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Interprofessional Education: Medical and dental hygiene student competencies during the delivery of patient care

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Abstract

Purpose: Interprofessional education (IPE) helps prepare health care students for collaborative delivery of patient care. The purpose of this pilot study was to evaluate changes in self-perceived collaborative competencies of dental hygiene and medical students after a live patient care IPE experience.

Methods: Dental hygiene (n=23) and medical students (n=26) were paired for a single-encounter IPE experience with adult patients. Following the collaboration, participants completed the 20-item, seven-point Likert scale retrospective pre-test/post-test Interprofessional Collaborative Competencies Attainment Survey (ICCAS) to assess changes in perceived collaborative competencies as a result of the IPE experience. Participants reflected on current and prior self-perceived interprofessional collaborative competence in the areas of communication, collaboration, roles and responsibilities, collaborative patient/family-centered approach, conflict management/resolution, and team functioning. Descriptive statistics were used to analyze the data.

Results: All participants (n=49) completed the IPE survey for a response rate of 100%. Pre-test mean scores ranged from M=5.40, SD=.46 to M=6.31, SD=1.23 and post-test scores ranged from M=6.09, SD=.46 to M=6.72, SD=.86 for all participants. All paired item mean score differences were statistically significant ($p \leq .05$) indicating increased self-reported collaborative competence.

Conclusions: A live patient care IPE experience created a positive perception of collaborative competence among medical and dental hygiene student participants. Dental hygiene curricula should include IPE, including live patient experiences to foster students' collaborative competence and preparation for interprofessional collaboration in the workplace.

Keywords: dental hygiene students, health care students, interprofessional education, collaborative competence, interprofessional collaboration

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Introduction

Dental and medical professionals share a common goal of optimizing patient health and quality of life. Historically, these professions have been independent of each other with defined areas of emphasis, despite the bi-directional relationships between oral and systemic health.[1] However, as patient populations present with multiple comorbidities due to chronic and complex diseases, it is increasingly important for medical and dental disciplines to embrace a collaborative model of health care delivery.

Interprofessional collaborative practice is defined by the World Health Organization as "when multiple health workers from different professional backgrounds work together with patients, families, careers, and communities to deliver the highest quality of care."[2] This approach increases efficiency, reduces costs, and improves patient health outcomes.[3,4] A centralized and collaborative practice approach could mitigate challenges of access to care and optimize disease management with fewer appointments.[5] Furthermore, the literature shows patient health outcomes are negatively affected by the failure of health care professionals to communicate and work together.[6-8]

Preparation for this type of health care delivery should begin with collaborative competencies developed by intentional curriculum and purposeful training of students across a range of health sciences educational programs.[9]

Interprofessional education (IPE) is when two or more students from different occupations learn with, about, and from each other to improve health outcomes.[2] Inclusion of interprofessional education can transform outdated, static curriculum of health professional education and equip graduates for collaborative practice delivery models.[10]

In 2001, the Institute of Medicine (IOM) published a report urging interprofessional education and evidence-based decision making to be incorporated in the curriculum for health professional students.[11] Since that time, the Interprofessional Education Collaborative Board published the Core Competencies for Interprofessional Collaborative Practice document for the purposes of guiding curriculum development for health professions education and improving health outcomes of patients.[12] The core competencies consist of four categories: values/ethics for interprofessional practice (IP), roles/responsibilities (RR), interprofessional communication (CC), and teams and teamwork (TT).[12] The American Dental Association's Commission of Dental Accreditation (CODA) which sets standards for dental hygiene edu-cation programs cites the need for IPE curriculum in standard 2-15: "Graduates must be competent in communicating and collaborating with other members of the healthcare team to support comprehensive patient care."[13]

However, the implementation of patient-centered IPE experiences in health science academic institutions has been found to be slow and inadequate.[14] Furthermore, most IPE research has focused on nurses and physicians, while excluding other heath science disciplines.[15] Since this area of research has not been fully explored, there is a lack of literature available for allied health educators to utilize when deciding on educational best practices for designing and implementing IPE curricula.

