tested by assessing the degree to which collective orientation predicts team performance on four types of tasks. Those tasks involve decision making, negotiating, executing and generating. Results were significant for decision making, negotiating and executing but not significant for generating. Thus, collective orientation can predict better team performance in tasks that require decision making, negotiating and executing skills (Driskell et al., 2010).

A copy of Collective Orientation Scale is attached in appendix B.

Section 2.3 Literature Review Conclusion

Two literature searches were conducted: 1) to assess the IPE literature for known predictors of teamwork development and current approaches used to evaluate teamwork development, 2) to identify suitable instruments for the evaluation of team development and collective orientation of individuals.

The first search yielded seven articles, six of which discuss strategies for the evaluation of teamwork development in IPE setting. Survey instruments were the most common tools used in this context. Furthermore, evaluation of teamwork development was found to occur primarily in experiential IPE settings. Three out of the seven articles assessed predictors of team performance. Based on the identified predictors, we theorized that most of the predictors can be conceptualized as aspects of collective orientation, which refers to the tendency of members of a team to cooperate with each other.

The second search found several instruments for the evaluation of teamwork development. Among the identified instruments, the Team Development Measure (TDM) survey was found to be the best suited to the requirements of our study. Our searches also identified an instrument, the Collective Orientation Scale, which we selected for use in measuring the collective orientation of individuals.

The current study will add to the body of IPE literature by using the TDM and the Collective Orientation Scale to assess teamwork development and collective orientation of individuals in didactic IPE setting. To our knowledge, it is also the first study to simultaneously assess predictors of teamwork, and to evaluate the effect of teamwork development on team performance.

Chapter 3: Specific Aim, Goals and Conceptual Framework

Section 3.1 Specific Aim and Hypotheses

Based on the literature review results, the main aim of this research is to test a model to explore how individual characteristics impact teamwork development and how teamwork development, in combination with content knowledge, influences team performance among teams of interprofessional students enrolled in the IPQIPS IPE course.

The two hypotheses that guided this research are:

- 1- Teams of interprofessional students who have (1) a higher affiliation score, (2) a lower dominance score, and (3) more experience working in interprofessional (IP) teams will have a higher score in TDM.
- 2- Teams with a higher score in TDM will be more successful in completing the final project, taking into consideration the moderation effect by course knowledge and skill as measured by the statistical process control quiz (SPCQ).

Section 3.2 Goals

The goals of this study were to:

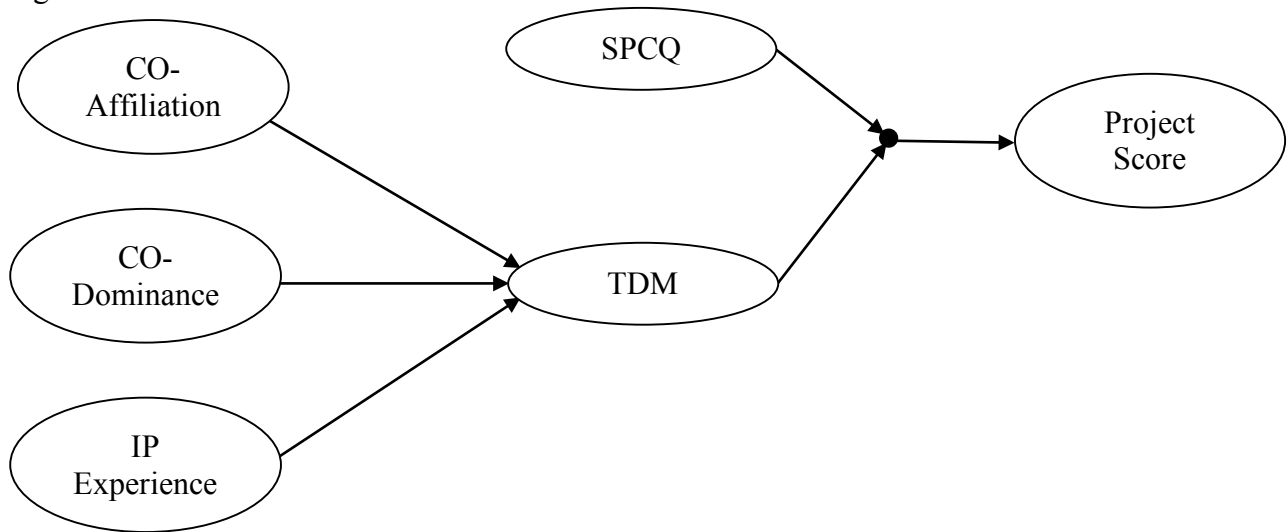
- 1- Measure the collective orientation of student teams in the IPQIPS 2016 course
- 2- Measure team development of student teams in the IPQIPS 2016 course
- 3- Evaluate the relationships between collective orientation and team development
- 4- Evaluate the relationship between team development and team-based project

Section 3.3 Conceptual Framework

The average collective orientation measure of members of student teams, as well as prior IP teamwork experience, can influence the level of team development which will ultimately affect their ability to complete team tasks. Students in highly developed teams and who have knowledge and skills are expected to be more successful in completing team assignments.

Below is the diagram illustrating the conceptual frame model of this thesis project.

Figure 3.1 Theoretical model



Chapter 4: Methods

Section 4.1 Study Design and Sample

Study Design

This study used a cross-sectional design. At the end of the semester, data was collected using two self-administered questionnaires, as well as course evaluation measures. All health profession students who were enrolled in the IPQIPS 2016 spring course were invited to participate in the study.

Interprofessional Quality Improvement and Patient Safety was offered as a course for the first time in the spring semester of 2016, at the VCU IPE Center. Medical, nursing and pharmacy students were exposed to quality improvement and patient safety curricula in an interprofessional learning environment. All the 498 students were divided into 88 teams, each team composes of 5-6 students, that were distributed throughout four learning studios (22 teams in each learning studio).

To ensure uniformity of lecture across different learning studios, each session was preceded by a formal meeting of faculty and clinical staff to discuss the session content. During each session, faculty and clinical staff delivered the lecture and supervised students in the completion of the team task.

Study Population (non-probability convenience sample)

All health profession students who enrolled in the IPQIPS course were invited to participate in the study. The total sample consisted of 498 students, of whom 216 were first year medical students, 133 were second year pharmacy students, and 149 were third year nursing students.

Section 4.2 IPQIPS Course Description

Interprofessional Quality Improvement and Patient Safety is a required, one credit, pass/fail course that was offered for the first time at the VCU IPE Center in Spring of 2016. The course objectives were derived from the IOM Health Professions Education: A Bridge to Quality report (2003) recommendations (Greiner & Knebel, 2003).

Health profession students from medicine, nursing and pharmacy were grouped together in a IPQIPS course to study basic concepts relating to quality improvement and patient safety science in an interprofessional atmosphere. This course replaced the previously program-specific quality improvement and patient safety courses in the medicine, nursing and pharmacy programs. During the course, health professions students were asked to collaborate within interprofessional teams to apply the course content to structured learning activities. Students met weekly to attend activities such as lectures, talks by guest speakers, practical application exercises and group activities. Various learning activities were offered during the course to enable the students to examine the complexity of the health care system, learn commonly-used safety design standards, evaluate hazards and common causes of health care errors, design interventions to improve quality of health care and examine the approaches for designing and sustaining a culture of safety.

Due to the large number of students, interprofessional teams were divided into four learning studios. In each learning studio, there was a team of three faculty members from

medicine, nursing and pharmacy. The faculty team included health professions educators and practicing clinicians with expertise in quality improvement and patient safety science.

