

Innovations in Dental Hygiene Education

Attitudes of Dental Hygiene and Nursing Students Following a Simulation Activity

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Abstract

Purpose: Interprofessional education (IPE) activities assist health care professionals outside of dentistry learn about the importance of oral care and its connection to overall health, while also encouraging the integration of dental hygienists into primary health care teams. The purpose of this study was to evaluate the effect of a simulation activity on dental hygiene and nursing students' attitudes about interprofessional collaboration (IPC).

Methods: Second-year dental hygiene (n=35) and nursing students (n=45) from a community college in the Midwestern United States were recruited to participate via e-mail. Participants completed an online module about oral care and ventilator-associated pneumonia followed by the Interprofessional Education Collaborative (IPEC) Competency Self-Assessment Survey version 3 prior to participating in an IPE simulation activity. The IPEC survey measures two domains: interprofessional interaction and interprofessional values. Following the simulation activity, participants completed the survey again. A Wilcoxon signed-rank test compared pre/post-survey responses.

Results: A total of 61 students completed the pre-IPE survey (73%; dental hygiene: n= 29, nursing: n=32); and a total of 38 students (47%) completed the post-IPE survey. Ten post-IPE surveys were excluded in the final analysis (dental hygiene: n=15, nursing: n=13). A significant difference was found between pre-IPE and post-IPE scores for the interprofessional interaction domain ($p<.001$). No difference was found for the interprofessional values domain ($p<.18$).

Conclusions: Participants had a high regard for IPC and their attitudes improved following the simulation activity. Open-ended responses indicated an increase in knowledge of the importance of IPC and a heightened awareness of professional roles and responsibilities. Interprofessional activities are needed across the health professions curricula to provide future collaboration and quality patient care.

Key Words: interprofessional education, interprofessional collaboration, professional attitudes, dental hygiene education, nursing education, health professions curricula, ventilator-associated pneumonia

This manuscript supports the NDHRA priority area, **Professional development: Education** (interprofessional education).

Submitted for publication: 10/17/20; accepted 5/10/21

Introduction

The oral cavity is a recognized source of inflammation,^{1,2} yet approximately 70% of medical school curricula only include five hours or less of oral health content and 10% do not have any education or training in oral health.¹ Until recently, few healthcare professions had defined oral health education training or required oral health competencies as part of their curricula. Interprofessional education (IPE) activities that include oral healthcare providers, have been shown to be a vital component for teaching effective and comprehensive patient care.¹ Such activities allow future health care providers from other disciplines to learn about the

oral cavity and how oral health influences systemic health, as well as proper preventive care.

To meet the demands of an evolving and complex healthcare system and the cultural shift towards interprofessional collaboration (IPC) and partnerships, new models of IPE may increase the quality and cost-effectiveness of care. Interprofessional education is defined as when “students from two or more professions learn about, from and with each other to enable effective collaboration and improve health outcomes.”³ Health professions accreditation standards now require some form of IPE in most curricula. In dental hygiene

education there are two standards required for accreditation by the Commission on Dental Accreditation (CODA).⁴ Standard 2-15 states, "Graduates must be competent in communicating and collaborating with other members of the health care team to support comprehensive patient care."⁴ Standard 2-19 states, "Graduates must be competent in the application of the principles of ethical reasoning, ethical decision-making and professional responsibility as they pertain to the academic environment, research, patient care and practice management."⁴ Thus, to create sustainable and longitudinal IPE activities, coordination across academic institutions, local health systems, and community partners is required for successful IPE learning activities.⁵ In conjunction with core competencies, IPE activities help institutions move beyond profession-specific learning to interactive learning, where students from different professions learn from each other. This collaboration can lead to measurable, outcome driven universal objectives that are applicable to all health professions. From a dental perspective, IPE highlighting the importance of oral care can enlighten and empower other health care profession students to implement best practices, thereby improving confidence, collaboration, and patient outcomes.

