Utilizing Simulation Training Modules to Improve Infection Control in a Dental Practice

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Problem Statement

A crucial part of care that all health care providers face is maintaining proper infection control in health care settings to lessen the risk of cross-contamination and disease spread (Upendran et al., 2023). While delivering care in a dental practice, there is a chance that the clinician and patient can be exposed to infectious agents in different ways, such as direct contact with skin or mucous membranes, indirect contact with surfaces or dental devices, inhalation, ingestion, or injection (Bromberg & Brizuela, 2023; De Paola & Grant, 2019). Bromberg & Brizuela (2023) specifically discuss how dentists and dental hygienists use various sharp instruments and local anesthesia needles that pose a risk of percutaneous injuries, which are a common mistake in dental settings that can expose clinicians to bloodborne pathogens, such as human immunodeficiency virus (HIV), hepatitis B virus (HBV), and hepatitis C virus (HCV), making infection control practices highly necessary. Therefore, standard precautions must be taken to decrease the likelihood of clinicians and patients contracting transmissible diseases (Bromberg & Brizuela, 2023; Volgenant & de Soet, 2018). The Centers for Disease Control and Prevention (CDC) (2024) express how vital it is for a dental practice to stay updated on the best infection control standard precautions when new research is conducted to prevent exposure risks. Simulation-based training for the dental professional entails active engagement in learning activities and assessments to have the ability to follow correct infection protocol. Examples include determining correct sterilization strategies for certain equipment or the proper order of donning/doffing PPE for contamination prevention through scenario-based simulations. Overall, it is imperative that dental office personnel have access to simulated training modules on the latest information to promote safe practices and infection control standard precautions.

Instructional Design Model

The Successive Approximations Model (SAM) is a repetitious procedure that supplies instructional designers with a succinct way to create instructional materials (Allen, 2012). SAM allows for the timely development of information that is particular, measurable, achievable, and logical to meet the needs of learners (Allen, 2012). Most dental practices do not have a large number of employees, which is the first reason SAM was chosen, specifically Level 1 SAM (SAM1). This version consists of administering three cycles of evaluation, design, and development to refine the solution until the design team is satisfied with the outcome (Allen, 2012). An example of how we will use the SAM1 cycle would be in the evaluation phase; the team will distribute a questionnaire that evaluates the current infection control knowledge of the dental staff to determine the design and development of the modules. The team decided to use SAM1 instead of the ADDIE Model because the ADDIE Model can be time-consuming and is generally more applicable for larger companies (Allen, 2012). Additionally, since COVID-19, infection control practices are actively evolving to provide patients with the best and safest dental care and must be implemented by dental personnel quickly, so SAM1 seems more appropriate due to continuous change in the dental field (Allen, 2012; CDC, 2024). Ultimately, SAM1 promotes refinement for frequent changes in information, constant advancement, and collaborative efforts (Allen, 2012).

Learner Analysis

To analyze the learners, the design team will discuss the pertinent needs of the targeted learners using research and previous knowledge. To move forward with the analysis, we will utilize Cheng et al.'s (2023) sixty-nine-question self-report questionnaire to examine a dental staff's current knowledge of infection control practices, which will be distributed to the target

learners. The instructional design team will use the data gathered from the learners' answers to determine what information will be needed in the simulation training modules. Cheng et al.'s (2023) questionnaire has four main groups, which include "personal characteristics, perception and attitude towards infection control procedures, exposure risk and training, and knowledge about and perception and attitude towards infectious disease."

In addition to evaluating knowledge, the design team will also assess the motivational factors that impact the learners' willingness to adopt and practice appropriate infection control practices. Being able to identify and understand the factors that influence dental personnel compliance will help shape our simulation activities. The "exposure risk and training" and "knowledge about and perception and attitude towards infectious disease" sections will be used to help assess motivational components (Cheng et al., 2023). Ultimately, it is important for the dental staff to have motivation to implement and maintain appropriate practices. The details gathered will assist us in determining the answers to the following questions:

1. Who is the target audience?
2. Why do they want to learn more about infection control practices?
3. What do learners already know about infection control practices?
4. How do they intend to implement the knowledge in real life settings?
5. What motivational factors can be employed to promote engagement in learning and implementation of infection control guidelines?