Learning assessment methods included a quiz, a midterm exam and a final project. Both the quiz and the midterm were assigned at individual level, while the final project was completed in teams. Individual effort accounted toward 50% of the total course grade (30% midterm, 15% peer evaluation and 5% quiz), and team effort accounted toward 50% of total course grade (5% group exercise and 45% final project).

Midterm and Quiz

The midterm exam and quiz were mandatory during the course. Both were created by course instructors and administered at an individual level. Grading was performed automatically through Blackboard (Washington, DC). The midterm exam counted as 30% of the total student score during the course. It consisted of multiple choice and true/false questions. It covered the content of the first five class sessions: 1) quality in the evolving health care marketplace, 2) epidemiology of error, 3) error identification and analysis, 4) the human face of error, and 5) systems thinking and complexity in health care. Since the content of the midterm was unrelated to the final project, this measure was not included in the model. The quiz was on the subject of statistical process control and counted as 5% of total student score. The quiz was based on a recorded lecture that students listened to prior to the class session. During class students worked individually to solve quiz questions related to the recorded lecture content. The quiz used multiple choice questions administered through the Blackboard (Washington, DC) learning management system. Because the content of the quiz was relevant to the final project, quiz performance was included as a measure in the model.

Final project

The final project accounted for 45% of the total course grade and was divided into three parts: An Ishikawa diagram: causal diagram that display the causes of specific incidents, (15%), a final report (25%) and a course reflection essay (5%). The concept for the final project was developed by one of the course instructors and, refined based on feedback from a faculty, after which a final version was approved by all course instructors. All elements of the final project were completed on a team level. Students were asked to apply what they had learned during the course to a final project scenario involving acute stroke care improvement. Student teams used course knowledge and skills to define, measure, analyze, improve and control interventions to improve acute stroke care.

Each project was graded by one of four instructors using standard rubric for the Ishikawa diagram and the final project report. Each instructor graded the final project for the 22 teams in their own learning studio. To minimize score variation across instructors, a meeting was held before finalization of course grade to discuss final project grading and to identify grading outliers. Final project instructions and grading rubrics are included in the appendix C.

Section 4.3 Data Collection

Multiple measures were used to examine the study hypothesis. To collect data about phase of team development, the TDM was administered. The Collective Orientation Scale was used to assess affinity for affiliation and dominance of individuals within teams. Questions about demographics (age, race, sex) and interprofessional teamwork experience (how many times student participated in interprofessional team) were added to the survey. Full text of the survey is included in the appendix D.

The final project was used to assess student understanding of the course content, as well as knowledge and skills acquired during the course. In addition, SPCQ data was treated as a moderator representing individual knowledge and skills relevant to the completion of the final project.

Several measures were collected for the study analysis. The SPCQ occurred during the ninth class session, and the final project was completed by the eleventh class session. The Collective Orientation Scale and TDM surveys were administered in the last class session via Qualtrics. All participants completed the Collective Orientation Scale first, followed by the TDM survey. During the final class session, course instructors invited the students to participate in the surveys, which were open for ten days (from April 14-24, 2016) following the final class session. During this period, students who had not yet completed the survey were sent reminder emails on April 16, 19, and 22.

Section 4.4 Ethical Consideration

The study was approved as an exempt study by the VCU Institutional Review Board. Informed consent information was included at the beginning of the online surveys, including a statement that participation was voluntary and student responses would not influence course grades or other course outcomes. Survey data was collected using Qualtrics and stored on a secure server that is password protected and only accessible to study personnel.

Students names and identifiers were used to link the survey data with the class assignments. After linkage, all data was de-identified prior to analysis.

Section 4.5 Statistical Analysis

Measures

Collective Orientation (Affiliation subscale): This subscale includes 10 items (each using a 5-point Likert scale) that were administered at the individual level. A higher score in this subscale indicates higher affinity for affiliation.

Collective Orientation (Dominance subscale): This subscale includes 5 items (each using a 5-point Likert scale) that were administered at the individual level. A higher score in this subscale indicates higher affinity for dominance.

Interprofessional teamwork experience: This variable was measured using a single ordinal item with four possible answers that was administered at individual level.

Team Development Measure: This survey includes 31 items, with a possible total score ranging from 0-100 and was administered at an individual level. A higher score represents individual experiences consistent with involvement in a more highly developed team.

Statistical Process Control quiz: This quiz was scored on a percent-correct basis and was administered at an individual level. A higher score indicates greater understanding of the course knowledge and skills by the students.

Final project score: The project was scored as a percent, with a higher score representing successful completion of team-based project.

Analysis

Descriptive and preliminary analyses were carried out using SAS software (version 9.4). The main analysis was conducted using Mplus software (version 7).

Descriptive analysis

The mean and standard deviation (SD) were used to summarize the continuous variable of age of the students. The median and interquartile range (IQR) were used to summarize the count variable of the IP teamwork experience. Frequency and percent were used to summarize all categorical variables including sex, student program, and race. In addition, the overall response rate and the response rate of each discipline were reported for each measure (affiliation, dominance, IPE experience, and TDM).

Preliminary analysis

Prior to beginning the analysis, all continuous variables were checked for normality, so the appropriate statistical tests could be applied. One-way ANOVA was conducted to test the differences in student response to various study measures, including affiliation, dominance, and TDM, based on student discipline. Where significant differences were found, follow-up pairwise testing was conducted using the Tukey-Kramer method to account for multiple comparisons. A Kruskal-Wallis one-way analysis of variance was used to assess similar relationships for IP teamwork experience. Follow-up testing was conducted using pairwise Mann-Whitney U tests with Bonferroni adjustment for multiple comparisons. Finally, a one-way ANOVA was used to check for differences in final project score between instructors.

Main analysis

A structural equation model was created using MPlus software. The model was designed in a way that would be able to handle missing values and account for the moderation effect of the SPCQ. In addition, the main analysis controlled for the differences between the grading instructors.

Prior to analysis, centered variables for both TDM and SPCQ were created using SAS software. After that, an interaction term was created by multiplying the two centered variables. The data with all study variables including the created centered variables and interaction term was imported to Mplus software for the main analysis.

Since the outcome of interest (final project score) is a group level variable and all of the predictors (dominance, affiliation, IPE teamwork experience, TDM, and SPCQ score) were individual level variables, two types of analysis were available (Croon & van Veldhoven, 2007). The first option was to aggregate the individual level variables for each team. The second choice was to use a latent variable model in which observed responses to each individual measure for each team member were used to create latent variables representing an overall team score on each measure that represented the underlying construct. Because several individual-level variables had missing data, and suitable information was not available to impute the missing values, the latent variable model approach was selected. (Croon & van Veldhoven, 2007).

A latent variable was created for each study variable that had been measured at the individual level. These variables include TDM, affiliation, dominance, IP teamwork experience, SPCQ and the SPCQxTDM interaction term. The latent variable model was created by using the observed response to each individual level measure for each team member to represent the

underlying construct for the team. Factor loading was adjusted to be equal to one, and error variance was constrained to be equal for each observed variable within each latent variable. The creation of each latent variable was examined separately to ensure that each latent variable performed appropriately despite individual level missing data. After that, the latent variables were fit in the final structural equation model to test both study hypotheses. First, TDM was regressed on affiliation, dominance and IP teamwork experience to determine which factors predicted team development. Second, final project score was regressed on the TDMxSPCQ interaction term, to account for the moderation of TDM by content knowledge (as measured by the SPQC).