As health care models highlight the importance of IPC and evidence continues to show a bidirectional relationship between oral health and systemic disease, there is an opportunity to incorporate oral health into IPE learning activities.¹ Oral health care providers and other health professionals should be taught to recognize the oral manifestations of systemic diseases and understand the implications of poor oral health on the overall well-being of a patient.⁶ Because research suggests that dental hygiene⁷ and nursing program directors⁸ agree that IPE activities improve teamwork and patient care, health care professional programs and community partners should strive to implement successful IPE activities. However, common barriers to IPE activities include communication, schedule coordination, and curriculum overload. Accreditation standards have become more specific about what constitutes quality IPE and health care professional programs are working to overcome these barriers by exploring new learning activities including classroom or lab simulations.

Interdisciplinary teams are common to care for patients who suffered a stroke, with head and neck cancers, undergoing methamphetamine addiction treatment, and treating chronic conditions, such as hypertension, diabetes, and polypharmacy.⁹ As such, interventions from a variety of health care providers can help prevent, manage, and treat medical conditions to reduce healthcare costs, increase patient satisfaction, and improve patient outcomes.⁹ In general, IPE initiatives involve medical, nursing, pharmacy, respiratory, social work, and

physical therapy students.¹ While research discussing IPE activities involving oral health providers is available, there is room for improvement on documentation of interprofessional experiences emphasizing the oral-systemic connection.¹ The purpose of this study was to evaluate the effect of an IPE simulation activity on dental hygiene and nursing students' attitudes regarding IPC.

Methods

This study was granted approval from the Institutional Review Boards of Parkland College and A.T. Still University. A cross-sectional, pre/post-survey design was used.

A convenience sample of dental hygiene (n=35) and nursing students (n=45) from a Midwest community college were invited to participate via email. Potential participants had to be second-year students in the dental hygiene or nursing associate degree programs at the college. Participants were excluded from analyses if they did not complete all survey questions or if they did not complete the survey before (pre-IPE) and after (post-IPE) the simulation activity. Participation was completely voluntary and did not affect student grades. All participants completed an informed consent form before participation.

Simulation activity

The complications associated with meth mouth in overall health and role of oral health to reduce the risk of ventilated-associated pneumonia (VAP) following intubation were highlighted in a simulation activity for this study. The simulation IPE model was based on recommendations of the Interprofessional Education Collaborative (IPEC)³ and included a framework based on the oral-systemic connection enabling students to learn the importance of oral care in overall health from each other. The simulation activity was a faculty-driven project designed to meet interprofessional accreditation standards. Prior to participating in the simulation activity, participants were asked to complete an online module that outlined the epidemiology of VAP, contributing factors, evidence-based practices to prevent VAP, proper oral care of a ventilated patient, and the roles and responsibilities of each profession. At that time of the education module, the pre-IPE survey was emailed to the participants. All survey responses were anonymous, and no identifying information was collected.

The IPE activity was performed at the simulation lab at the college. Dental hygiene and nursing students were evenly divided into three labs. To avoid curriculum overload and scheduling conflicts, dental hygiene and nursing faculty agreed to incorporate the oral care component of the activity

into an existing simulation within the nursing curriculum. The simulation activity focused on an intubated burn patient. The standardized patient was a 35-year-old male with third-degree burns from a methamphetamine lab explosion. A briefing session was held prior to the simulation. Students discussed that due to the fact that the injuries were from a methamphetamine lab explosion, it was likely that the patient used methamphetamine; therefore, would have manifestations of meth mouth. Dental hygiene students were able to provide education to nursing students on the characteristics of meth mouth, how meth mouth could cause complications during intubation because of the possibility of tooth mobility and brittle teeth, as well as how poor oral health could compromise the patient's recovery. In addition to meth mouth manifestations, discussion centered on the importance of oral care to reduce the risk of VAP. Once the simulation started, the nursing students were expected to stabilize the patient before the dental hygiene students could perform oral care. The simulation was stopped several times for teaching and discussion during each session, allowing students to explain their roles and rationales for care. A de-briefing session was held immediately following the simulation.