Surveys of United States (US) dental hygiene program directors have identified the overall value placed on IPE, how it has been implemented into academia, and barriers to implementation. In 2015, 59% of surveyed dental hygiene program directors reported IPE was a priority, but curriculum overload (76%) and scheduling (92%) were cited as barriers to implementation.[16] Subsequently in 2017, program directors reported curriculum overload (76%), faculty calibration (48%), and outcomes assessments (32%) as barriers.[17] A survey revealed interprofessional pedagogy was viewed positively by Northeastern US dental hygiene program directors; however, 72% reported IPE was not in the curriculum or only in the beginning stages of implementation.[18] More recently, Tolle et al. surveyed US dental hygiene program directors in 2019 and found 73% had positive attitudes toward IPE, but time constraints was the top barrier to implementation.[19]

A wide range of health care professional students have been studied for self-perceived changes in competencies following IPE experiences using the Interprofessional Collaborative Competencies Attainment Survey (ICCAS).[20-23] Haber et al. surveyed nurse practitioner, medical, and dental students using the ICCAS before and after an IPE case study and clinical simulation and identified a statistically significant increase in overall mean scores for perceived collaborative competencies from pre- to post-tests.[21] Likewise, in studies which surveyed medical students in IPE experiences with pharmacy, occupational therapy, and physical therapy students found there was a statistically significant increase from pre-test to post-test scores on all 20 ICCAS items indicating increased self-perceived collaborative competencies as a result of single-encounter IPE experiences.[20,22,23]

Interprofessional education studies of dental hygiene students have been reported and measured with a variety of research designs and instruments. Allen et al. conducted a qualitative study of dental hygiene students who wrote reflection papers upon completion of a service-learning activity with nursing students and the results indicated learning was reinforced in the RR category.[24] McGregor et al. conducted a retrospective pre-test/post-test of students from dental hygiene, dentistry, nursing, occupational therapy, pharmacy, and physical therapy (n=300) who completed a one-hour course about IPEC core competencies.[25] Results from the Student Perceptions of Interprofessional Clinical Education survey demonstrated statistically significant increases in students' positive impressions of IPE following the course.[25] Coan et al. used the ICCAS survey to study nursing and dental hygiene students after an IPE experience with hospital patients and found significant increases in perceived development of interprofessional competencies among all students.[26] Infante et al. utilized a researcher-designed pre-test/post-test survey for nursing, dentistry, dental hygiene, and medical students who participated in IPE to create personalized health plans for homeless people and identified increases in confidence in completing IPE tasks with patients and understanding training of other disciplines when comparing survey scores.[27] Despite variations in IPE experiences and research design among these studies, positive changes occurred in the dental hygiene students' reinforcement of IPEC competencies,[24] their view of IPE,[25] development of interprofessional competencies,[26] and confidence with IPE tasks.[27]

Interprofessional education experiences can range from didactic theoretical classroom presentations, case studies and simulations to real-time experiences. The purpose of this pilot study was to evaluate changes in self-perceived collaborative competencies of dental hygiene and medical

students after a single-encounter IPE experience during live patient care in a dental hygiene care clinic at one university. More specifically, the perceived collaborative competencies in the areas of communication, collaboration, roles and responsibilities, collaborative patient-centered approach, conflict management/resolution, and team functioning of dental hygiene and medical students were assessed.

Methods

This study was granted exempt status from the Old Dominion University (ODU) Institutional Review Board. Senior students from the ODU entry-level bachelor's degree dental hygiene program and third- and fourth-year students from the Eastern Virginia Medical School were invited by email to participate in a live patient IPE experience at an on-campus dental hygiene care facility, at an appointed time over the course of one year. Prior to the IPE experience, the medical students were given policies and procedures for the dental hygiene facility and a list of evidenced-based readings on oral-systemic links.

Each medical student was paired with a senior dental hygiene student during the provision of clinical care to an adult patient. Medical students observed dental hygiene care delivery and engaged in unscripted open verbal dialogue with their dental hygiene student partner during the live patient appointments consisting of various phases of the dental hygiene process of care. For example, medical students observed dental hygiene students as they conducted medical/dental history interviews, extra/intra oral examinations, periodontal assessments, nonsurgical periodontal therapy, and provision of patient education that included evidence-based care and considerations for oral-systemic links.

Dental hygiene and medical student participants were asked to complete the Interprofessional Collaborative Competencies Attainment Survey (ICCAS) to assess changes in perceived collaborative competencies following the IPE experience. The IPE experience was not assessed for academic grading purposes but counted towards community engagement curriculum requirements.