Chapter 5: Results

Section 5.1 Descriptive Statistics

The sample consisted of 498 students. Of those students, 299 (60.04%) responded to the TDM survey, 315 (63.25%) responded to affiliation subscale, 309 (62.05%) responded to dominance subscale and 311 (62.45%) responded to interprofessional teamwork experience question. Response rates varied by discipline, as shown in Table 5.1. The SPCQ was mandatory, so data on this measure was available for all 498 students. Similarly, all 88 teams completed the mandatory final project.

Table 5.1 Summary of surveys respond rate across different students' programs.

Measures	Medicine(%)	Nursing (%)	Pharmacy(%)
TDM	65.28	66.44	44.36
Affiliation	69.44	70.47	45.11
Dominance	68.05	68.46	45.11
Interprofessional teamwork experience	68.52	69.13	45.11

Descriptive statistics of participating students are provided in Table 5.2.

Table 5.2 Summary of study variables.

Variable		Data summary
		Frequency (%)
Program	Medicine	216 (43.37)
	Pharmacy	133 (26.71)
	Nursing	149 (29.92)
Gender	Male	186 (37.35)
	Female	292 (58.63)
	Not specified	20 (4.02)
Race	White	271 (54.42)
	Asian	108 (21.69)
	Black/ African American	29 (5.82)
	Hispanic/ Latino	24 (4.82)
	American Indian/Alaskan Native	2 (0.40)
	International	6 (1.20)
	Two or more races	17 (3.41)
	Unknown	41 (8.23)
		Mean (SD)
Age		24.98 (3.66)
		Median (IQR)
Interprofessional teamwork experience		3.00 (2.00 – 3.00)

Section 5.2 Preliminary findings

Student responses differed across programs for several measures, including TDM (P-value = 0.0042), IP teamwork experience (P-value < 0.0001) and the affiliation subscale (P-value = 0.0418). For TDM, students in the medicine program had significantly higher scores than students in the nursing program. For IP teamwork experience, students in medicine scored significantly lower than students in either nursing or pharmacy. For the affiliation subscale, students in pharmacy scored significantly higher than students in nursing. There were no differences between program in responses to the dominance subscale (P-value = 0.1476).

There was a significant difference in final project grades between the four instructors (P-value < 0.0001). As a result, the main analysis controlled for such differences.

Section 5.3: Main Analysis Finding

The main model results are presented in Table 5.3.

Table 5.3 Main analysis results

SEM model	Estimate (SE)	P-value***
Hypothesis 1*: Affiliation	-7.09 (6.07)	0.243
Dominance	13.94 (5.15)	0.007
Interprofessional teamwork experience	2.49 (5.12)	0.626
Hypothesis 2**: TDM x SPCQ	0.02 (0.01)	0.113

*Hypotheses 1 is that affiliation, dominance, and interprofessional teamwork experience predict TDM.

**Hypothesis 2 is that TDM predicts final project performance, with this relationship being moderated by SPCQ.

***Significant p-value = 0.05.

Hypothesis 1 results:

When affiliation, dominance, and IP teamwork experience were examined together, only dominance was found to have a significant relationship with TDM (P-value <0.05).

Hypothesis 2 results:

TDM (moderated by SPCQ) did not have a statistically significant relationship with final project score (P-value > 0.05).

Chapter 6: Discussion

Section 6.1: Context and Interpretation of Study Findings

Teams and teamwork are one of the important core competencies for IPE and collaborative practice. Teamwork and collaborative practice play a critical role in the current health care system. It has been demonstrated that collaborative practice is associated with improvement in the quality of health care, as well as reductions in medical errors and cost (Buring et al., 2009; J. Thistlethwaite, 2012). Interprofessional education is an approach that allows students to work with colleagues in other health disciplines throughout their education, preparing them for collaborative practice. In designing an IPE activity, health profession educators must focus on incorporating and evaluating teamwork. Teamwork assessment allows for the evaluation of how individuals' contributions influence team function and helps to identify areas where there is potential for improvement.

Existing IPE literature has used a variety of approaches to evaluate teamwork performance, using both faculty observation and student self-report. The use of different instruments allows for the examination of many different dimensions and aspects of teamwork. Several common instruments for the evaluation of teamwork have been applied in an IPE context particularly in experiential IPE settings, including TeamSTEEPS, and McMaster-TOSCE scale (Blue et al., 2013; Lie et al., 2015; Ekmekci et al., 2015; Dobson et al., 2009; Emmert & Cai, 2015). The use of such tools is resource intensive and requires training to ensure interrater

reliability. To our knowledge, the current study used a novel approach to evaluate teamwork development (using the TDM questionnaire) in didactic IPE setting.

This cross-sectional study examined the effect of teamwork development on the successful accomplishment of team-based project. Using the same data, it also evaluated the predictors associated with better teamwork development. The simultaneous evaluation of both aspects is a strength of this study, as previous studies have tended to examine only one of the questions in isolation (predictors of teamwork or the relationship between teamwork development and team performance). Blue et al. used a regression model to examine the influence of a positive attitude towards teamwork and teamwork development on clinical outcomes in an experiential IPE setting, however their model did not account for the likely mediation relationship between attitude towards teamwork and teamwork development. (Blue et al., 2013). The current study used structural equation modeling to simultaneously examine the predictors of teamwork and the relationship between teamwork development and team task accomplishment in a didactic IPE setting.

Two hypotheses were tested in the current study. The first hypothesis was that student teams with more favorable scores for affiliation (higher), dominance (lower), and interprofessional teamwork experience (higher) would have better teamwork development. Although our results were not significant for affiliation or interprofessional teamwork experience, higher levels of dominance were significantly associated with better teamwork development. The significant positive relationship between the higher level of dominance and TDM is not consistent with our study hypothesis. This finding in particular has a logical interpretation in a leadership context. From our point of view, leadership may be associated with dominance. As a result, teams that show higher affinity for dominance might include more

individual team members who possess strong leadership skills. Strong leaders may contribute to effective team development by motivating team members to function effectively within the team to accomplish team goals, improve communication and trust among team members, and help team members to understand their roles and responsibilities (Elkins & Keller, 2003; NHS Leadership Academy, 2009; Stewart, 2006).

Prior studies have identified a variety of factors associated with teamwork development, many of which may represent differing aspects of group orientation (Blue et al., 2013; Ekmekci et al., 2015; Rotz & Dueñas, 2016). These studies used quantitative, qualitative, and mixed methods, which allowed them to explore a variety of factors, however none of these studies have statistically tested the relationships between their identified predictors and teamwork development. The current study evaluated the relationship between measures relating to collective orientation and past interprofessional teamwork experience on team development. The results partially supported the existence of such a relationship, but may be subject to limitations.