According to Cheng et al. (2023), the findings of the self-report questionnaire depicted that the majority of dental personnel were aware of proper infection control practices in a dental setting and were about 90% compliant overall with standard infection control guidelines (Cheng et al., 2023). However, Cheng et al.'s (2023) questionnaire also portrays that among dental

personnel there is still a deficiency in infection control protocol that warrants more training and consistent evaluation. Important insights are brought about from the questionnaire, which include knowledge of mandatory personal protective equipment (PPE) and surface/item disinfection, education on sterilization of various dental instruments, an understanding of glove usage and hand hygiene, and comprehension of the legal and ethical implications around infection control practices (Cheng et al., 2023). The important insights will allow the team to analyze the target audience regarding the previous questions. It is key to utilize the information collected to understand the needs of the learners in order to create training modules that will promote improvement.

Needs Analysis

When examining the information from Cheng et al.'s (2023) study, it can be concluded that many dental care workers may not have sufficient training or fall into poor habits regarding infection control procedures. Therefore, it is necessary to develop simulated training modules that are not only theoretical but also practical. Utilizing simulation-based training modules is the most effective approach because it allows learners to be actively engaged and reinforces critical thinking skills, which is imperative in the dental world. Using the data gathered from the learners' answers to the questionnaire for the learner analysis, we are able to conduct the needs analysis, where the team has discovered that certain areas of infection control practices are insufficient. To summarize, these modules should provide proper instruction on the areas of infection control practices where the staff is insufficient while taking into account the perceptions, attitudes, and years of experience of dental care workers.

According to Azimi et al. (2024), it is important to provide standardized training opportunities, evaluations, and recommendations to dental staff on a regular basis. All of this

ensures that all personnel receive proper training to improve infection control in dental offices (Azimi et al., 2024). In a survey conducted among 3,042 dentists from different parts of the United States, they recognized the importance of receiving continuing education in order to meet the requirements established by the CDC (Cleveland et al., 2012). It is also worth mentioning that even though there is sufficient knowledge about infection control, dental personnel still do not adhere to the guidelines due to the lack of regular training and competency evaluations (Garland, 2013). Insufficient training as well as not having routine evaluations are identifiable gaps that need to be addressed.

Among dental students, the Commission on Dental Accreditation (CODA) ensures that all future dental personnel are competent in proper infection control practices (CODA, 2025). It is necessary to design an appropriate didactic curriculum for baccalaureate dental hygiene programs that provide clinical development and critical thinking skills while complying with infection control principles (Garland, 2014). The integration of theoretical curriculum into real-life experiences is achieved when learners apply classroom lectures in real-world situations. Moreover, Garrison & Vaughan (2011) suggest that collaborative engagement and self-reflection enhance active learning. It is recommended that teachers facilitate scenarios where students can promote peer interaction and critical reflection, as these qualifications ensure students' development as critical thinkers (Garrison & Vaughan, 2011). Just as teachers must facilitate scenarios for student growth, instructional designers should foster situations that enhance learner growth. Furthermore, this valuable information motivates us to design an appropriate infection control curriculum to engage dental staff in adequate learning experiences through simulated training modules that will ensure all employees are maintaining safe infection control practices.

In addition, legal and ethical principles for safe infection control protocol are of paramount importance. Furthermore, continuous training and evaluation will help dental staff to maintain appropriate practices. The simulated training modules should be centered around dental personnel being able to provide responses to the following questions:

1. Why is it important to follow infection control procedures?
2. What are standard precautions for infection control?
3. What are the types of decontamination?
4. Who will be impacted by improper infection control practices?

Learning Objectives

Although the target learners are employed in the health sector, there remains a need to strengthen their foundational knowledge of infection control, as certain errors continue to occur in daily practice (Azimi et al., 2024). According to McCoy, it is essential to conduct regular training within a supportive and culturally responsive environment, where continuous evaluation by supervisors helps strengthen infection control knowledge and ensure proper compliance (McCoy et al., 2001). Therefore, the instructional team developed a series of learning objectives based on Bloom's Taxonomy, progressing systematically from lower-order cognitive skills, such as remembering and understanding, to higher-order skills, including applying, analyzing, and creating infection control practices.

In order to enable dental care personnel to obtain the latest information on infection control and promote safe practices as well as standard precautions, we will provide the following learning objectives.

