Collaborative Skill Building in Dentistry and Dental Hygiene through Intraprofessional Education: Application of a quality improvement model

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Abstract

Purpose: The purpose of this study was to apply a quality improvement model in the application of an intraprofessional educational experience by improving student perceptions of collaboration and increasing the number of collaborative experiences within the dental hygiene curriculum.

Methods: A quality improvement model, Plan, Do, Study, Act (PDSA) developed by the Institute for Healthcare Improvement (IHI), was used to initiate an intraprofessional education experience for dental hygiene and dental students. Faculty members utilized the PDSA worksheet to plan, implement, and analyze the educational experience. Pre- and post-session surveys were used to measure dental hygiene student perceptions of their ability to perform four Interprofessional Education Collaborative (IPEC) sub-competencies. Statistical analysis was carried out on the pre and post session surveys. Students were also given the opportunity to discuss their learning and intraprofessional experiences in a reflection assignment.

Results: Dental hygiene students demonstrated positive changes from pre- to post-session survey data in in all four targeted IPEC sub-competencies. Statistical significance was noted in three of the four IPEC sub-competency rating statements. Themes from the reflection assignments indicated student learning in the areas of teamwork and communication. Dental hygiene faculty applied the information gained from the assessments as part of the IHI PDSA cycle for improvement in health care to evaluate and plan for future learning experiences.

Conclusion: Meaningful intraprofessional education experiences between dental hygiene and dental students support collaborative practice skills and should be integrated into dental and dental hygiene curricula. Applying a continuous quality improvement model, such as the IHI PDSA, can assist educators in planning, implementing, and evaluating curricular changes in order to improve student learning outcomes.

Keywords: intraprofesional collaboration, intraprofessional education, dental hygiene education, quality improvement models

This manuscript supports the NDHRA priority area: **Professional development: Education** (Educational models).

Submitted for publication: 6/7/17; accepted 7/9/18

Introduction

Academic communities in dental hygiene have been advocating for collaborative practice models between dental and dental hygiene providers through formal curricular training dating back to 1986.[1] Intraprofessional education involves students from different disciplines within the same profession to learn from, about and with, each other.[2,3] Kee and Darby discussed the development of mutual respect and understanding as positive collaborative practice outcomes resulting from intraprofessional education.[1]

More recently, both Hamil and Formicola, et al. have promoted the inclusion of intraprofessional learning activities in dental education.[2,4] Specifically, Formicola et al. state that "cost-effective, efficient quality oral health care depends upon teamwork in dental practice."[4] The authors also emphasize the need to focus renewed attention on collaboration within the dental workforce, beginning with educational experiences, especially in the clinical arena.[4] Research conducted on intraprofessional learning attitudes and perceptions within dentistry, as well as in other health professions, indicates

that both students and professionals value intraprofessional learning and agree that shared, formal learning models can improve teamwork and communication.[3,5-7] However, a study conducted by Brame et al., indicates that the majority of dental and dental hygiene curricula do not include an emphasis on intraprofessional education.[5]

A lack of focus in intraprofessional education could be a result of the increased attention to interprofessional education (IPE), defined as education that occurs when individuals from two or more professions learn about, from and with each other.[8] The foundational knowledge and skills needed for effective collaboration from either an interprofessional or intraprofessional perspective are complimentary[2] and both perspectives are necessary to prepare students to practice collaboratively.[2-7] Collaborative practice has been defined as occuring when health care workers from different professional backgrounds provide comprehensive care by working with patients, their families, and communities.[7] The Commission on Dental Accreditation (CODA) promotes collaborative practice through required educational accreditation standards.[9] Dental hygiene Standard 2-15 requires competency in communicating and collaborating with other members of the health care team to support comprehensive patient care.[10] IPE as well as intraprofessional education experiences can serve to support Standard 2-15. Specifically, intraprofessional educational experiences within dentistry can encourage comprehensive patient care through co-assessment and co-therapy.[3]

Faculty developing intraprofessional educational activities emphasizing the use of collaborative skills can refer to the Interprofessional Education Collaborative (IPEC) competencies to guide student learning,[11] as these collaborative behaviors are foundational to both types of learning. The IPEC competencies, created by a panel of health education organizations including American Dental Education Association, focus on the promotion of collaborative behaviors among health students and health professionals.[11] The IPEC expert panel established four main competency domains for collaborative practice: Values and Ethics (VE), Roles/Responsibilities (RR), Interprofessional Communication (CC), and Teams and Teamwork (TT).[11]