The second hypothesis was that teams of students who scored higher on TDM would score higher in the final project (as moderated by SPCQ score). Our results did not show a statistically significant relationship, however other studies have found evidence supporting such a relationship, both in an IPE context (Blue et al., 2013) and in more general studies of team performance in health care setting (Susan A. Wheelan, PhD, Christian N. Burchill, RN, PhD, and Felice Tilin, 2003; Manser, 2009). Our non-significant finding could have several explanations. First, we used TDM as a measure to evaluate teamwork development, although TDM was initially designed to evaluate teamwork effectiveness in healthcare settings. To our knowledge, it has never been evaluated for use in a didactic setting. Further studies examining the use of TDM in didactic setting are needed to assess its appropriateness as an evaluation measure in this

context. Second, the current study assessed the relationship between TDM and the final project score as the outcome variable. This measure was designed by the course instructor based on the knowledge presented in course, but has not been examined for construct validity. Third, TDM examines four elements of team development: cohesion, communication, clarity of team roles, and clarity of team goals (Team & Measure, 2010; Stock et al., 2013). We conceptualized collective orientation as a broad construct encompassing these four elements. Driskell et al, the originators of the Collective Orientation Scale, found that the measure was associated with effective team performance on tasks involving decision making, negotiation, and execution of plans, but not on tasks involving generation of ideas. (Driskell et al., 2010). In our study, we evaluated the relationship between the Collective Orientation Scale and TDM. Our findings suggest that while there is some association, particularly on the dominance subscale, that the Collective Orientation Scale does not fully account for TDM results. Furthermore, since our team performance measure (final project score) has not been tested for validity or examined in depth, we cannot be certain that this task resembled the team-based tasks previously used in studies of the Collective Orientation Scale. Additionally, our findings could have been influenced by design and statistical issues discussed in the limitations section.

Section 6.2: Study Limitations

Study results should be interpreted in light of study limitations.

One major challenge of this study was the potential for differential patterns in missing data. Although some measures were mandatory (the SPCQ and the final project) and thus had a 100% response rate, all other measures were optional and lower response rates. Some optional measures received higher response rates than others; furthermore, on the optional measures, response rate was found to differ depending on student program, as shown in Table 5.1.

Another major challenge of this study was the potential for confounding by factors external to the hypothesis. Student scores on study measures such as affiliation, interprofessional teamwork experience, and TDM were found to differ by student program. There were also differences in student knowledge and clinical experience by program, as medical students were in the foundation stage of their program, while nursing and pharmacy students were in more advanced stages. This introduces the potential for student program to act as a confounder, since it was not accounted for in our model. There was also variation in final project grading between instructors, despite the use of a rubric and of meetings to minimize scoring inconsistency. We attempted to account for this variation in score by controlling for which instructor graded each team's final project.

Section 6.3: Future Studies

Future studies using a similar design would benefit from addressing its weaknesses by using a larger sample size, taking measures to reduce non-response, and using validated outcome measures. To increase response rate, surveys could be administered alongside mandatory assignments such as quizzes or exams, or course instructors could set aside time in class to complete the survey. In addition, students could be offered incentives for survey completion. To encourage participation in teamwork evaluations, the importance of teamwork in IPE didactic settings should be highlighted at the beginning of and throughout the course. It should also be emphasized to students that teamwork will be important to their future careers in health care practice, where a collaborative approach is required to achieve patient centered and evidence based practice. Response rates on teamwork-related surveys are likely to be improved in a setting where students understand the importance of teamwork. In addition, classes should be composed of students who are at similar levels in their respective programs, so that all students are equally prepared to contribute to the team's completion of the task.

Further studies of team dynamics and development in an IPE context are recommended, particularly as related to team performance outcomes. The current study focuses on evaluating the role of individual characteristics on teamwork development. Additional studies are needed to evaluate the effect of group and institutional characteristics on teamwork development. Results of such studies can help educators determine which factors will be the most important in facilitating the development of effective teams. In addition, more studies that measure predictors

of teamwork and evaluate teamwork development in IPE settings are needed. The current study used the Collective Orientation Scale to evaluate individual characteristics that relate to team performance, and used TDM to assess teamwork development. Other studies may attempt to replicate the use of these two measures in a setting which avoids some of the limitation of the current study, making it possible to further evaluate the use of such measures in didactic IPE settings. It could also be valuable to evaluate the use of other measures, both for the predictors of teamwork effectiveness and for the measurement of team development. Results of such studies will help health profession educators to focus on such factors and emphasize the role of teamwork in designing IPE activities. Such studies could also help to develop and validate methods for the assessment of these constructs in a didactic IPE setting.

Section 6.4: Conclusion

This study adds to the IPE literature examining the role of collective orientation in predicting TDM. In addition, it examined TDM as a predictor of team performance in an IPE setting. To our knowledge, it is the first study to assesses both relationships in the same setting.

Although the limitations of this study prevent the drawing of definitive conclusions, the finding that dominance subscale score was associated with TDM is interesting and worthy of replication. Future studies that address the current limitations are needed to improve our understanding about the role of group orientation in TDM and the role of teamwork in improving task outcomes in IPE settings.

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Appendices

Appendix A: Team Development Measure

Instructions: This questionnaire is a measure of team characteristics. Please indicate how much you strongly disagree, disagree, agree, or strongly agree to each statement as it applies to your team at the present time. There are no right or wrong answers, just your perceptions. Before beginning please write the name of your team on this line:

	Strongly Disagree	Disagree	Agree	Strongly Agree
1. Team members say what they really mean.	1	2	3	4
2. Team members say what they really think.	1	2	3	4
3. Team members talk about other team members behind their back.	1	2	3	4
4. All team members participate in making decisions about the work of the team.	1	2	3	4
5. All team members feel free to share their ideas with the team.	1	2	3	4
6. All team members feel free to express their feelings with the team.	1	2	3	4
7. The team practices tolerance, exibility, and appreciation of the unique differences between team members.	1	2	3	4
8. The team handles conflicts in a calm, caring, and healing manner.	1	2	3	4
9. Regardless of the topic, communication between the people on this team is direct, truthful, respectful, and positive.	1	2	3	4
10. The team openly discusses decisions that affect the work of the team before they are made.	1	2	3	4
11. In this team, members support, nurture, and care for each other.	1	2	3	4
12. The team has agreed upon clear criteria for evaluating the outcomes of the team's effort.	1	2	3	4
13. As a team we come up with creative solutions to problems.	1	2	3	4
14. In the team there is more of a WE feeling than a ME feeling.	1	2	3	4
15. There is confusion about what the work is that the team should be doing.	1	2	3	4
16. There is confusion about how to accomplish the work of the team.	1	2	3	4
17. Roles and responsibilities of individual team members are clearly understood by all members of the team.	1	2	3	4
18. All team members place the accomplishments of the team ahead of their own individual accomplishments.	1	2	3	4
19. The goals of the team are clearly understood by all team members.	1	2	3	4
20. All team members define the goals of the team as more important than their own personal goals.	1	2	3	4

21. I am happy with the outcomes of the team's work so far.	1	2	3	4
22. I enjoy being in the company of the other members of the team.	1	2	3	4
23. This team is a personally meaningful experience for me.	1	2	3	4
24. I have a clear understanding of what other team members expect of me as a team member.	1	2	3	4
25. The work I do on this team is valued by the other team members.	1	2	3	4
26. I am allowed to use my unique personal skills and abilities for the benefit of the team.	1	2	3	4
27. Some members of this team resist being led.	1	2	3	4
28. Information that is important for the team to have is openly shared by and with all team members.	1	2	3	4
29. All individuals on this team feel free to suggest ways to improve how the team functions.	1	2	3	4
30. When team problems arise the team openly explores options to solve them.	1	2	3	4
31. On this team, the person who takes the lead differs depending on who is best suited for the task.	1	2	3	4

Appendix B: Collective Orientation Scale

Collective Orientation

Driskell, J E, Salas, E, & Hughes, S. (2010). Collective orientation and team performance: Development of an individual differences measure. *Human Factors*, 52(2), 316-328.

15 items on a 5-point scale. Instructions: Please indicate the extent of your agreement with each of the following statements.