Survey instrument

The ICCAS is a 20-item self-assessment survey based on "six core collaboration competencies: communication, collaboration, roles and responsibilities, collaborative patient/family-centered approach, conflict management/resolution, and team functioning."[28] Each of the retrospective pre- and post-test items are answered on a seven-point Likert scale with 1=strongly disagree, 7=strongly agree, and a "not applicable" option. The survey prompts participants to retrospectively reflect on their current and prior self-perceived collaborative competence following an IPE experience.[29] The expectation of this retrospective research design is that learners will better understand slight differences in perceived competencies and be able to better rate their prior competency abilities following the IPE experience.[28] The ICCAS is a valid and reliable survey, with Cronbach's alpha scores for all 20 pre- and post-test items reported as 0.94-0.97 and 0.95-0.98 respectively.[29-31]

Participants were given the paper ICCAS survey immediately following the IPE experience. Participants were provided a cover letter and informed that participation was voluntary and consent was implied by completing and returning the survey. Responses were kept anonymous by using a participant-created unique identifier number. Statistical analysis included demographic descriptors, paired samples t-tests, and Cohen's d effect scores. Cohen's d effect sizes were calculated for each pair as the *t* statistic divided by the square root of the sample size; adjustments were made to reflect missing values. Effect sizes were interpreted as "large" for differences greater than 0.8, "moderate" for those between 0.79 and 0.50, and "small" as those less than 0.5.[32] Statistical significance was set at alpha ≤ 0.05.

Results

A total of 26 medical students and 23 dental hygiene students participated in a single-encounter live patient IPE experience and retrospectively completed the pre- and post-test ICCAS survey based on the IPE experience. All participants (n=49) completed the IPE experience and survey for a response rate of 100%. Three dental hygiene students collaborated with medical students twice during two different dental hygiene appointments but completed the survey following the first encounter only. Data revealed all dental hygiene participants were female (n=23, 100%) and most medical students were male (n=18, 69%). The majority of participants were between the ages of 25 – 34 years (n=32, 65%). When asked if they had previously participated in an interprofessional learning experience, 73.4% (n=36) reported 1-2 events, 14.3% (n=7) reported 3-4 events, 8.2% (n=4) reported 5 or more events, and 4.1% (n=2) reported they had not. Demographic data are shown in Table I.

Dental hygiene and medical student participants combined

Calculated mean scores for all participants (n=49) showed ICCAS item pre-test responses ranged from M=5.40, SD=.46 to M=6.31, SD=1.23 and post-test responses ranged from M=6.09, SD=.46 to M=6.72, SD= .86. A paired samples t-test compared pre-test and post-test mean scores and revealed participants increased in paired mean differences

Table I. Participant demographics (n=49)

Characteristics	n (%)
Discipline and Gender	
Medical student	26 (53.0)
Male	18 (69.0)
Female	8 (31.0)
Dental hygiene student	23 (46.9)
Male	-
Female	23 (100.0)
Age (all participants)	
18-24	16 (32.7)
25-34	32 (65.3)
35-44	1 (2.0)
Previous IPE experiences	
Medical students	
0	1 (3.8)
1-2	18 (69.2)
3-4	3 (11.5)
5 or more	4 (15.4)
Dental hygiene students	
0	1 (4.3)
1-2	18 (78.3)
3-4	4 (17.4)
5 or more	-

for each of the 20 items following the IPE experience, ranging from .340 to .809 showing students self-reported their perceived collaborative competence as having increased as a result of participation. Based on two-tailed paired samples t-tests, all paired item mean score differences were statistically significant ($p \leq .05$) showing increases in self-reported perceived collaborative competency because of the IPE experience. The pre-and post-test ICCAS items, paired samples t-test results and *p*-values for all participants are shown in Table II. Cohen's *d* effect sizes were large for five paired items (d=0.80 to d=0.94) and moderate for fifteen paired items (d=0.54 to d=0.77) from the ICCAS survey and are shown in Table III.

Table II. Paired mean differences and *p*-values for ICCAS items (all participants, n=49)

Pre-test and post-test ICCAS Items	Paired mean differences*	p-values** (2-tailed)
Promote effective communication among members of an IP team	.735	.000
Actively listen to IP team members' ideas and concerns	.408	.000
Express my ideas and concerns without being judgmental	.408	.000
Provide constructive feedback to IP team members	.489	.000
Express my ideas and concerns in a clear, concise manner	.408	.000
Seek out IP team members to address issues	.809	.000
Work effectively with IP team members to enhance care	.625	.000
Learn with, from and about IP team members to enhance care	.681	.000
Identify and describe my abilities and contributions to the IP team	.531	.000
Be accountable for my contributions to the IP team	.429	.000
Understand the abilities and contributions of IP team members	.694	.000
Recognize how others' skills and knowledge complement and overlap with my own	.574	.000
Use an IP team approach with the patient to assess the health situation	.638	.000
Use an IP team approach with the patient to provide whole person care	.717	.000
Include the patient/family in decision-making	.340	.001
Actively listen to the perspectives of IP team members	.447	.000
Take into account the ideas of IP team members	.426	.000
Address team conflict in a respectful manner	.381	.001
Develop an effective care plan with IP team members	.604	.000
Negotiate responsibilities within overlapping scopes of practice	.532	.000

*Paired differences calculations based on "before" responses subtracted from "after" responses (post-test > pretest).