While not specifcially defined in the literature, barriers for intraprofessional education may mimic barriers for IPE. Furgeson and Inglehart found that over half of the hygiene program directors in the United States consider IPE as an important initiave for the dental hygiene community, fewer than half consider it to be important for their academic institutions.[9] Casa-Levine's survey of dental hygiene program directors and faculty in the Northeastern United States showed that a majority of the respondents recognized the value of IPE in order to prepare students for collaborative practice; however, only 6% reported extensive application of IPE into their program curriculum.[12] This discrepancy is not surprising as dental hygiene educators have been shown to experience similar barriers related to integrating IPE into their programs, as compared to other health professional programs.[2,9,13-15] Common issues include difficulties with schedule coordination, an overloaded curriculum, and the lack of necessary faculty training required to create meaningful IPE experiences.[2,9,13-16] Administrative support along with identifiying leaders within the academic institution, are also crucial to the success of both IPE and intraprofessional education initiatives.[17]

Studies by Leisnert, et al. and Reinders, et al. measured competencies in professional roles and responsibilities gained through intraprofessional learning experiences between dental and dental hygiene students and reported positive outcomes resulting from these experiences.[18,19] Understanding professional roles and responsibilities is fundamental to team-based care and intraprofessional educational experiences can provide students with opportunities to discuss their training and respective scope of practice. Leisnert, et al. noted that intraprofessional experiences increased dental student knowledge regarding the professional roles of dental hygienists.[18] while Reinders, et al. found both dental and dental hygiene student attitudes had shifted regarding tasks considered to be "dentist-centered" following an intraprofessional intervention.[19]

The Institute for Healthcare Improvement (IHI) is a non-governmental organization founded in 1991 as part of the National Demonstration Project on Quality Improvement in Healthcare.[20] The IHI works with health care systems along with other countries and organizations on improving quality, safety and value in healthcare.[20] Using a business management model created by the Associates for Process Improvement, the Plan-Do-Study-Act (PDSA) cycle was developed by the IHI as a means to begin improvement efforts on a small scale as a means to leverage the learning gained to plan for scaling up for a system-wide change.[21] The IHI Model for Improvement poses three questions as the basis for the PDSA cycle: "What are we trying to accomplish?"; "How will we know that a change is an improvement?"; "What changes can we make that will result in improvement?".[21] The Model for Improvement as created by the IHI is not meant to replace an exisiting change model within an institution or organization but rather serve to accelerate improvement.[21] By utilizing the scientific method, the PDSA focuses on what has been learned through planning and observation of the results in real work settings.[21]

Louisiana State University Health-New Orleans (LSUHNO) established a Center for Interprofessional Education and Collaborative Practice (CIPECP) in 2015 to support the development and implementation of collaborative learning experiences across its six schools, including the dental, dental hygiene and dental laboratory technology programs housed in the School of Dentistry (SOD). As the SOD is separated by a significant distance from the other LSUH-NO schools, creating logistical challenges in creating IPE activities, dental and dental hygiene faculty members explored educational opportunities to engage in intraprofessional collaborative practice activities within the SOD. The dental hygiene faculty was also interested in developing a program that could be part of a formal curriculum management plan as required by CODA Standard 2-24.[10] With this is mind, faculty wanted to utilize principles of continuous quality improvement in order to systematically plan, implement, and evaluate such an activity. Dental hygiene faculty at the SOD received support from the CIPECP to develop the intraprofessional educational experience as part of a pilot project utilizing the IHI PDSA Model for Improvement. Quality improvement models such as the IHI PDSA have been used in health care professions;[22,23] however, there is a gap in the literature regarding its use in dental hygiene education. The purpose of this pilot study was to apply a quality improvement model to the development of a new intraprofessional educational experience, as a foundational activity to prepare students for future collaborative practice.

Methods

The educational pilot study was developed as a quality improvement initiative within the dental hygiene and dental programs in the SOD at LSUH-NO during the spring semester of 2017. An intraprofessional experience was integrated into an existing first year dental hygiene clinical course. Institutional Review Board approval was not required. Dental hygiene and dental faculty and members of the CIECP utilized the IHI PDSA worksheet,[24] to plan and evaluate the outcome of the intraprofessional activity focused on measuring change in student perceptions in four targeted IPEC sub-competencies. (Figure 1). Data was collected for the purpose of evaluating the activity as part of the PDSA Model for Improvement. The IHI PDSA worksheet outlining the process of the activity is shown in Figure 2.