- 1 = Definitely Agree
- 2 = Somewhat Agree
- 3 = No Opinion
- 4 = Somewhat Disagree
- 5 = Definitely Disagree

1. I find working on team projects to be very satisfying.
2. I would rather take action on my own than to wait around for others' input.
3. I prefer to complete a task from beginning to end with no assistance from others.
4. Teams usually work very effectively.
5. I think it is usually better to take the bull by the horns and do something yourself, rather than wait to get input from others.
6. For most tasks, I would rather work alone than as part of a group.
7. I find it easy to negotiate with others who hold a different viewpoint than I hold.
8. I can usually perform better when I work on my own.
9. I always ask for information from others before making any important decision.
10. I find that it is often more productive to work on my own than with others.
11. When solving a problem, it is very important to make your own decision and stick by it.
12. When I disagree with other team members, I tend to go with my own gut feelings.
13. When I have a different opinion than another group member, I usually try to stick with my own opinion.
14. It is important to stick to your own decisions, even when others around you are trying to get you to change.
15. When others disagree, it is important to hold one's own ground and not give in.

There are two subscales:

(1) Affiliation (items 1-10). On this subscale, 6 variables should be reverse-coded.

- 2
- 3
- 5
- 6
- 8
- 10

(2) Dominance (items 11-15). Nothing needs to be recoded on this scale.

The items on each sub-scale should be averaged to determine each student's score for Affiliation and for Dominance.

Appendix C: Final Project



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Chief Executive Officer

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Re: Acute Stroke Care Improvement Project

March 16th, 2016

Dear Project Team,

Thank you for your commitment to the acute stroke care improvement project. Based on your careful analysis of the initial data and your suggestions for further evaluation of delays in acute stroke care, I directed our performance improvement staff to collect additional information about our processes of care. The summary of this information is attached. I hope your team will give each of these datasets some consideration as you define the next steps for improving care of our acute stroke patients.

One of the activities undertaken by the performance improvement group was to conduct interviews of key individuals involved in acute stroke care at U Health. You will find important statements from these interviews attached. Please analyze these statements for possible causes of our lagging performance.

In addition, we have collected some other data from internal pharmacy and radiology systems that may be of use. From pharmacy, we have data around the wastage of alteplase which I understand is the medication used in lytic therapy while, from radiology, we have data around the time it takes to complete a priority 1 head CT, which I understand is essential prior to lytic therapy. I hope you will examine these reports and include them in your analysis if they are of benefit.

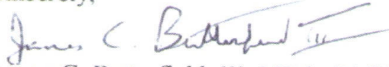
Finally, as I mentioned previously, the Board and I are very concerned about improvement in this area. For your final report to me, I have a specific request about format. As you may know, the chair of our Board is a retired president of a systems engineering firm, and he advocates for the DMAIC strategy of process improvement. In this strategy, the 'D' stands for Define, 'M', for Measure, 'A', for Analyze, 'I', for Improve, and 'C', for Control. I believe I have already 'Defined' the issue for you, but please frame it for the board. For 'Measure', your previous analysis of times to lytic therapy and the data appended here should provide enough substance for this section. The 'Analyze' section is perhaps the most important. Here, please provide an Ishikawa diagram using the 6Ms to delineate the problems with acute stroke care at U Health and, following that diagram, prioritize the areas for improvement. In the 'Improvement' section, please describe 3-5 next steps for the institution with a focus on the highest priority areas from your analysis. These next steps may include solutions or further analysis that should be undertaken to better understand acute stroke care at U Health. Finally, in the 'Control' section, please outline your approach to ongoing monitoring and support for any changes that you recommend in our processes of acute stroke care. As we plan resource allocation for the next fiscal year, this section will be critically important.

In terms of deliverables, please plan on the following:

- By April 1st, submit a draft of your Ishikawa diagram. We will review this submission to confirm you are meeting appropriate milestones.
- By April 8th, please submit your final 2-3 page report. Format your report using the five DMAIC headings. Also, include at least three references citing the evidence used to guide your analysis and recommendations.

Please know that the Board and I are counting on a thorough and well-presented report from your team to guide change at U Health. While I realize that you may not identify a single unifying solution to improving acute stroke care at the U, we are looking forward to your suggestions for targets for further analysis or intervention. As you know, quality improvement is an ongoing process, and I eagerly anticipate your recommendations for next steps. Thank you again for your commitment to this project. If I can be of any assistance, please let me know.

Sincerely,

A handwritten signature in blue ink, appearing to read "James C. Butterfield III".

James C. Butterfield, III, MBA, FACHE
CEO and President
University Hospital

Acute Stroke Care Improvement Project

University Health

Key Statements from Interviewees

Collected February, 2016 by Mary Shelden, Performance Improvement Coordinator

Sanjay Ajit, Clerk, Adult Acute Unit, Emergency Department: "I've been here twelve years so you know to expect the unexpected. They are always changing something and you know something unexpected is going to happen because of the change. With the new unit and all the turnover, I'm not surprised you've got some problem to investigate."

Ljubica Bell, MD, Faculty in Neurology: "Acute strokes are always a priority so we try to evaluate them as soon as we can. Whenever I get a call about an acute stroke patient, I go evaluate them right away. Unless I'm in clinic. Then, I either try to get one of my colleagues to go evaluate the patient, or I finish up with my current clinic patient and then evaluate the patient. Either way, we try to get there as soon as we can."

Bridgette Chu, RN, Nursing Director, Trauma and Shock Unit, Emergency Department: "We don't see the stroke patients in my new unit, but we have always delivered top-notch care to stroke patients. I'm sure nothing substantive has changed."

Jenni Clinton, Director of Staffing, Emergency Department: "As you know, we opened the new Trauma and Shock Unit in October, but we had very few issues with understaffing. Because we knew about the need for more staff, we proactively hired more nurses and, when the new unit opened, we never missed a beat."

Liese Costa, RN, Frontline Nurse, Adult Acute Unit, Emergency Department: "I've only been here since September so I'm not sure I have much to say. There's always things that hold stuff up because everyone is busy. But, I've learned the ropes and I know how to get stuff done now. Most of the nurses who started with me were new graduates from nursing school so it took awhile. But we're rolling now."

Valentin Forestier, MD, Chair of Neurology: "I don't think we have been the cause of any delays in stroke case. Yes, we had a faculty member retire and another go on maternity leave so we are down to only five faculty. But, I know – and my faculty know – acute stroke care is a priority. We meet our obligations in this department. And, as soon as I can get a newly hired physician through credentialing, we will do it even better. There's a problem you should be investigating – the mess that is human resources."

Deborah Foster, Radiology Technician, Emergency Department: "That one scanner was down while they had to fix the ventilation, but it's up now. I'm glad we are passed that because we really had to juggle in radiology. Truth be told, everyone acted like the work was done when the new unit opened, but we were still scrambling to fix the ventilation in radiology and adjust to all the additional patients."

Patton Foster, Pharmacist, Emergency Department: "We've been going through a lot of alteplase, and it's expensive – over a \$1000 a dose. I have been trying to get the medical staff to be conscious of when to use it and when not to use it by making sure I call them before I send the pharmacy tech over with it. We can be so wasteful sometimes."

Louie Fyodorov, RN, Frontline Nurse, Trauma and Shock Unit, Emergency Department: "I miss taking care of stroke patients! Everything moved so fast with them and sometimes you could see them get better right before your eyes. It's pretty cool when someone comes in and they can't move their arm, and, then, a few hours later,

they wave goodbye to you as they go upstairs to the inpatient area. I wish I still took care of those patients, but they said they needed the best nurses over here in the Trauma and Shock Unit.”