***p*-value significant at ≤.05

Table III. Cohen's d effect sizes and differences for ICCAS items (all participants, n=49)

Constructs	ICCAS item	Cohen's d scores	Differences
Communication	1. Promote effective communication among members of an IP team		Large
	2. Actively listen to IP team members' ideas and concerns	0.61	Moderate
	3. Express my ideas and concerns without being judgmental	0.61	Moderate
	4. Provide constructive feedback to IP team members	0.75*	Moderate
	5. Express my ideas and concerns in a clear, concise manner	0.56	Moderate
Collaboration	6. Seek out IP team members to address issues	0.88*	Large
	7. Work effectively with IP team members to enhance care	0.77*	Moderate
	8. Learn with, from and about IP team members to enhance care	0.69*	Moderate
Roles and Responsibilities	9. Identify and describe my abilities and contributions to the IP team	0.63	Moderate
	10. Be accountable for my contributions to the IP team	0.63	Moderate
	11. Understand the abilities and contributions of IP team members	0.94	Large
	12. Recognize how others' skills and knowledge complement and overlap with my own	0.80*	Large
Collaborative Patient/Family-centered approach	13. Use an IP team approach with the patient to assess the health situation	0.73*	Moderate
	14. Use an IP team approach with the patient to provide whole person care	0.71*	Moderate
	15. Include the patient/family in decision-making	0.54*	Moderate
Conflict management/ resolution	16. Actively listen to the perspectives of IP team members	0.68*	Moderate
	17. Take into account the ideas of IP team members	0.65*	Moderate
	18. Address team conflict in a respectful manner	0.58*	Moderate
Team Functioning	19. Develop an effective care plan with IP team members	0.85*	Large
	20. Negotiate responsibilities within overlapping scopes of practice	0.74*	Moderate

*Survey items left blank by participants and "N/A" responses were considered as missing values and not counted in the sample size for calculations.

Dental hygiene student participants

Self-reported pre-test mean scores for dental hygiene students revealed their lowest score (M=5.36) was for item six, which asked about perceived ability to seek out IP team members to address issues in the collaboration core competency area. Scores were highest (M=6.55) for item 16 which asked about perceived ability to actively listen to perspectives of IP team members in the conflict management/ resolution competency area. After the IPE experience, their lowest mean score (M=6.27) was for item four which asked about perceived ability to provide constructive feedback to IP team members in the communication competency area and the highest (M=6.86) occurred for items 16-17 in the conflict management/resolution competency area. The largest mean increase for a paired item among dental hygiene students was .913 for item one, which asked participants about their ability to promote effective communication among members of an interprofessional team. The smallest mean increase for a paired item was .261 for item three which asked participants about their ability to express their own ideas and concerns without being judgmental.

Among dental hygiene student participants, all 20 paired item competencies mean score increases were statistically significant with alpha scores ≤ 0.05; four had large effect sizes (d=0.96 to d=0.81), fifteen were moderate (d=0.53 to d=0.78), and one was small (d=0.48). For dental hygiene participants, large effect sizes were found in four domains: communication, collaboration, roles and responsibilities, and team functioning. The communication domain had one small effect size for dental hygiene student participants. Paired sample t-test results of mean scores before and after the IPE experience and paired mean differences of dental hygiene student participants are shown in Table IV.

Table IV. Paired sample t-test results of mean scores before and after the IPE experience and paired mean differences[**]