Upon completion of the simulated training modules, dental care workers should be able to:

1. Define the principles of infection control within a dental care setting. (Remembering)

2. Describe the importance of hand hygiene and the appropriate use of personal protective equipment (PPE) for dental personnel. (Understanding)
3. Determine the correct sterilization processes for specific dental instruments and equipment. (Applying)
4. Select effective strategies to minimize the transmission of respiratory pathogens in a dental environment. (Analyzing)
5. Design monitoring procedures to ensure that infection control precautions remain current and consistently applied within a dental office. (Creating)

The first learning objective establishes the foundational level, where learners demonstrate basic knowledge of infection control principles. At the second level, learners describe the importance of proper practices for effective hand hygiene and the appropriate use of personal protective equipment (PPE). At the third level, learners apply their knowledge by determining and performing correct sterilization processes. Progressing to the analyzing level, learners examine strategies to minimize the transmission of respiratory pathogens within the dental environment. Finally, at the highest level, learners develop and implement a monitoring plan for infection control for the dental office, ensuring adherence to infection control recommendations and promoting full compliance with Centers for Disease Control and Prevention (CDC) guidelines.

To put these learning objectives into practice, we will use Bloom's Taxonomy as a framework for student instruction. According to Bloom and his collaborators, the original taxonomy developed in 1956 was divided into three domains of learning: cognitive, affective, and psychomotor (Valiathan, 2023). Although all three domains are important, we chose to apply the learning objectives to the cognitive domain to ensure competence and focus on its six main

levels: remembering, understanding, applying, analyzing, evaluating, and creating (Valiathan, 2023).

It is important to note that the first level of Bloom's Taxonomy, remembering, involves the learner's ability to recall and memorize information. The next level, understanding, refers to the learner's capacity to understand, explain, and interpret that information. This understanding facilitates advancement to the application level, where learners apply their knowledge in practical or new situations. At the analyzing level, the learner develops the ability to examine, compare, and differentiate information critically. Finally, the highest stages, evaluating and creating, emphasize the learner's ability to integrate ideas, make informed judgments, and create original work. Ultimately, in these final stages, learners can both critique the work of others and produce their own in a meaningful and coherent manner (Valiathan, 2023).

These categories are organized from the simplest to the most complex, forming a hierarchy in which the lower levels provide the foundation for higher-order thinking skills. Although the term "taxonomy" was not widely used at the time, many educators recognized the significance of this framework. Consequently, it became highly influential and was translated into more than twenty-two languages and modified (Krathwohl, 2002). According to Valiathan (2023), the latest version of Bloom's Taxonomy is depicted below.

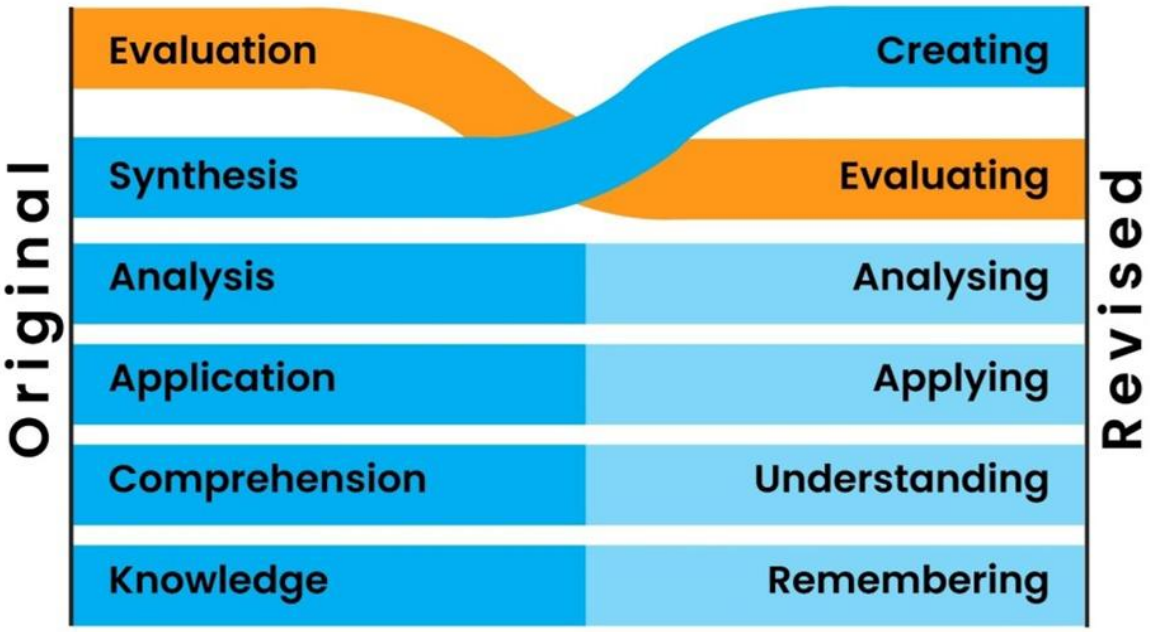

Figure 1 . Revision of Bloom's Taxonomy (Valiathan, 2023)