Survey instrument and distribution

The IPEC model highlights four competency domains: values and ethics for interprofessional practice, roles and responsibilities, communication, and teamwork.³ Using IPEC guidelines for validity, Dow et al¹⁰ created the IPEC Competency Survey instrument in 2014. This 42-item survey is categorized by the four competency domains and can be used to structure curricula. The survey was designed to assess competency based IPEC objectives with a valid, reliable, and practical evaluation instrument.¹⁰

Lockeman et al. revised the original survey but retained its psychometric strengths in 2016.¹¹ The updated IPEC Competency Self-Assessment Survey version 3 was used with permission for this study. Unlike the original, this survey measures two domains: interprofessional interaction (e.g., communication and shared problem solving) and interprofessional values (e.g., embracing diversity in health professionals and patient-centered care). The revised survey can be used for multiple health professions and includes sixteen 5-point Likert scale items, where 1 point represents strongly disagree and 5 points represent strongly agree. Since the simulation lab did not involve direct patient care interactions, several items in the values and ethics domain of the original IPEC Competency Survey instrument would have been inappropriate. Other advantages of using the IPEC

Competency Self-Assessment Survey version 3 included that the shorter version might encourage a higher response rate and that the attitudes of dental hygiene and nursing students had not been previously studied using this version.

Students completed the survey prior to (pre-IPE) and following (post-IPE) the simulation activity. Both versions were the same, except the post-IPE survey included the following open-ended questions: "What is the most significant lesson you learned from your interprofessional experience?" and "How has this experience influenced your interprofessional role development?" Participants were asked to address one or all of the following in their response: "Your roles and responsibilities for collaborative practice, interprofessional communication, interprofessional teamwork and team-based care." The final question was, "What could we do to improve the experience?" Participant demographic information (health profession, age, sex, and race) was also collected.

Two weeks before the simulation activity, students were e-mailed a link to an electronic version of the IPEC Competency Self-Assessment Survey version 3 (pre-IPE survey). Once all three simulation lab sessions were complete, students were again e-mailed a link to the survey (post-IPE survey). The survey was accessed using SurveyMonkey (San Mateo, CA).

Statistical analysis

Data were analyzed using SPSS version 25 statistical software (IBM Corp: Armonk, NY). Responses from dental hygiene and nursing students were analyzed together. Descriptive statistics were summarized using frequency and percentages and survey results were summarized using median and interquartile range. Responses for the two domains of the survey (interprofessional interaction and interprofessional values) were summarized using mean and standard deviation (SD) to calculate a domain score. Due to the small sample size, a Shapiro-Wilk test was used and determined that the data were not normally distributed. A Wilcoxon signed rank test, was used to compare pre-IPE and post-IPE survey responses. A $p < .05$, two-tailed, was considered statistically significant.

Results

A total of 61 students (48% dental hygiene, $n=29$; 53% nursing, $n=32$) consented to participate and completed the pre-IPE survey for a response rate of 73%. Participants were predominantly female (90%, $n=55$), aged 21 to 29 years (67%, $n=40$), and White (95%, $n=58$). Demographics of the participants who completed the pre-IPE survey are shown in Table I.

A total of 38 students completed the post-IPE survey for a response rate of 47% ($n=61$). Eight participants who

Table I. Pre- IPE participant demographics (n=61)

| Demographic Characteristic | n (%)* |
|----------------------------|-----------|
| Health profession | |
| Dental hygiene | 29 (48.0) |
| Nursing | 32 (53.0) |
| Age, y | |
| 18-20 | 6 (10.0) |
| 21-29 | 40 (67.0) |
| 30-39 | 8 (13.0) |
| 40-49 | 5 (8.0) |
| 50-59 | 1 (2.0) |
| Prefer not to answer | 1 (2.0) |
| Sex | |
| Male | 5 (8.0) |
| Female | 55 (90.0) |
| Prefer not to answer | 1 (2.0) |
| Race | |
| Asian or Asian American | 1 (2.0) |
| Black | 1 (2.0) |
| White | 58 (95.0) |
| Other | 1 (2.0) |

*Percentages may not equal 100% because of rounding.

completed the post-IPE survey had not completed the pre-IPE survey and were excluded. Two participants began the survey but did not complete it and were also excluded, leaving a total of 28 participants (n=15 dental hygiene and n=13 nursing) in the analyses.

Overall, participants demonstrated a high initial regard for interprofessionalism (Median=4, Agree) and showed an improvement in attitudes following the simulation activity (Median=5, Strongly Agree). Responses by item to the pre- and post-surveys are presented in Table II. The mean and median were used to display data; the mean provides an average of the scores, whereas the median provides an accurate depiction of scores without being affected by extreme scores in an ordinal scale.