	Dental hygiene students				Medical students			
ICCAS items and constructs	**Mean before**	**Mean after**	**Paired mean differences**	**p-values (2-tailed)**	**Mean before**	**Mean after**	**Paired mean differences**	**p-values (2-tailed)**
Communication								
1	5.65	6.57	.913	.000*[a]	5.81	6.38	.577	.001*[b]
2	6.48	6.83	.348	.008*[b]	6.15	6.62	.462	.005*[b]
3	6.48	6.74	.261	.030*[c]	5.96	6.50	.538	.001*[b]
4	5.77	6.27	.500	.002*[b]	5.44	5.92	.480	.001*[b]
5	6.00	6.48	.478	.018*[b]	5.88	6.23	.346	.004*[b]
Collaboration								
6	5.36	6.23	.864	.001*[a]	5.44	6.20	.760	.000*[a]
7	5.95	6.59	.636	.003*[b]	5.85	6.46	.615	.000*[a]
8	5.77	6.59	.818	.004*[b]	5.88	6.44	.560	.001*[b]
Roles and responsibilities								
9	5.87	6.39	.522	.011*[b]	5.69	6.23	.538	.002*[b]
10	6.04	6.61	.565	.001*[b]	6.00	6.31	.308	.018*[b]
11	6.13	6.70	.565	.000*[a]	5.58	6.38	.808	.000*[a]
12	6.00	6.48	.478	.002*[b]	5.67	6.33	.667	.000*[a]
Collaborative Patient/Family-centered approach								
13	5.57	6.38	.810	.003*[b]	5.69	6.19	.500	.001*[b]
14	5.65	6.40	.750	.005*[b]	5.73	6.42	.692	.001*[b]
15	5.86	6.45	.591	.002*[b]	6.20	6.32	.120	.083[c]
Conflict management/resolution								
16	6.55	6.86	.318	.005*[b]	6.04	6.60	.560	.001*[b]
17	6.45	6.86	.409	.004*[b]	6.12	6.56	.440	.005*[b]
18	6.42	6.84	.421	.007*[b]	6.04	6.39	.348	.029*[c]
Team functioning								
19	5.77	6.41	.636	.001*[a]	5.69	6.27	.577	.000*[a]
20	5.95	6.55	.591	.002*[b]	5.44	5.92	.480	.001*[b]

**Paired differences calculations were based on "before" responses subtracted from "after" responses (post-test > retrospective pre-test).

Cohen's d effect sizes values are denoted as: [a] "Large," [b] "Moderate," [c] "Small"

**p*-value significant at ≤.05

Medical student participants

Self-reported pre-test mean scores for medical student participants revealed their lowest score (*M*=5.44) was for the items on providing constructive feedback (item 4), seeking out team members to address issues (item 6), and negotiating overlapping responsibilities (item 20); all from the communication, collaboration, and team functioning core competency areas. Medical student participant pre-test mean scores were highest (*M*=6.20) for their responses regarding perceived ability to include the patient/family in decision-making (item 15) from the collaborative patient/family-centered approach competency area.

Following the IPE experience, medical students had the lowest mean scores (*M*=5.92) for items in the communication

and core competency areas, while they scored highest (M=6.20) for perceived ability to include the patient/family in decision making (item 15). The largest mean increase (.808) was for the paired item 11 which asked about perceived ability to understand the abilities and contributions of IPE team members. The smallest mean increase (.120) was for the paired item 15 which asked about perceived ability to include patient/family in decision-making. Among medical student participants, all paired item mean score increases were statistically significant, except for one paired item (number 15, p=.083). Of the nineteen statistically significant paired items, five had large effect sizes (d=0.82 to d=1.01), thirteen were moderate (d=0.50 to d=0.77), and one was small (d=0.49). Large effect sizes were found in three domains: collaboration, roles and responsibilities, and team functioning, one small effect size was found in the conflict management/resolution domain. Paired sample t-test results of mean scores before and after the IPE experience and paired mean differences for medical student participants are shown in Table IV.

Discussion

The importance of interprofessional collaboration is well documented in the literature[6-8] and IPE learning experiences have been recognized as important for incorporation into all dental hygiene educational programs in accreditation standards.[13] There are numerous ways to design IPE experiences including case studies, classes, simulation, and/or live patient care; each potentially resulting in increased collaborative competence for participants. Assessing the changes in student perceived collaborative competence resulting from live patient experiences similar to the current study is needed to assist educators with the implementation of effective IPE curriculum. It is critical for all dental hygiene educational programs to incorporate IPE into the curriculum and one strategy may be collaboration with other neighboring health care education programs to create IPE experiences to increase collaborative competencies across disciplines.

Dental hygiene student participants in the current study demonstrated statistically significant increases between mean retrospective pre-test and post-test scores in each of the 20 items on the ICCAS. Similarly, Coan et al. found statistically significant increases among dental hygiene students for 80% of the ICCAS items.[26] Three other dental hygiene student IPE studies found increases in collaborative competencies and their perceptions of IPE; however, making comparisons is difficult due to variations of the research design and instruments.[24,25,27] Generally, data from the current study and others suggest students may have positive increases in their perceptions of collaborative competency outcomes as a result of IPE experiences with other healthcare students; supporting the idea that IPE helps meet the ADA CODA accreditation standard 2-15 for communication and collaboration competence with other healthcare team members.[13] These findings support the implementation of IPE into dental hygiene curricula to prepare students for establishing effective work rapport with other health care providers after graduation.