Instructional Strategy Selection

When designing the simulated training modules, the instructional design team gravitated towards utilizing various learning theories, such as authentic learning, behaviorism, constructivism, and cognitivism. The diverse mixture of these learning theories allows us as the design team to develop simulation training modules that have a complex approach to skill acquisition, knowledge transfer, and clinical problem-solving (Ertmer & Newby, 2018; Lee et al., 2022). The combination of authentic learning, behaviorism, constructivism, and cognitivism can help create simulation training modules that move from basic skill-building and understanding to real-world decision-making scenarios (Ertmer & Newby, 2018; Lee et al., 2022). By intentionally using these learning theories throughout the training experience, learners can gradually progress from step-by-step guided practice in the modules to independent

application (Ertmer & Newby, 2018; Lee et al., 2022). The authentic learning, behaviorism, constructivism, and cognitivism frameworks are more effective for the creation of simulated training modules than other theoretical frameworks because they each address a significant part of how clinicians learn procedural and decision-making skills (Felix & Simon, 2022). Ultimately, the integration of these various learning theories supports better comprehension, long-term retention, and improved dental infection control compliance (Felix & Simon, 2022).

The authentic learning theory is an educational approach that consists of developing and using activities that connect to actual real-life tasks, procedures, or problems (Lee et al., 2022). This approach can improve the engagement of learners and motivation towards content material (Lee et al., 2022). The design team believes that utilizing the authentic learning theory is beneficial for the creation of simulation training modules on dental infection control because it concentrates on providing learners with authentic learning activities that will be applicable in clinical dental settings (CDC, 2024; Lee et al., 2022). An example of a simulation activity that promotes the authentic learning theory would be analyzing and differentiating between scenario images and videos in the module that depict correct and incorrect strategies to reduce airborne pathogen transmission, where the learner will have to choose the correct strategy. Additionally, the alignment between training activities and real clinical expectations helps ensure that learners can readily apply their skills during real clinical situations involving infection control (Lee et al., 2022). Furthermore, the utilization of the authentic learning theory is beneficial in designing simulation training modules due to its ability to focus on providing real-world scenarios that will transfer into practical use in a dental facility.

Ensuring that appropriate infection control standards are followed in a dental setting is imperative, and all dental personnel should understand and follow the same recommended

guidelines (CDC, 2024). Previously, we identified that not all dental professionals have sufficient training and knowledge of proper infection control practices (Cheng et al., 2023). In addition to using the authentic learning theory, the team made the decision to use the behaviorism, constructivism, and cognitivism frameworks for developing simulation training modules on dental infection control practices that can help address the deficiency gaps by concentrating on providing dental staff with critical infection control guidelines (Ertmer & Newby, 2018). An article by Felix & Simon (2022) discusses the use of behaviorism, constructivism, and cognitivism in medical education simulation training, which suggests that the combination is crucial to providing well-rounded and comprehensive simulated training modules in health care education due to their different concentrations on learning. Essentially, to ensure proper development of simulated training modules on dental infection control guidelines in a dental office, the behaviorism, constructivism, and cognitivism frameworks are necessary.

Behaviorism allows the learners to focus on repetitive practice, clear expectations, and immediate feedback so that learners develop correct infection control practices. Constructivism encourages learning by letting learners actively engage in authentic scenario-based simulation training and build knowledge based upon previous experiences and decision-making. Cognitivism supports learners by concentrating on how learners process and retain content, ensuring that important infection control principles are retained and memorized efficiently. The behaviorism, constructivism, and cognitivism frameworks let individuals learn the necessary content to remember and understand, then apply the appropriate practices when analyzing various infection control situations (Ertmer & Newby, 2018; Valiathan, 2023). This approach allows learners to assess situations about infection control in a risk-free way to further build knowledge, understanding, and confidence in skills (Felix & Simon, 2022). Overall,

behaviorism, constructivism, and cognitivism promote beneficial learning experiences that can help prepare dental professionals for safe and compliant infection control practices (Ertmer & Newby, 2018; Felix & Simon, 2022).