Domain scores (interprofessional values and inter-professional interactions) for the pre-IPE and post-IPE surveys are presented in Table III. Participant scores (dental hygiene and nursing) were grouped together for both domains. The median was used as the measure of central tendency because the results were skewed. When

comparing the pre-IPE and post-IPE domain scores, a difference was found for the interprofessional interaction domain ($p<.001$) but not for the interprofessional values domain ($p<.18$).

Open-ended responses

Student responses to the open-ended questions of the post-IPE survey were mostly positive. In response to the question about the most significant lesson learned from the interprofessional experience, one nursing student wrote, “It wouldn’t have occurred to me to include a dental hygienist on an ICU, but it makes perfect sense. I also hadn’t realized how much need there is in our community for access to appropriate dental care.”

To the same question, a dental hygiene student responded with, “I’ve realized that my job is much more than just educating patients. I hope to attend and be involved in more interprofessional team-based care in years to come. As I do that, I will need to educate not only my patients, but other healthcare professionals that I am around. I hope they will do the same for me.” Another nursing student shared, “I believe dental hygienists are a valuable tool that many hospitals are missing out on. While working in the hospital I can attest that many patients are underserved with relation to oral care, even though there is high emphasis being put on its completion by management during routine chart audits. I believe this would be solved by the utilization of skilled dental hygienists.”

Responses to the open-ended question regarding how the experience influenced professional role development showed insight into the students’ commitment to professional roles and responsibilities for collaborative practice, interprofessional communication, and teamwork and team-based care. One nursing student wrote, “I believe that this experience has allowed me to strengthen my teamwork/team-based care because I better understand what other professions can do within their scope of practice.” Another reported, “I have realized that the oral care I provide for my patients that I have been taking for granted is much more important that I realized. Yes, I knew this information but in participating in this experience the importance of even the most basic care that you and I do twice a day without thinking is critical and crucial for our patients’ condition while in the hospital.” Another straight forward, but poignant statement was, “Everyone works very hard in their profession and not to take anyone for granted.”

Discussion

The effect of a simulation activity on dental hygiene and nursing students’ attitudes about IPC were assessed using the IPEC Competency Self-Assessment Survey version 3. Scores for individual survey items for the pre-IPE survey were relatively high and improved for the post-IPE survey, which suggested students had a high regard for IPC prior to the simulation activity and were

Table II. Pre- and Post- IPE participant responses*

| Survey Item | Pre-IPE (n=61) | | Post-IPE (n=28) | |
|--|----------------|-------------|-----------------|------------|
| | Median (IQR)** | Mean (SD)** | Median (IQR) | Mean (SD) |
| I am able to choose communication tools and techniques that facilitate effective team interactions. | 4.0 (1) | 3.9 (.994) | 4.0 (1) | 4.5 (.582) |
| I am able to place the interests of patients at the center of interprofessional health care delivery. | 4.0 (1) | 4.1 (.813) | 5.0 (1) | 4.7 (.485) |
| I am able to engage other health professionals in shared problem-solving appropriate to the specific care situation. | 4.0 (2) | 3.6 (1.129) | 4.0 (1) | 4.4 (.643) |
| I am able to respect the privacy of patients while maintaining confidentiality in the delivery of team-based care. | 5.0 (1) | 4.5 (.637) | 5.0 (1) | 4.7 (.471) |
| I am able to inform care decisions by integrating the knowledge and experience of other professions appropriate to the clinical situation. | 4.0 (1) | 3.7 (.983) | 5.0 (1) | 4.7 (.496) |
| I am able to embrace the diversity that characterizes the health care team. | 4.0 (2) | 4.1 (.900) | 5.0 (1) | 4.7 (.846) |
| I am able to apply leadership practices that support effective collaborative practice. | 4.0 (2) | 3.9 (.994) | 5.0 (1) | 4.5 (.582) |
| I am able to respect the cultures and values of other health professions. | 4.0 (1) | 4.4 (.629) | 5.0 (1) | 4.7 (.471) |
| I am able to engage other health professionals to constructively manage disagreements about patient care. | 4.0 (2) | 3.5 (1.071) | 5.0 (1) | 4.6 (.504) |
| I am able to develop a trusting relationship with other team members. | 4.0 (1) | 4.2 (.772) | 5.0 (1) | 4.7 (.485) |
| I am able to use strategies that improve the effectiveness of interprofessional teamwork and team-based care. | 4.0 (2) | 3.7 (1.090) | 5.0 (1) | 4.6 (.504) |
| I am able to demonstrate high standards of ethical conduct in my contributions to team-based care. | 4.0 (1) | 4.2 (.833) | 5.0 (1) | 4.6 (.852) |
| I am able to use available evidence to inform effective teamwork and team-based practices. | 4.0 (1) | 3.7 (1.013) | 5.0 (1) | 4.4 (.917) |
| I am able to act with honesty and integrity in relationships with other team members. | 5.0 (1) | 4.4 (.737) | 5.0 (1) | 4.7 (.846) |
| I am able to understand the responsibilities and expertise of other health professions. | 4.0 (2) | 3.8 (1.056) | 5.0 (1) | 4.6 (.578) |
| I am able to maintain competence in my own profession appropriate to my level of training. | 4.0 (1) | 4.2 (.568) | 5.0 (1) | 4.6 (.496) |