The effect size of paired ICCAS items among dental hygiene students in the current study and participants in the study by Coan et al. were compared. In the current study, large effect sizes were found for the following paired items: promoting communication among team members (item 1), seeking team members to address issues (item 6), understanding abilities and contributions of team members (item 11), and developing effective care plan with team members (item 19) among dental hygiene participants. Coan et al. found 17 of the ICCAS items had large effect sizes for dental hygiene participants which included the same items found in this study.[26] In contrast, paired item three, "express my ideas and concerns without being judgmental," was the only item with a small effect size in this study, whereas Coan et al. did not find any small effects.[26] It is not clear why dental hygiene participants in the current study had a small effect size for this particular item; however, their overall agreement for perceived ability to express their own ideas and concerns without being judgmental increased after the IPE experience.

In the current study, there was a statistically significant increase in self-perceived collaborative competence for medical student participants in 19 (95%) ICCAS items which is similar to results of several other studies.[20-23] Nagge et al. found 95% of ICCAS items were statistically significant among medical student participants.[20] While MacKenzie et al. and Wheeler et al. did not separate their data to look at medical student participants alone, results of their study showed a statistically significant increase between pre-test and post-test scores for 100% of the ICCAS items in a mixed group of participants.[22,23] Data from the current study and others suggests medical students demonstrate benefits from IPE with students from other health care disciplines.

Effect sizes of paired ICCAS items among medical student participants of this study and research by Nagge et al. were compared. Results from both studies revealed large effect sizes for seeking team members to address issues (item 6) working effectively with members to improve care (item 7), understanding abilities and contributions of team members (item11), and recognizing how others' skills and knowledge complement my own (item 12).[20] Additionally, there was a large effect for develop effective care plan with team members

(item 19) in the current study among the medical student participants. In contrast, paired items, addressing conflict in respectful manner (item 18) and including patient/family member in decision-making (item 15), were the only ones with small effect sizes among medical student participants in both studies.[20] There may have been a small effect size for addressing conflict in respectful manner among medical student participants in the current study due to a lack of conflict during the IPE experience since the design of this activity did not include a problem-based scenario that would require conflict resolution. Medical students likely did not perceive a change in their ability to handle team conflict since this was not a challenged aspect for them in the IPE experience.

Results from this study showed a statistically significant increase in self-perceived collaborative competence among all participants in each of the ICCAS items, with the exception of the paired item regarding including patient/family members in decision-making (item 15) for the medical student participants. Similarly, Coan et al. who studied dental hygiene and nursing students, and Nagge at al. who studied medical and pharmacy students, also found this item regarding the inclusion of a patient/family member in decision-making did not have a statistically significant difference between mean pre-test and post-test scores for participants.[20,26] During the live patient IPE experience for this study, most medical student participants did not interact with patient family members since patients often came to the appointment alone, which may explain why there was not a significant increase from pre-test to post-test scores.

The effect sizes of paired ICCAS items among all participants of the current study and all participants in similar IPE studies utilizing the ICCAS were compared. In the current study, each item had moderate or large effect sizes when responses from all participants were combined. This is promising and reinforces the hypothesis that the change effect was not likely the result of chance alone. In the current study, large effect sizes were found among all participants for paired items including promote effective communication among team members (item 1), seeking out team members to address issues (item 6), understanding the abilities and contributions of team members (item 11), and recognizing how others' skills and knowledge complement my own (item 12). Similarly, large effect sizes were found in other studies using the ICCAS for item one,[20,22] item six,[20,22,23] item eleven,[20,23] and item twelve.[20,22,23] These findings indicate that the perceived collaborative competencies in the domains of communication, collaboration, and roles and responsibilities were most affected by the IPE experience.

Paired ICCAS items, seeking out team members to address issues (item 6), and understanding abilities and contributions of team members (item 11), and developing effective care plan with team members (item 19) revealed statistically significant large effect sizes among both dental hygiene and medical students indicating an increase of self-perceived competence for those areas. It is important for health care providers to collaborate with the common goal of optimizing health and quality of life for mutual patients. Increases in self-perceived competence for seeking out other team members is promising and indicates that these future professionals are likely to recognize the value of specialized expertise held by other health care providers and request collaborative assistance to best address oral-systemic health concerns. Large effect sizes for seeking out team members to address issues (item 6), understanding abilities and contributions of team members (item 11), and developing effective care plan with team members (item 19) indicates both professions mutually benefitted from working together. In consideration of best practice standards, intentional curricula planning for future IPE experiences could positively impact health care students when these competencies are taught collaboratively.