Thirty-one first year dental hygiene students (n=31) participated in the intraprofessional experience as a required activity during their second semester, clinical dental hygiene course. Each student was scheduled for one session in the oral diagnosis clinic which took place twice a week over a period of 10 weeks. Each dental hygiene student was paired with a third-year dental student during an oral diagnosis patient appointment. All dental hygiene students were oriented to the rotation at the same time by the same dental hygiene faculty member. Students were provided a paper copy of the learning session document. The document included the definition of IPE, the four IPEC sub-competency student learning objectives, discussion topics and details on the time and location of the rotation. Students were instructed to introduce themselves to their assigned dental student on the day of the rotation and were also expected to introduce themselves to the patient and explain their role during the appointment, independent of the dental student.

Figure 1. Faculty Selected IPEC[11] Sub-competency Areas

- **Roles and Responsibilities (RR1):** Communicate my roles and responsibilities clearly to the patient, family, and other health professionals.
- **Teams and Teamwork (TT3):** Engage other health professionals in shared patient-centered and population-focused problem solving.
- **Interprofessional Communication (CC2):** Communicate information with patients and families in a form that is understandable, avoiding discipline-specific terminology.
- **Interprofessional Communication (CC4):** Listen actively, and encourage ideas and opinions of other team members.

Dental hygiene students participated in collecting information included in the initial assessment (oral exam findings and periodontal assessment findings), while also observing the communication between the dental student and the patient and/or family. Dental hygiene students were instructed to make note of the use and context of discipline-specific terminology and any positive aspects of the communication made by dental students to the patient and/or family during the visit.

Dental hygiene and dental students were expected to discuss aspects of the appointment following the session. The post-session discussion was to be guided by the following topics identified on the intraprofessional education session document: review the positive aspects of communication between the student and patient; work together to find other terminology/phrases that can be used to explain assessment

Figure 2. Institute for Healthcare Improvement Plan-Do-Study-Act Worksheet[24]

PDSA Worksheet
Objective: Develop and implement an intraprofessional education experience using the framework utilized to develop an interprofessional experience with the goal of improving dental hygiene student perceptions in targeted IPEC sub-competencies.
1. Plan: Plan the test, including a plan for collecting data. **Questions and predictions:** The intraprofessional experience will improve dental hygiene student perceptions in targeted IPEC sub-competencies. **Who, what, where, when:** The intraprofessional educational experience will be integrated into an existing dental hygiene course during the spring 2017 semester. First year dental hygiene students will attend one oral diagnosis rotation with a third-year dental student. **Plan for collecting data:** Dental hygiene student perceptions will be measured through a voluntary pre- and post-survey. In addition, they will be asked to evaluate and reflect on the experience.
2. Do: Run the test on a small scale. **Describe what happened:** Dental hygiene and dental students were paired during an oral diagnosis clinic rotation which included the initial assessment of a patient. **What data did you collect?** Dental hygiene student perceptions of their ability to perform the IPEC sub-competencies, student evaluation of the experience, and suggestions to improve the experience. **What observations did you make?** See results for the pre- and post-surveys, student evaluation, and student reflection.
3. Study: Analyze the results and compare them to your predictions. **Summarize and reflect on what you learned:** Dental hygiene students demonstrated positive changes from pre- to post-scores in all four targeted IPEC sub-competencies. All student feedback was positive. Results are consistent with the prediction.
4. Act: Based on what you learned from the test, make a plan for your next step. **Determine what modifications you should make — adapt, adopt, or abandon:** The intraprofessional education experience was adopted for the first year dental hygiene students. Faculty will adapt various aspects of the intraprofessional experience based on the limitations identified. New changes will be tested on a larger scale.

and treatments to patients in a form that is understandable; discuss the options for treatment and plan for prevention from the perspective of a dental hygienist and dentist. No recordings were made of the student statements during the post-session discussions.

Prior to the assigned session in the oral diagnosis clinic, each dental hygiene student received a standardized email from a dental hygiene faculty member requesting their participation in a pre-session survey, prior to meeting their assigned dental student. A link to the survey was embedded in the email. Students received a second email the day after their rotation requesting participation in a post-session survey to be completed the same day. Pre- and post- session survey participation was voluntary; accessing the email implied consent to participate.

The pre-session survey included four questions and the post-session survey included seven questions. The first four questions on both surveys were identical and were directly related to students' perceptions of their ability to perform the four identified IPEC sub-competencies for the learning experience. The post-session survey included two additional components evaluating the intraprofessional experience and an additional question requesting suggestions for improvement. Students also had the option to complete a reflection assignment which included the following two open-ended questions: "Was the intraprofessional experience meaningful to your learning? If so, why?" and "How could this experience affect how you interact with other professions in the future?".