*Responses based on a 5-point Likert scale, where 1=strongly disagree and 5=strongly agree.

** interquartile range; standard deviation

Table III. Post-IPE participant domain scores* (n=28)

| Domain | Median | Minimum | Maximum |
|---------------------------------------|--------|---------|---------|
| Interprofessional Interactions | | | |
| Pre-IPE | 3.9 | 2.1 | 5.0 |
| Post-IPE | 4.7 | 3.8 | 5.0 |
| Interprofessional Values | | | |
| Pre-IPE | 4.3 | 2.8 | 5.0 |
| Post-IPE | 5.0 | 2.8 | 5.0 |

*IPEC survey version 3

already aware of the importance of interprofessional skills and collaboration. When comparing the pre-IPE and post-IPE survey domain scores, the interprofessional interaction domain significantly improved following the simulation activity; however, the interprofessional values domain remained about the same. These findings support those of Lockeman et al., who also found a negative correlation between these domains.¹¹ Lockeman et al., noted that this negative correlation may be because as students began to understand the importance of the interprofessional model they also recognized the challenges of collaborative teams.¹¹

Open-ended questions were included in the survey, because Lockeman et al.¹¹ suggested that such self-reflective content from students adds depth to quantitative results as shown in the selected quotes from the participants. Overall, the collaborative experience was successful on several levels and met core competencies laid out by IPEC.³ First, students were able to use the knowledge of one's own role and those of other professionals to appropriately assess and address the health care needs of the simulation scenario as demonstrated by the dental hygiene and nursing students in this study. Second, students were able to apply relationship-building values and the principles of team dynamics to perform and communicate effectively in different team roles to plan, deliver, and evaluate patient-centered care for a ventilated simulated patient. Lastly, significant changes were noted in the attitudes of dental hygiene and nursing students and the participants' statements indicated increased understanding of the role of interprofessional communication and a deeper understanding of both professions was shown. Findings from this study corroborate with previous literature demonstrating the importance of incorporating IPE into curricula to improve students' attitudes of working in interprofessional teams.^{6,12}

Self-assessment

Student attitudes about working in multidisciplinary teams were assessed as part of the IPEC survey. Bose et al. stated that knowledge was related to self-assessment, which

was defined as observation and evaluation of behavior in addition to one's reaction and interpretation of that behavior.¹³ In another study by Cole et al.¹⁴ individuals with low knowledge tended to overrate their knowledge, whereas those with high knowledge tended to underrate their knowledge. Both studies^{13,14} emphasized the need to incorporate several IPE activities into the curricula for students to develop self-assessment skills and be able to identify knowledge gaps and stay current in practice.¹⁵ Even though the validity of self-assessment can be problematic, the information gathered from these assessments can be an effective means for students to reflect on their performance and formulate ways for improvement. Further, research suggests that self-assessment during training encourages sustainable behaviors.¹³ Questionnaires are the most common way to conduct self-assessments,¹³ but feedback from a supervisor, which can be obtained during de-briefing sessions as in this study, can also be beneficial.