Queenie Gutierrez, MD, Medical Director of the Emergency Department: “Listen – I’ve been here for twelve years so I know the drill. We can open all the brand, new shiny units we want, but it’s the people that make this place work. Everyone’s overworked and overstretched so you just got to go with the flow. Take neurology for example – they’ve been short a few docs lately, but I know they are doing their best with this stroke thing.”

Vasil Janicek, MD, Emergency Department Radiologist: “We always bump emergent cases to the top priority so patients – like rule outs of acute stroke – get scanned right away. It’s been a little busy lately because we’ve seen more trauma cases with the new ED unit, but we get them in as quickly as we can.”

Kelly Moore, Radiology Technician, Emergency Department: “We use a priority system to decide who gets scanned first. Acute strokes are priority 1 so we work them in as soon as we can. It only gets hard when you have a bunch of priority 1s at the same time. Then, we ask the Trauma and Shock Unit Director who should go first.”

Tammy Nguyen, RN, Nursing Director, Adult Acute Unit, Emergency Department: “I’ve only been a nursing director since September, but I think we are doing a good job considering the circumstances. We just have to be proactive to advocate for our patients. As long as we know the plan we can pester who it is that we need to in order to get things done. Radiology, the lab, pharmacy, other medical services – I know how to get their attention.”

Sameera Noor, Family Member: “When my husband had his stroke this December, I wanted the ambulance to go to U Health because it’s the best. We had a good experience – my husband is better – but it did seem like we had to wait a lot in the beginning. Where’s the doctor? When is the CT scan going to happen? How do you give the medicine? But, everything worked out OK so I am very thankful. “

George Ralston, Head Custodian, Emergency Department: “You know I remember they had one of the CT scanner closed for a while in the fall. They said it needed repairs, and they were waiting for a part. That was good for us – we have to wipe down those rooms after every scan so they keep us on our toes. Having that one closed for a while gave us a breather.”

Hank Rodgers, MD, Medical Director of the Emergency Department: “I doubt we have any problems with stroke care that won’t fix themselves in a couple months. We just opened our new trauma and shock unit in the ED this fall and so it has been an exciting time for everyone. But, change is always hard for some people – even if it means we are doing the right thing for our patients. World class emergency care does not come easily.”

Jose Rodriguez, Patient: “I’m just so appreciative that everyone took the time to care for me. I am doing much better, and I hope to be able to get in to see the neurologist soon. I heard that they have some new doctors starting soon and that they will have more appointments for people.”

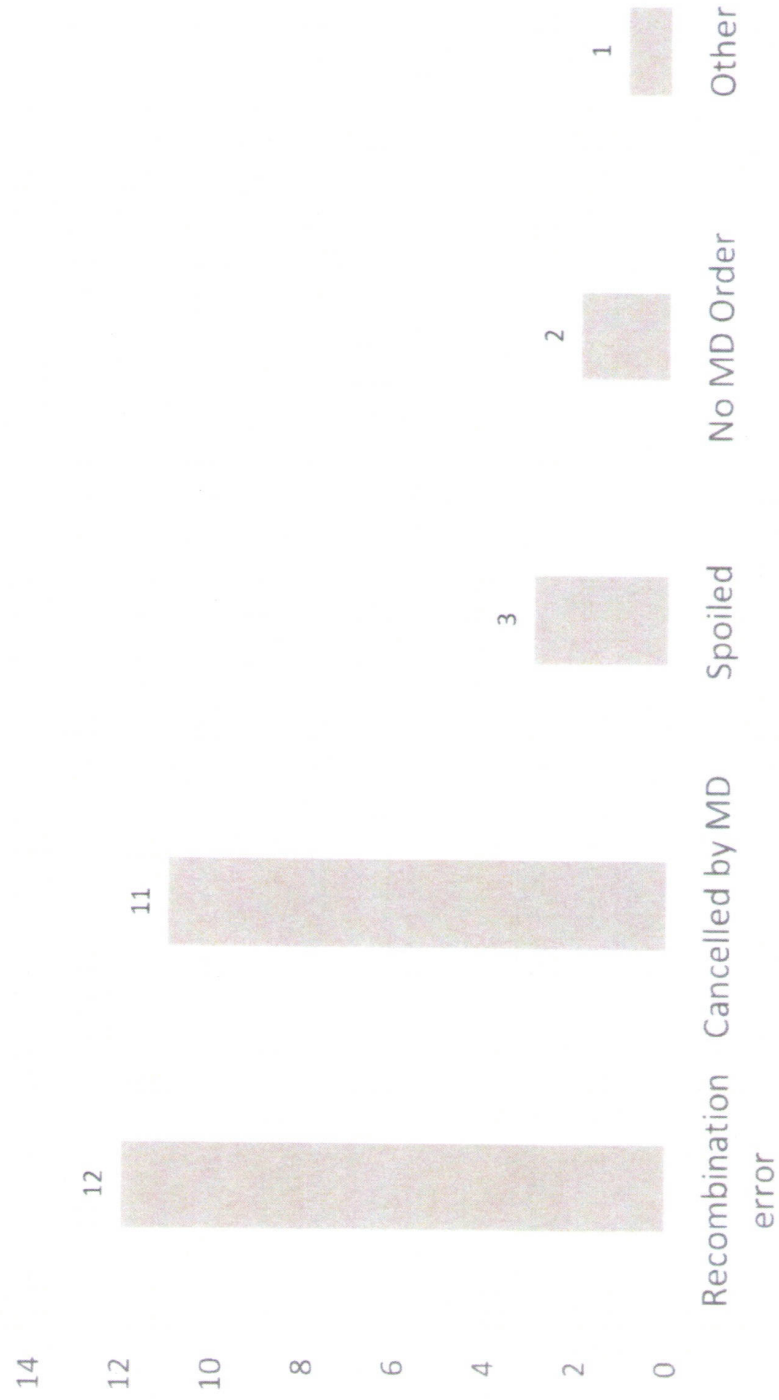
Edison Yu, Pharmacy Technician, Emergency Department: “The only thing I’ve seen is that we’ve had to waste some vials of alteplase. It’s a tricky medicine to use and the nursing staff struggled to administer it a few times. So, if I get called to a stroke, I always bring an extra now.”

Reasons for Alteplase Wastage

U Health Emergency Department

Analyzed by Patton Foster, PharmD

4th quarter, 2015 (n=29)



Average time in minutes from priority 1 head CT order to study performed by month, 2015