Dental hygiene student perceptions of their ability to perform the IPEC sub-competencies before and after the intraprofessional experience were measured using a Likert scale ranging from strongly disagree to strongly agree (1 to 5). The same scale was used to measure the responses regarding the activity questions in the post-session survey. Analyses were performed using the Statistical Analysis System, version 9.4 (SAS Institute; Cary NC). Pre/post session survey paired comparisons were performed using the t-test. A dental hygiene faculty member and the CIPECP director evaluated student suggestions for improving the learning experience and analyzed the two reflection questions for common themes. After the questions were independently themed, the faculty member and the CIPECP agreed upon the common themes.

Results

Twenty-nine dental hygiene students (n=29) participated in the pre-session survey; however three students completed the demographic questions, but did not answer the perception questions. Twenty-seven students (n=27) participated in the post-session survey; one student did not answer the perception

questions. After the data was cleaned for missing responses, twenty-six paired data sets (n=26) remained for an overall participation rate of 84%. Statistical significance (p<.05) was noted in pre-and post-survey scores for three IPEC sub-competencies: Teams and Teamwork (TT3); Interprofessional Communication (CC2) and (CC4). No statistical significance was found for Roles and Responsibilities (RR1). Table I provides a summary of the IPEC sub-competencies data analysis.

Thirteen students (n=13) responded to the post-survey open-ended question regarding suggestions to improve the learning experience. All responses contained positive feedback. Two students indicated the experience could be improved if the dental students were more informed about the rotation and one student requested for dental hygiene students to have more active engagement during the patient evaluation/assessment. Table II summarizes the student evalu-ation of the intraprofessional learning experience.

A total of 29 students (n=29) completed the reflection assignment. All students indicated that the experience was meaningful to their learning with the majority of students commenting positively on the opportunity to learn from, about and with the dental students. When asked how the experience might influence future interactions with other health care professionals, the respondents discussed how the experience increased their confidence with communication skills. Table III provides an overview of four themes identified in the reflection assignments and respective student quotes.

Table I Dental Hygiene Student Perceptions of Achieving IPEC Sub-Competencies (n=26)

IPEC Sub-Competency	Pre-Survey Mean (SD)	Post-Survey Mean (SD)	Post-Pre Survey Mean (SD)	*p value*
I am able to communicate my roles and responsibilities clearly to the patient, family, and other dental professionals (RR1).	4.28 (0.67)	4.48 (0.58)	0.20 (0.50)	0.0569
I am able to engage other dental professionals in shared patient-centered and population-focused problem solving (TT3).	3.88 (0.72)	4.44 (0.65)	0.56 (0.65)	0.0002*
I am able to communicate information with patients and families in a form that is understandable, avoiding discipline-specific terminology (CC2).	4.20 (0.76)	4.64 (0.56)	0.44 (0.82)	0.0131*
I am able to listen actively, and encourage ideas and opinions of other team members (CC4).	4.28 (0.73)	4.76 (0.43)	0.48 (0.71)	0.0026*

*Denotes statistical significance $p<.05$

Table II: Student Evaluation of the Intraprofessional Learning Experience (n=26)

Question	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
This intraprofessional activity increased my confidence in participating on an intraprofessional team with dental providers.	0%	0%	0%	26.92% (n=7)	73.08% (n=9)
This intraprofessional activity increased my appreciation for a team-based approach to healthcare.	0%	0%	0%	19.23% (n=5)	80.77% (n=21)

Discussion

Developing, implementing, and assessing intraprofessional education activities in an academic environment can be challenging; however, results from this pilot project demonstrate that even brief intraprofessional experiences can be meaningful to student learning. Incorporating a continuous quality improvement cycle model, such as the IHI PDSA[21], when introducing a new educational methodology or curriculum, can be beneficial to both the educator and the learner by testing for change within the work setting. [21] The IHI PDSA process utilizes predicted changes as part of the planning process followed by an analysis of the results of the intervention as compared to the prediction and reflection on what was learned in the process. [21]

In this study, faculty predicted that dental hygiene student perceptions in targeted IPEC sub-competencies would improve following the intraprofessional