Since attitudes influence behaviors, health care educators should work to understand the attitudes of their students regarding IPC to strengthen the collaborative spirit of future health care providers. As demonstrated in this study, using the IPE model to emphasize the oral-systemic connection to students outside of dentistry can be a powerful method for establishing a strong commitment to team-based care in future practice. This study also highlighted the urgent necessity of promoting medical-dental integration as the new norm. Viewed through the Health Professions Accreditors Collaborative competencies,⁵ findings from this study demonstrated the benefits of using a standardized patient to increase dual identity development, contribute to professional expertise in team-based care, with the ultimate goal of improving the quality of health care delivery and patient safety.

Research suggests that health care professional students generally have positive attitudes toward IPC at baseline.^{11,12} Studies investigating IPE activities based on IPEC competencies have also found improvements in attitudes towards collaborative care^{12,16,17} and results from this study appear to corroborate these findings. Other studies investigating IPC have also included open-ended questions and de-briefing sessions to the design to add depth to the quantitative results.^{16,17} Clinical exposure, interprofessional experience, and professional values have been shown to significantly influence the ability of students to collaborate in clinical practice.^{16,17} The mostly positive responses the open-ended questions in this study also support these findings.

As IPE research moves to measure other health outcomes (i.e., behavior/skills, teamwork, organizational culture), it

is beneficial to gain an understanding of student's attitudes regarding IPE. Groessl and Vandenhouten¹⁸ found that student's initial attitudes towards IPE and collaboration were positive, however experience led to an early reduction in attitude scores. This can be alluded to the "reality check" as students begin to experience the challenges and stereotypes that are accompanied with working in interdisciplinary teams. Although, attitudes have also been shown to improve steadily over time as students understand the overarching goal of improving patient outcomes.^{11,12,18}

Limitations and future research

This study had limitations. The response rates for the pre-IPE and post-IPE surveys were relatively low; this study can serve a pilot study for future research. The timing of the simulation activity within the curriculum may have been a barrier and limitation to the findings. The IPE simulation occurred at the end of the semester, so students could apply concepts learned over the semester to the activity. This may have inflated positive survey responses. The timing of the simulation may have also contributed to the lower post-IPE survey response rate because the dental hygiene students were taking finals and nursing students were preparing for graduation.

Student attitudes were assessed after a single IPE activity, which may affect the generalizability of results. Future studies should include assessment of student attitudes after multiple IPE activities throughout the curriculum and could include other health professions students, such as respiratory therapy and pre-medicine students, for a larger sample size. Such designs would increase the validity of study results. Also, while the IPEC Competency Self-Assessment Survey version 3 has internal validity, response bias is always a potential limitation of self-reported data. As no other studies using IPEC Competency Self-Assessment Survey version 3 to assess dental hygiene student attitudes about IPC have been reported in the literature, it was not possible to compare results from this study to previous research in dental hygiene.

Although open-ended questions were included as part of the post-IPE survey, future studies should consider using a true mixed-methods approach to obtain a more comprehensive view of student attitudes. From an education perspective, the simulation preceptor could use quantitative and qualitative data to provide formative feedback based on observations of the students' collaborative behavior during the activity.¹¹ Health care educators should also consider implementing a design like the simulation in the hospital setting as part of a clinical rotation, so students can experience the integrative care firsthand. Such an experience would likely add definitive

value to interprofessional attitudes. Ideally, IPE activities should be implemented throughout an entire curriculum. Results from this study could also be used as a baseline for incorporating more IPE into curriculum for early learners, so educators can better understand how attitudes evolve during a student's academic career. In addition to suggestions for increased IPE activities, the importance of faculty development should be considered, especially because health care faculty members are often the driving force behind IPE activities. Effective training and faculty calibration are required to create authentic and meaningful educational experiences across interdisciplinary boundaries.³

Conclusion

The dental hygiene and nursing students in this study had positive attitudes towards IPC prior to participating in an IPE simulation activity. Attitudes towards IPC were shown to improve significantly following the simulation, while values remained the same. Structured interactions among health professions students, such as IPE activities, can allow educators to break down barriers associated with profession-specific learning and prepare students to be leaders and collaborators within interprofessional teams. As the demand for more collaborative health care providers continue to grow along with the increasing evidence regarding the relationship between oral and systemic health, it is crucial for dental hygiene educators to take advantage of the IPC framework to establish a defined role for dental hygienists as members of primary health care teams.

Acknowledgements

This study would not have been possible without the support and cooperation of the dental hygiene and nursing faculty and students at Parkland College, Champaign, IL.

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