The current study found no small effect sizes when the data from all participants was combined, similar to the findings of MacKenzie et al.[20] and Nagge et al.[22] In contrast, Wheeler at al. found small effect sizes for eight ICCAS items; however, the IPE activity was focused on the roles and responsibilities domain which may explain why several small effect sizes were found in other domains.[23]

Results from this study suggest a single-encounter live patient collaborative experience contributed to a positive perception of collaborative competencies for medical and dental hygiene students. A benefit of collaborating during time already devoted to patient care may help avoid a barrier identified by Furgeson et al., that scheduling time within the curriculum for IPE can be challenging.[16] Inviting medical students to participate during live patient care allowed this IPE experience to count towards community engagement curriculum requirements without impinging on didactic classroom time. Likewise, this IPE experience did not require students to devote time to extra assignments in addition to what was already required in their respective programs; thereby avoiding the curriculum overload barrier cited by Furgeson et al.[16] Live patient care IPE experiences may have a positive impact without requiring major expenditures of time and effort by already taxed faculty and students. Considering there was a low investment of time and preparation, the favorable outcome resulting from this experience is promising as a way to facilitate collaborative competence.

Dental hygiene student IPE research has been conducted with a variety of experiences and instruments making it difficult to compare and synthesize results. Future research utilizing validated instruments like the ICCAS would help fill a gap in the literature by making it feasible to compare results and extract meaningful conclusions. Future research should include live patient IPE experiences inclusive of the four core competency domains and all phases of the dental hygiene process of care.

This study had limitations. Participants consisted of a convenience sample of medical and dental hygiene students from one metropolitan area and therefore results are not generalizable to other populations. The retrospective pre-test/post-test survey design may contribute to recall bias in participants. The survey design did not allow participants to elaborate on their ICAAS scoring process, which may have given valuable insight to better understand the paired mean increases. Additionally, paired students collaborated during different phases of the dental hygiene process of care which may have affected how certain ICCAS items were scored. The IPE experience was not designed to intentionally challenge perceived competency in conflict and collaboration with family members. It is possible that in some patient cases, these competency areas may have arisen in conversation between paired students in an inherent way, but this aspect was not ensured and if these had been purposefully built into the experience, the outcome scores may have been different.

Conclusion

A live patient care IPE experience increased perceived collaborative competence among dental hygiene and medical student participants. Including IPE experiences during scheduled clinical time periods may help overcome obstacles such as timing and curriculum rigor constraints, since no didactic class time is required. Dental hygiene curricula should include IPE experiences that incorporate live patient collaborations as an effective method to foster students' perceived collaborative competence and future interprofessional collaboration in the workplace.

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References

1. Kane SF. The effects of oral health on systemic health. Gen Dent. 2017 Nov/Dec; 65(6): 30-4.
2. World Health Organization, Department of Human Resources for Health. Framework for action on interprofessional education and collaborative practice [Internet]. Geneva, Switzerland; World Health Organization, 2010 [cited 2018 Sep 8]. Available from: https://www.who.int/hrh/resources/framework_action/en/
3. Nguyen KH, Seaman K, Saunders R, et al. Benefit–cost analysis of an interprofessional education program within a residential aged care facility in Western Australia. J Interprof Care 2019 Jan; 33(6): 619–27.
4. Illingworth P, Chelvanayagam S. Benefits of interprofessional education in health care. Br J Nurs 2007 Jan; 16(2): 121-4.
5. Rudman WJ, Hart-Hester S, Jones WA, et al. Integrating medical and dental records: a new frontier in health information management. J AHIMA. 2010 Oct; 81(10): 36-9.
6. Baker MJ, Durham CF. Interprofessional education: A survey of students' collaborative competency outcomes. J Nurs Educ. 2013 Nov; 52(12):713-18.
7. Dow A, Thibault G. Interprofessional education: A foundation for a new approach to health care. N Engl J Med 2017 Aug; 377(9): 803-5.
8. Vanderbilt AA, Dail MD, Jaberi P. Reducing health disparities in underserved communities via interprofessional collaboration across health care professions. J Multidiscip Healthc. 2015 Apr; 2015(8): 205-8.
9. Interprofessional Education Collaborative. Team-based competencies: Building a shared foundation for education and clinical practice [Internet]. Washington (DC); Interprofessional Education Collaborative 2011 [cited 2018 Sep 8]. Available from: https://nebula.wsimg.com/191adb6df3208c643f339a83d47a3f28?AccessKeyId=DC06780E69ED19E2B3A5&disposition=0&alloworigin=1
10. Frenk J, Chen L, Bhutta ZA, et al. Health professionals for a new century: Transforming education to strengthen health systems in an interdependent world. Lancent. 2010 Dec; 376(9756): 1923-58.
11. Institute of Medicine. Crossing the quality chasm: A new health system for the 21st century [Internet]. Washington (DC); Institute of Medicine 2001 Mar [cited 2018 Sep 8].