Course Development Plan

Refined Learning Objectives

Upon completion of the simulated training modules, dental care workers should be able to:

1. Identify the principles of infection control their respective process orders within a dental care setting with at least 90% accuracy on a principles quiz. (Remembering)
2. Describe the importance of hand hygiene and the appropriate use of personal protective equipment (PPE) for dental personnel utilizing a reflection prompt and a concept map with at least 90% accuracy. (Understanding)
3. Determine the correct sterilization processes for specific dental instruments and equipment by completing an interactive decision-making simulation with at least 90% accuracy. (Applying)
4. Select effective strategies to minimize the transmission of respiratory pathogens in a dental environment with at least 90% accuracy on a scenario-based quiz. (Analyzing)
5. Design monitoring procedures to ensure that infection control precautions remain current and consistently applied within a dental office by creating a workplace checklist for all employees who must score at least a 90% or better on a post-review quiz. (Creating)

Activities & Assessments

In order for dental workers to fully understand the importance of the basic principles of infection control, we have decided to implement a series of activities designed to enhance their comprehension and practical application of these principles. These activities will enable

participants to remember, understand, apply, analyze, and ultimately create their own monitoring systems within their workplaces based on dental infection control guidelines (Valiathan, 2023). We also incorporated generative strategies that will help learners encode the information into memory, such as active recall, where learners can actively use the knowledge learned to apply it in scenario-based simulation modules, and repetition, where learners can have access to and continue to take quizzes even after passing them to reinforce important points. Ultimately, the activities aim to create a meaningful educational environment in which learners can first recall and understand the fundamental principles of infection control, then progress to analyzing, applying, and integrating these principles into real-world clinical situations.

The design team also created assessments designed not only to measure understanding but also to strengthen cognitive skills. Post-quizzes will evaluate knowledge retention and comprehension, while digital concept maps will serve as visual summaries of each participant's learning. There will also be a chance for learners to reflect on the importance of hand hygiene through a reflection prompt. Additionally, interactive activities as well as videos will encourage students to explore the qualities that define a competent dental professional in specific clinical scenarios (Kim & Park, 2025). Through this process, dental professionals will be able to apply their knowledge, engage in self-evaluation, and contribute to the creation of an effective and ethical clinical environment. Overall, the assessments are carefully aligned with the stated objectives to ensure competency when implemented into the dental office once training is completed.

	Learning Objectives	*Activities*	*Assessments*
LO 1 (Remembering)	Upon completion of the simulated training modules dental care workers will be able to identify the principles of infection control and their respective process orders within a dental care setting with at least 90% accuracy on a principles quiz.	· Multiple choice pre-training quiz on infection control principles within the module. · Watch short videos on dental infection control principles and do a drag and drop "put in order" game after reviewing the videos.	· Multiple choice and Likert scale question post-training quiz on infection control principles within the module.
LO 2 (Understanding)	Upon completion of the training program dental care workers will describe the importance of hand hygiene and the appropriate use of personal protective equipment (PPE) utilizing a reflection prompt and a concept map with at least 90% accuracy.	· Watch videos about hand hygiene and PPE. · Kahoot game with multiple choice and true/false questions on hand hygiene and donning/doffing PPE.	· Create a concept map to demonstrate their understanding of the steps for good hand hygiene and PPE appropriate use. · Complete a reflection prompt to describe the importance of hand hygiene.
LO 3 (Applying)	Upon completion of the training program dental workers will determine the correct sterilization processes for specific dental instruments and equipment by completing an interactive decision-making simulation with at least 90% accuracy.	· Watch videos about critical, semi-critical, and non-critical sterilization and disinfection guidelines in demo mode. · Demonstrate proper sterilization procedures and disinfection guidelines for critical, semi-critical, and non-critical items through interactive simulation-based scenarios in training mode.	· Complete an interactive decision-making simulation assignment in assessment mode, applying infection control practices in clinical simulation-based scenarios.

LO 4 (Analyzing)	Upon completion of the training program dental care workers will select effective strategies to minimize the transmission of respiratory pathogens in a dental environment with at least 90% accuracy on a scenario-based quiz.	· Watch the video "If saliva were red" (ADS, 2023). · Analyze scenario images/videos in the module showing correct and incorrect strategies to reduce airborne pathogen transmission.	· Complete an interactive quiz evaluating scenarios and suggesting improvements based on guidelines within the module.
LO 5 (Creating)	Upon completion of the training program dental care workers will design monitoring procedures to ensure that infection control precautions remain current and consistently applied within a dental office by creating a workplace checklist for all employees who must score at least a 90% or better on a post-review quiz.	· Develop a workplace infection control checklist to use in their workplace. · Create a mini-educational poster or infographic to monitor infection control procedures.	· Review key points of infection control procedures and complete a final post-review interactive quiz. · Complete satisfaction survey.