U Health Emergency Department

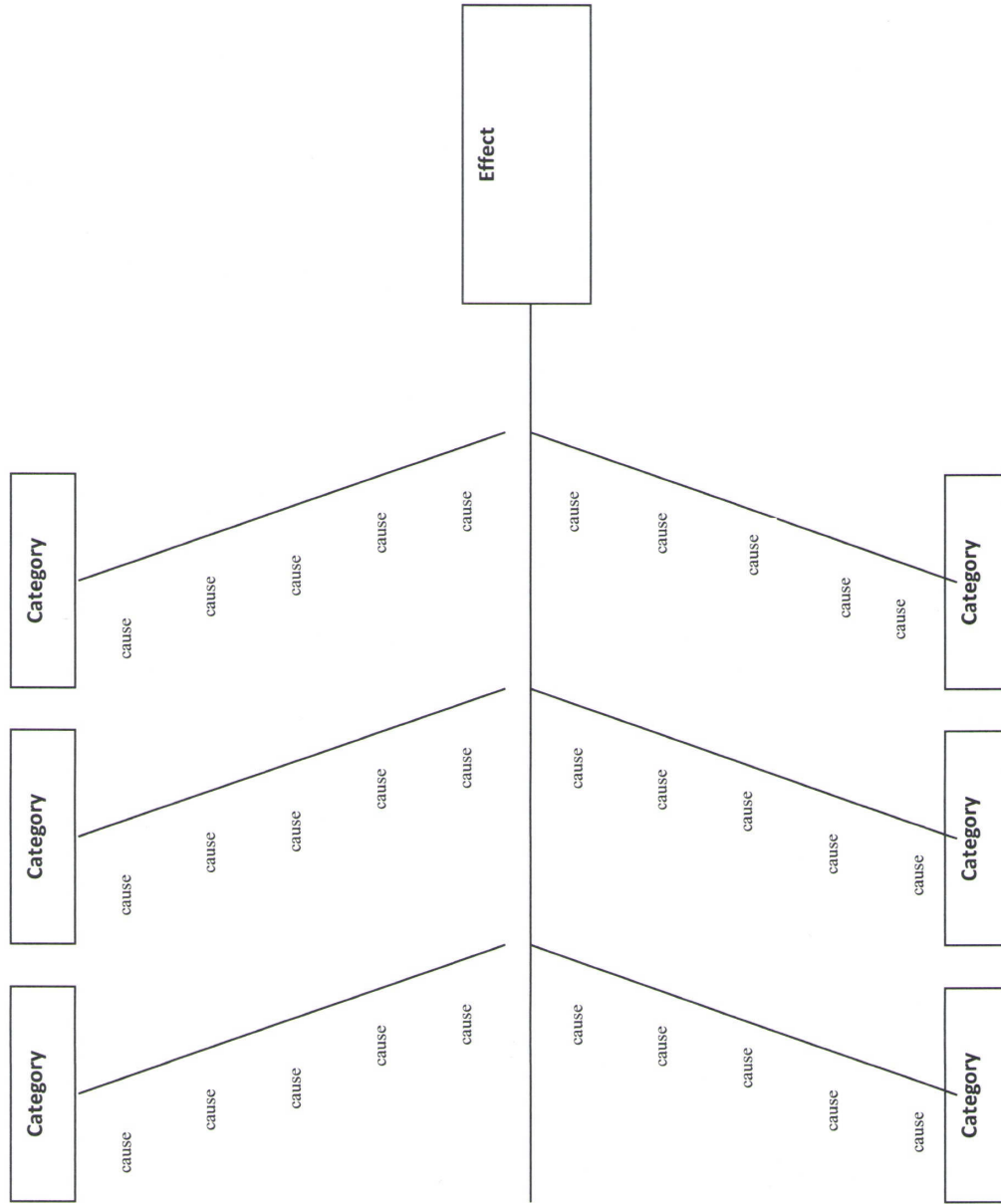
Collected by: Kelly Moore

Reviewed by: Vasil Janicek, MD

	Trauma and Shock Unit	Adult Acute Unit	Emergency Department overall
January	n/a	8	8
February	n/a	9	8
March	n/a	8	9
April	n/a	7	8
May	n/a	9	8
June	n/a	8	8
July	n/a	8	9
August	n/a	7	8
September	n/a	7	8
October	7	10	9
November	6	11	10
December	6	10	10

IPEC 502: Interprofessional Quality Improvement and Patient Safety
Ishikawa Diagram Assignment

Submitted by Floor: _____ Table: _____ Team Member Names: _____



IPEC 502: Interprofessional Quality Improvement and Patient Safety
Ishikawa Diagram Assignment

Submitted by Floor: _____ Table: _____ Team Member Names: _____

Based on your analysis of the contributing factors, list 3-5 priorities for improvement which you will present to the hospital CEO.

- 1.
- 2.
- 3.
- 4.
- 5.

IPEC 502: Interprofessional Quality Improvement and Patient Safety

Ishikawa Diagram – Grading Rubric

Case Analysis: Ishikawa Diagram	Priorities for Improvement	Professional Accountability
5 points: Ishikawa diagram reflects a <i>thorough</i> analysis of the quality issue. Multiple causal and/or contributing factors are clearly considered within each category of the 6M framework.	3-5 <i>key</i> priorities for quality improvement are listed/described. Identified priorities are clearly stated and clearly derived from the analysis of the quality issue.	5 points: Assignment is submitted on time and complete.
4 points: Ishikawa diagram reflects an <i>acceptable</i> analysis of the quality issue. A variety of causal and/or contributing factors are considered within the categories of the 6M framework.	4 points: 3-5 <i>acceptable</i> priorities for quality improvement are listed/described. Identified priorities are clearly stated and reflect adequate understanding of the quality issue.	4 points: Completed assignment is submitted 0-6 hours late.
3 points: Ishikawa diagram reflects a <i>partial</i> analysis of the quality issue. Causal and/or contributing factors are listed in some categories of the 6M framework.	3 points: List of priorities for quality improvement include less than three areas of concern OR reflect only a <i>partial</i> understanding of the quality issue.	3 points: Completed assignment is submitted 7-24 hours late.
2 points: Ishikawa diagram reflects a <i>minimal</i> analysis of the quality issue. Causal and/or contributing factors are listed in few categories of the 6M framework.	2 points: List of priorities for quality improvement demonstrates <i>minimal</i> understanding of the quality issue.	2 points: Completed assignment is submitted 25-48 hours late.
1 point: Case analysis does not include an Ishikawa diagram.	1 point: List is submitted but it does not include applicable or acceptable priorities for quality improvement.	1 point: Completed assignment is submitted 49-72 hours late.
0 points: Analysis is not completed or submitted.	0 points: Priority listing is not submitted.	0 points: Assignment is submitted more than 72 hours late or is not submitted.

IPEC 502: Interprofessional Quality Improvement and Patient Safety
Final Project Report – Grading Rubric

	4 points	3 points	2 points	1 point	0 points
Define	The area of focus and its importance are succinctly and completely defined.	The area of focus and its importance are only partially defined.	Either the area of focus or its importance are not defined.	Neither the area of focus nor its importance are defined.	Not present
Measure	All of the data sources are described.	All but one of the data sources are described.	Half of the data sources are not described.	Most of the data sources are not described.	Not present
Analyze	Findings from data sources are carefully analyzed and presented.	Findings from data sources are only partially analyzed and presented.	Findings from data sources are superficially analyzed and presented.	Most key findings are omitted.	Not present
Improve	3-5 suggestions with detailed description for interventions or further evaluation are listed and demonstrate significant critical thinking.	3-5 suggestions for interventions or further evaluation are listed but lack adequate descriptions or only partially demonstrate significant critical thinking.	Less than 3 suggestions with detailed description for interventions or further evaluation are listed or suggestions do not demonstrate significant critical thinking.	Less than 3 suggestions with detailed description for interventions or further evaluation are listed and suggestions do not demonstrate significant critical thinking.	Not present
Control	Report suggests several thoughtful approaches to long-term monitoring and evaluation of the process.	Report suggests only one approach or several cursory approaches to long-term monitoring and evaluation of the process.	Report suggests one, cursory approaches to long-term monitoring and evaluation of the process.	Examples given are not focused on long-term monitoring or evaluation of the process.	Not present
Evidence application		At least three references (one from each discipline) are cited.	2 references are cited.	1 reference is cited.	No reference is cited.
Timeliness			Assignment is submitted on time.	Assignment is submitted within one day of due date.	Assignment is submitted more than 24 hours after due date.