Table III. Reflection Assignment Themes and Student Quotes

Theme	Student quote
Increased confidence when speaking to other professionals/ students (n=3)	*"This experience put me at ease when talking to other professions. It also made me feel valued."*
Importance of providers working together (n=6)	*"Now I understand how important it truly is for all professions to be on the same page."*
Team approach will benefit the patient (n=7)	*"I learned that communication is key, and in order to do what's best for the patient, the dentist and dental hygienist should be able to discuss options and treatment plans in a professional manner."*
Importance of collaborative practice, using non-discipline specific language (n=3)	*"The rotation helped me to really focus on how the dental student talked with the professor and the patient while presenting the case. I enjoyed using proper dental terminology with the student clinician and then explaining the same information to the patient in a way the patient could understand."*

experience. Results demonstrated positive changes in all four targeted IPEC sub-competencies. Changes in perceptions regarding the ability to engage other dental professionals in problem solving (TT3) showed the strongest level of statistical significance. Examining which aspect of the learning activity may have influenced this change is part of the PDSA process. One component of the learning activity included a discussion between the dental and dental hygiene students regarding possible treatment options for the patient. Integrating a discussion component between the students after the patient encounter had the potential to strengthen dental hygiene students' perceptions of their abilities for TT3.

Results from the pre-session surveys showed that students scored themselves relatively high in the IPEC sub-competency areas of RR1, CC2, and CC4. Over-estimation of one's level of competence can be explained by the Dunning-Kruger effect.[25] Novices who are potentially incompetent in collaborative healthcare delivery skills, but are unaware of their incompetence, can overestimate their actual performance.[25] In this pilot study, students' higher estimation of their competency in collaborative skills could explain the weaker statistical significance when comparing the changes for CC2 and CC4, and why there was no statistical significance for RR1. Another factor that may have contributed to the low statistical difference found in RR1 for dental hygiene students is that this intraprofessional experience was embedded in the early portion of the second semester of the dental hygiene curriculum and the students may have been less confident regarding their full scope of practice.

A significant limitation of this intraprofessional experience was the lack of information regarding the dental student perceptions in the selected IPEC sub-competencies either prior to or following the activity. One of the advantages of using the PDSA process for quality improvement is that each intervention is carried out on a small scale, analyzed and changes implemented prior to the next cycle. [21]

Other limitations of the pilot project initial outcomes include one site implementation and a single learning experience. Participation in the pre and post survey assessments was voluntary, which could explain why some students did not participate in the survey or why some questions were not answered.

The final aspect of the PDSA cycle focuses on planning the next steps in the activity or intervention. Modifications are discussed and decisions to adapt, adopt or abandon are made. Based on the results from this pilot study, dental hygiene faculty members decided to adopt this intraprofessional experience for first year dental hygiene students with adaptations made based on the limitations previously identified. Dental students' perceptions of their ability to perform the IPEC sub-competencies will be measured in future intraprofessional education experiences. Future considerations will also include moving beyond the assessment of perceptions and including assessment of student knowledge. Targeted questions supporting RR1 such as "What is the role of a dentist and/or what is the role of a dental hygienist?" could be included in the pre-session survey. Completion of a validated communication instrument, such as the Communication Assessment Tool[26] could be incorporated into the intraprofessional experience to provide further support for CC2.

Additional modifications include having the same dental hygiene faculty member orient both the dental hygiene and dental students prior to beginning the clinical rotation experience. Having the same dental hygiene faculty member deliver the orientation and expectations of the learning experience will enhance consistency of information. Differences between intraprofessional and interprofessional education and

their roles in successful collaborative practice can be emphasized in future orientations. Participation in surveys assessments could also be a required aspect of the rotation.

Results from the pilot project provided faculty members with sufficient information to improve future intraprofessional experiences as part of a continuous quality improvement process. Increasing the number of meaningful and sustainable collaborative experiences within the curriculum addresses accreditation standards[10] in addition to aligning student learning with healthcare delivery expectations. Utilization of the IHI PDSA cycle[21] provided a formalized process for the pre-planning, implementation, analysis and future plans for implementing an intraprofessional experience at LSUH-NO.

Conclusion

Meaningful intraprofessional education experiences between dental hygiene and dental students support collaborative practice skills and should be integrated into dental and dental hygiene curricula. Offering ongoing opportunities for intraprofessional collaboration will support students as they prepare for collaborative practice. The IHI Model for Improvement and the PDSA cycle provides health care organizations with a process for testing change in real-world settings. Applying continuous quality improvement models, such as the IHI PDSA, can assist educators in planning, implementing, and evaluating curricular changes in order to improve student learning outcomes.

Disclosure

This study was supported in part by 1 U54 GM104940 from the National Institute of General Medical Sciences of the National Institutes of Health, which funds the Louisiana Clinical and Translational Science Center. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

Acknowledgements

Bobby Moore, MA, assisted in the development and coordination of the IPE activity and Julie H. Schiavo, MLIS, AHIP assisted in the literature review and formatting of the references.

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