Instructional Materials and Technology Integration

According to Issa et al. (2011), the use of multimedia instructional materials promotes better knowledge acquisition in the health care field. Therefore, we integrated a variety of educational and technological resources to create engaging and motivating learning experiences to achieve learning outcomes for dental personnel. The multimedia instructional materials and modules will be located in the Adobe Learning Manager system with the content created from the Adobe Captivate app, which can be accessed on any device (Adobe, 2025). The Adobe Learning Manager system allows learners to view content in different modes, such as demo, training, and assessment (Adobe, 2025). The Adobe Learning Manager system also allows learners to interact with scenario-based simulations that will definitely help apply knowledge and

promote critical thinking that were developed through Adobe Captivate (Adobe, 2025). In short, the simulation training modules in the Adobe Learning Manager system will include different multimedia instructional materials that will effectively support the learning objectives.

The instructional materials for teaching the principles of infection control within a dental care setting will consist of a pre-training quiz, videos, an interactive drag-and-drop game, and a post-training quiz. The pre-training quiz will be for learners to gauge their current understanding of infection control guidelines within the first module. There will be short videos within the first module about the principles of infection control within a dental office, such as surface/item disinfection, sterilization of various dental instruments, and glove usage, as well as legal and ethical implications around infection control practices (Cheng et al., 2023). The videos are designed to be step-by-step demonstration guides for each part of the infection control guidelines, so learners can grasp the content and remember the processes more effectively, as research has shown in dental education (Forni et al., 2023). After reviewing the videos, there will be an interactive drag-and-drop game to place the steps of each process in order from beginning to end. Lastly, the first module will conclude with a post-training assessment quiz on the infection control principles using multiple-choice and Likert scale questions.

To describe the importance of hand hygiene and the appropriate use of personal protective equipment (PPE), videos, a Kahoot-style game, a reflection prompt, and the creation of concept maps will be used. The videos will encompass the steps of proper hand hygiene and donning/doffing PPE in the second module (Cheng et al., 2023). Afterwards, a Kahoot-style game will be played by learners in the second module, which will include true or false and multiple-choice questions related to the content in the videos about hand hygiene and donning/doffing PPE. Next, the learners will have the opportunity to describe the importance of

hand hygiene through a reflection prompt. Finally, the second module will end with the learners being asked to create a concept map to demonstrate their understanding of the processes of hand hygiene and donning/doffing PPE in a dental facility.

In order to determine the correct sterilization processes for specific dental instruments and equipment, the Adobe Captivate simulation modes will be utilized in the Adobe Learning Manager system during module three, which include demo, training, and assessment (Adobe, 2025). First, learners will watch videos on proper sterilization and disinfection procedures for critical, semi-critical, and non-critical equipment in a dental office in Adobe Captivate's demo mode (Adobe, 2025; Azimi et al., 2024). Next, learners will practice demonstrating proper sterilization procedures and disinfection guidelines for critical, semi-critical, and non-critical items through interactive simulation-based scenarios in training mode (Adobe, 2025; Azimi et al., 2024). After sufficient practice, learners will complete an interactive decision-making simulation assignment in assessment mode, applying infection control practices in clinical simulation-based scenarios (Adobe, 2025; Azimi et al., 2024). Ultimately, interactive simulation-based scenarios ensure learners practice real-world scenarios to help prepare for the clinical setting (Forni et al., 2023).

To select effective strategies to minimize the transmission of respiratory pathogens in a dental facility, learners will watch the Association of Dental Safety's (2023) video, "If saliva were red," examine scenario images/videos in module four, and conclude with a quiz on the content. The "If saliva were red" video depicts how airborne and bloodborne pathogens can be transmitted to surfaces, objects, and individuals and will help learners visualize and understand the importance of strategies to minimize transmission (ADS, 2023; CDC, 2024). Then, the learners will assess scenario images/videos in module four. These images/videos will be showing

correct and incorrect strategies to reduce airborne pathogen transmission, and they will have to click on the correct strategy. Using images and videos of incidents will help the learners think critically of the best way to respond to decreasing the risk of airborne and bloodborne transmission (ADS, 2023; CDC, 2024; Forni et al., 2023). After practicing evaluating scenarios, the learners' knowledge will be examined through an interactive quiz, and evaluating scenarios and suggested improvements will be given for the specific situation based on guidelines if the learner answers incorrectly.