Availablefrom:http://www.nationalacademies.org/hmd/~/media/Files/Report%20Files/2001/Crossing-the-Quality-Chasm/Quality%20Chasm%202001%20%20report%20brief.pdf

12. Interprofessional Education Collaborative. Core competencies for interprofessional collaborative practice: 2016 update [Internet]. Washington (DC); Interprofessional Education Collaborative 2016 [cited 2018 Sep 8]. Available from: https://nebula.wsimg.com/2f68a39520b03336b41038c370497473?AccessKeyId=DC06780E69ED19E2B3A5&disposition=0&alloworigin=1
13. American Dental Association. Accreditation standards for dental hygiene education programs [Internet]. Chicago; Commission on Dental Accreditation, 2019 [cited 2019 Nov 21]. Available from: https://www.ada.org/~/media/CODA/Files/2020_dental_hygiene_standards.pdf?la=en
14. Guraya SY, Barr H. The effectiveness of interprofessional education in healthcare: A systematic review and meta-analysis. Kaohsiung Med Sci. 2018 Mar; 34(3): 160-5.
15. Vries DR, Woods S, Fulton L, Jewell G. The validity and reliability of the interprofessional socialization and valuing scale for therapy professionals. Work. 2016 Mar; 53(3): 621-30.
16. Furgeson D, Kinney JS, Gwozdek, AE, et al. Interprofessional education in U.S. dental hygiene programs: A national survey. J Dent Educ. 2015 Nov; 79(11):1286-94.
17. Furgeson D, Inglehart MR. Interprofessional education in dental hygiene programs and CODA Standards: Dental hygiene program directors' perspectives. J Dent Hyg. 2017 Apr; 91(2):6-14.
18. Casa-Levine C. The value of interprofessional education: Assessing the attitudes of dental hygiene administrators and faculty. J Dent Hyg. 2017 Dec; 91(6):49-58.
19. Tolle SL, Vernon MM, McCombs G, De Leo G. Interprofessional education in dental hygiene: Attitudes, barriers and practices of program faculty. J Dent Hyg 2019 Apr; 93(2):13-22.
20. Nagge JJ, Lee-Poy MF, Richard CL. Evaluation of a unique interprofessional education program involving medical and pharmacy students. Am J Pharm Educ 2017 Dec; 81(10): 80–6.
21. Haber J, Hartnett E, Allen K, et al. The impact of oral-systemic health on advancing interprofessional education outcomes. J Dent Educ 2017 Feb; 81(2):140-8.
22. MacKenzie D, Creaser G, Sponagle K, et al. Best practice interprofessional stroke care collaboration and simulation: The student perspective. J Interprof Care 2017 Jul; 31(6): 793–6.
23. Wheeler S, Valentino AS, Liston BW, et al. A team-based learning approach to interprofessional education of medical and pharmacy students. Curr in Pharm Teach Learn 2019 Nov; 11(11): 1190–5.
24. Allen HB, Gunaldo TP, Schwartz E. Creating awareness for the social determinants of health: Dental hygiene and nursing students interprofessional service-learning experiences. J Dent Hyg 2019 Jun; 93(3):22-8.
25. McGregor MR, Lanning SK, Lockeman KS. Dental and dental hygiene student perceptions of interprofessional education. J Dent Hyg 2018 Dec; 92(6):6-15.
26. Coan LL, Wijesuriya UA, Seibert SA. Collaboration of dental hygiene and nursing students in hospital units: An interprofessional education experience. J Dent Educ 2019 Jun; 83(6):654-62.
27. Infante TD, Arevalo-Flechas LC, Ford LA, et al. Community service learning: An effective vehicle for interprofessional education. J Res Interprof Pract Educ 2015 May; 5(1):1-11.
28. MacDonald CJ, Trumpower DL, Cragg B. Designing and operationalizing a toolkit of bilingual interprofessional education assessment instruments. J Res Interprof Pract Educ. 2010 Dec;1(3):304-16.
29. Archibald D, Trumpower D, MacDonald CJ. Validation of the interprofessional collaborative competency attainment survey (ICCAS). J Interprof Care. 2014 May; 28(6):553-8.
30. Violato EM, King S. A validity study of the interprofessional collaborative competency attainment survey: An inter-professional collaborative competency measure. J Nurs Educ. 2019 Apr; 58(8):454-62.
31. Schmitz CC, Radosevich DM, Jarline P, et al. The interprofessional collaborative competency attainment survey (ICCAS): A replication validation study. J Interprof Care. 2017 Sep; 31(1):28-34.
32. Field A. Discovering statistics using IBM SPSS statistics. Fourth Edition. London: Sage Publications Ltd; 2013. p.79-82.