Appendix D: Actual Survey Used in the Study

Note: This is an electronic survey that will be administered via Qualtrics]

IPEC 502: Interprofessional Quality Improvement and Patient Safety. The principal investigator for this study is Patricia W. Slattum, Pharm.D., Ph.D. As part of this study, you are required to complete a survey that asks for your opinions about yourself and your team in IPEC 502. Responses to the measures on this survey will be analyzed with scores on assessments and assignments completed in IPEC 502 during the course of the semester.

Time Required: We expect the survey will take approximately 10-15 minutes to complete.

Risks: This is a confidential, individual survey. There are no reasonably foreseeable risks or discomforts involved in taking part in this survey.

Compensation: None.

Confidentiality: This survey is confidential. Results will be reported in aggregate.

Participation: Completing this survey will not have any influence on your course grade or other academic measures.

Study contact: If you have questions or concerns about this study, contact Dr. Slattum at pwslattu@vcu.edu.

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

Office for Research
Virginia Commonwealth University
800 East Leigh Street, Suite 113
P.O. Box 980568
Richmond, VA 23298
Telephone: 804-827-2157

Continue to survey

IPEC 502 Course Evaluation Survey – Spring 2016

SECTION 1: COURSE EVALUATION

INSTRUCTIONS: Please indicate the extent of your disagreement/agreement with the following statements about the COURSE.	Strongly Disagree	Disagree	Agree	Strongly Agree
1. The course was well organized.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Learning objectives were clear.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Course content was clearly aligned with the learning objectives.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. Teaching methods were effective.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. The assignments were helpful in acquiring a better understanding of interprofessional care.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. The course provided ample opportunities to learn with, from, and about other students.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. The quizzes were directly related to assignments, discussions, and other planned activities.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. Student responsibilities (being prepared, participation, team assignments, etc.) were well defined.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9. The workload was appropriate for a one-credit course	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
a. [BRANCH to this if #9 is answered with "Disagree" or "Strongly Disagree"] There was too much work.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10. An interprofessional course should be required in all health professions programs.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11. The late afternoon time for this class was conducive to my learning.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12. A morning class would more effective.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13. A mid-day class would more effective.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Overall, how would you rate this course?

- Outstanding
- Very Good
- Good
- Adequate
- Poor

Relative to your knowledge at the beginning of this course, how would you rate the learning which you have achieved about interprofessional collaboration?

- Outstanding
- Very Good
- Good
- Adequate
- Poor

Overall, how much time did your team spend collaborating outside class over the course of this semester? Please enter the total number of hours. _____ [must be a numeric value between 0-100]

What methods did your team use to collaborate outside of class time? Select all that apply.

- Email
- Face-to-face meetings
- Social media
- Google docs
- Phone calls
- Text messages
- Other (please describe) _____

What aspects of the course contributed the most to your learning?

What aspects of the course could be improved?

Would you be willing to participate in a focus group session at a later date to expand on your comments?

- Yes
- No

SECTION 2: EVALUATION OF FACULTY

A faculty team provided instruction for each session and facilitated discussion among student teams on each floor. You can find more information about your faculty in the Course Overview/Syllabus area on Blackboard.

INSTRUCTIONS: Please indicate the extent of your disagreement/agreement with the following statements.	Strongly Disagree	Disagree	Agree	Strongly Agree	NA (unable to judge)
1. Faculty were well-prepared for class sessions.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Faculty expressed ideas clearly.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

INSTRUCTIONS: Please indicate the extent of your disagreement/agreement with the following statements.	Strongly Disagree	Disagree	Agree	Strongly Agree	NA (unable to judge)
3. Faculty responded effectively to questions.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. Faculty demonstrated thorough knowledge about interprofessional care.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. Faculty demonstrated thorough knowledge about quality improvement and patient safety.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. Faculty demonstrated thorough knowledge about the assignments and activities in the course.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. Faculty seemed genuinely interested in our learning.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Use this space to provide additional comments about your faculty.

SECTION 3: INDIVIDUAL COLLECTIVE ORIENTATION

Please indicate the extent to which you agree with each statement.	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. I find working on team projects to be very satisfying.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. I would rather take action on my own than to wait around for others' input.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. I prefer to complete a task from beginning to end with no assistance from others.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. Teams usually work very effectively	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. I think it is usually better to take the bull by the horns and do something yourself, rather than wait to get input from others.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. For most tasks, I would rather work alone than as part of a group.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. I find it easy to negotiate with others who hold a different viewpoint than I hold.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. I can usually perform better when I work on my own.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9. I always ask for information from others before making any important decisions.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10. I find that it is often more productive to work on my own than with others.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11. When solving a problem, it is very important to make your own decision and stick by it.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12. When I disagree with other team members, I tend to go with my own gut feelings.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13. When I have a different opinion than another group member, I usually try to stick with my own opinion.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14. It is important to stick to your own decisions, even when others around you are trying to get you to change.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
15. When other disagree, it is important to hold one's own ground and not give in.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

SECTION 4: TEAM DEVELOPMENT MEASURE

Please indicate the extent to which you agree with each statement <u>as it applies to your team in IPEC 502.</u> There are no right or wrong answers, just your perceptions.	Strongly Disagree	Disagree	Agree	Strongly Agree
1. Team members say what they really mean.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Team members say what they really think.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Team members talk about other team members behind their back.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. Team members participate in making decisions about the work of the team.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. All team members feel free to share their ideas with the team.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. All team members feel free to express their feelings with the team.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. The team practices tolerance, flexibility and appreciation of the unique differences between team members.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. The team handles conflicts in a calm, caring and healing manner.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9. Regardless of the topic, communication between the people on this team is direct, truthful, respectful and positive.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10. The Team openly discusses decisions that affect the work of the team before they are made.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11. On this team, members support, nurture and care for each other.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12. The team has agreed upon clear criteria for evaluating the outcomes of the team's effort.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13. As a team, we come up with creative solutions to problems.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14. In the team, there is more of a WE feeling than a ME feeling.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
15. There is confusion about what the work of the team should be doing.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16. There is confusion about how to accomplish the work of the team.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
17. Roles and responsibilities of individual team members are clearly understood by all members of the team.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
18. Team members place the accomplishments of the team ahead of their own individual accomplishments.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please indicate the extent to which you agree with each statement as it applies to your team in IPEC 502. There are no right or wrong answers, just your perceptions.	Strongly Disagree	Disagree	Agree	Strongly Agree
19. The goals of the team are clearly understood by all team members.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
20. Team members define the goals of the team as more important than their own personal goals.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
21. I am happy with the outcomes of the team's work so far.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
22. I enjoy being in the company of the other members of the team.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
23. This team is a personally meaningful experience for me.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
24. I have a clear understanding of what other team members expect of me as a team member.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
25. The work I do on this team is valued by the other team members.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
26. I am allowed to use my unique personal skills and abilities for the benefit of the team.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
27. Some members of this team resist being led.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
28. Information that is important for the team to have is openly shared by and with all team members.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
29. All individuals on this team feel free to suggest ways to improve how the team functions.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
30. When team problems arise the team openly explores options to solve them.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
31. On this team the person who takes the lead differs depending on who is best suited for the task.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

SECTION 5: DEMOGRAPHIC INFORMATION

How many times in the past have you worked on an interprofessional team that included students or clinicians from other health professions?

- Never
- Once or twice
- Several times
- Many times

[Note: Additional demographic data will be linked to the survey data from student records maintained by VCU. These variables include:

- student's academic major

- gender
- age
- race/ethnicity]