The instructional materials for designing monitoring procedures to ensure that infection control precautions stay current and consistently applied within a dental office include developing a workplace infection control checklist, a mini-educational poster or infographic, and completing a final post-review quiz. Each individual will create an infection control checklist in module five and then come together as a group to review the summarized infection control guidelines to create a final workplace checklist that will be made into a mini-educational poster or infographic to monitor infection control procedures. Collaborative work will help to motivate the staff to be on the same page with infection control guidelines and promote compliance (Carr & Walton, 2014). After the group collaboration effort, a final review will be conducted, and a final post-review interactive quiz will be given to the learners to complete individually. Lastly, the dental personnel will complete a satisfaction survey that will have some open-ended questions to reflect on their individual learning process and feelings towards the simulation-based training modules.

Implementation

The implementation of the simulated dental infection control training modules will follow a structured and practical plan designed specifically for a small- to mid-sized dental

practice. The design team decided to use Roger's Implementation Model, which is a five-step process that includes knowledge, persuasion, decision, use, and confirmation, to help direct the implementation of the simulated training modules on dental infection control to a dental office (Eichler & McDonald, 2021). In addition, thorough attention is also given to potential challenges, including technical issues, accessibility needs, learner engagement, and ethical considerations.

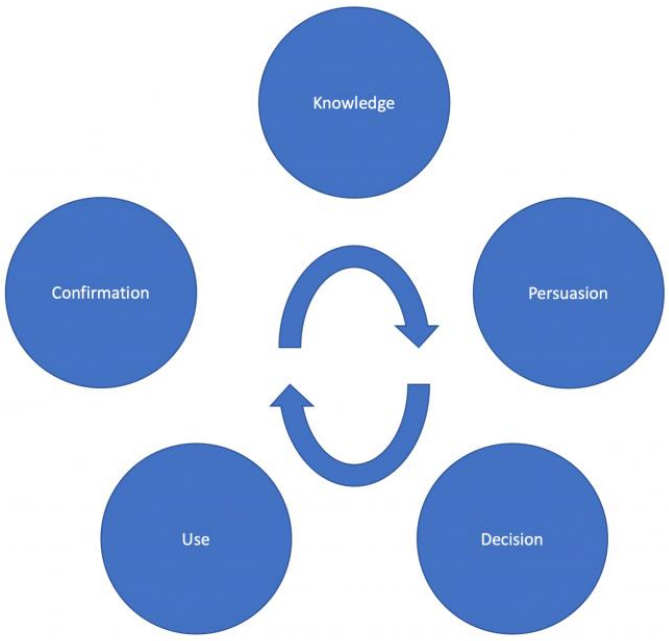

Figure 2. Roger's Implementation Model (Eichler & McDonald, 2021)

During the first week, the knowledge stage of Roger's Implementation Model will begin with an introductory meeting that will be led by the instructional designer and dental office manager. During this meeting, the dental practice clinical staff will be introduced to the reasoning behind the training, discovered infection control gaps from the prior analyses, and CDC guidelines (CDC, 2024; Cheng et al., 2023; Eichler & McDonald, 2021). Additionally, dental personnel will receive demonstrations on how to use the Adobe Learning Manager system

and its relevant features as well as a training module schedule sheet to ensure clarity and accessibility (Adobe, 2025). Next, the persuasion stage, which will also occur in the first week, will focus on forming positive perceptions of the dental personnel toward the training by emphasizing its practicality, real-life relevance, and compatibility with dental infection control procedures in the United States (CDC, 2024; Updendran, 2023). Furthermore, the dental staff will have a chance for hands-on exploration of the modules in the Adobe Learning Manager system to reduce perceived technical challenges. Lastly, there will be time to discuss insights from the learner analysis that highlight the need for improved dental infection control practices within the dental facility.

The decision stage will occur in the second week and involves staff completing Module 1 as more of a low-stakes trial run, which will be completed by the learners to help evaluate the usability, scenario understanding, and readability for learners before fully implementing the modules. Following, the dental personnel will complete a brief survey about usability and relevance, allowing the design team to implement adjustments. The office manager will then confirm adoption of the training plan to be utilized in the dental practice. Afterwards, the implementation (use) stage will happen during the third to fifth week, with two self-paced modules assigned each week due to the fast-paced nature of the dental field. Throughout these two weeks, the dental staff must complete interactive simulations, quizzes, and hands-on tasks such as PPE concept maps, a reflection prompt, sterilization decision-making simulations, and scenario-based analyses to focus on remembering, understanding, applying, and analyzing appropriate infection control procedures (Valiathan, 2023; CDC, 2024). Finally, the fifth and final module will include creating a workplace infection control checklist and educational poster to reinforce and motivate long-term behavior change (Lee et al., 2022; McCoy, 2001).

Furthermore, progress will be monitored by the office manager through weekly check-ins associated with the training content to ensure learners meet the competency level of at least 90%.

In the sixth week, the confirmation stage will include evaluating overall learning outcomes, reviewing learned information, and implementing the dental personnel team-developed dental infection control checklist into the practice's daily procedures. In addition, educational posters will be displayed in the sterilization labs as well as other relevant clinical areas. The dental staff will also receive certificates of completion that will be kept on file by the office manager to help maintain and ensure compliance. As well, long-term compliance and knowledge will be supported through annual refresher modules, updates based on CDC guideline changes, and bi-annual re-administration of the Cheng et al. (2023) questionnaire to monitor progress.

Throughout the implementation of the simulation training modules on dental infection control, there are potential challenges that need to be addressed. In addition, technical issues are reduced through pre-testing of the Adobe Captivate and Adobe Learning Manager system software and providing technical support, as well as captioned and transcript-supported media for accessibility needs. Furthermore, learner engagement is supported by sufficient training time, simulated and interactive activities, and short, manageable modules. Also, ethical concerns are tackled by using simulations, video, and images rather than live patients who could potentially be harmed. By integrating detailed steps, the design team's implementation plan ensures the training is authentic and practical and provides the proper dental infection control standards for the compliance needs of the dental practice.

Evaluation

The team decided to utilize the Kirkpatrick Model for evaluating the simulated training modules on dental infection control and will also use formative and summative evaluation methods. The Kirkpatrick Model uses a four-level approach that is sequential and comprehensive for evaluating training (Kirkpatrick & Kirkpatrick, 1996). The four levels of the model include reaction, learning, behavior, and results (Bertiz, 2022; Kirkpatrick & Kirkpatrick, 1996). Bertiz (2022) discusses the use of the Kirkpatrick Model for evaluation of simulation training in health care as a useful theoretical framework for examining and summarizing the effect of simulation learning experiences. Bertiz (2022) also describes the use of formative evaluation to promote learners in their development and growth during training as well as summative evaluation, which concentrates on determining the results of training at the end. Ultimately, the design team believes that utilizing the Kirkpatrick Model, formative and summative evaluations, as well as interviews with learners at the end of the modules will provide beneficial information to further improve and revise the dental infection control simulation modules.

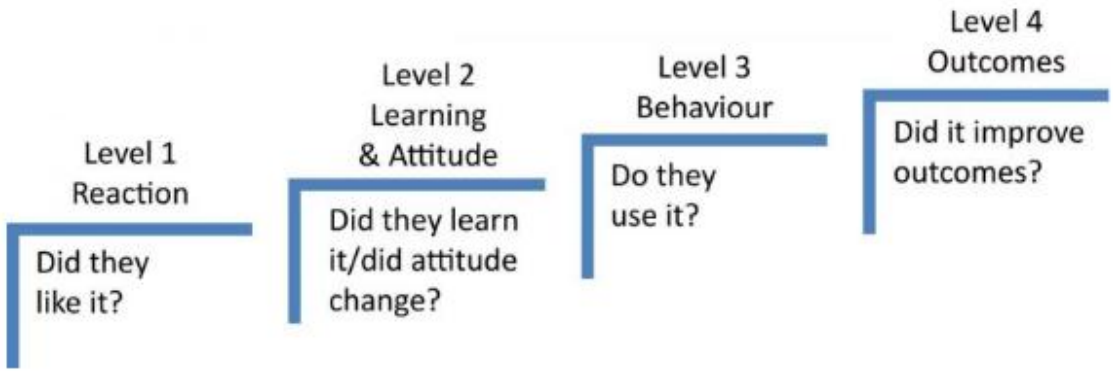

Figure 3. The Kirkpatrick Model (Bertiz, 2022)

A formative evaluation plan will be implemented throughout learner use of the simulation training modules to ensure continuous improvement and alignment with learner needs. The design team will ask for feedback from learners through a survey at the end of each module regarding the ease of use of the modules. Each survey will have a place for open-ended responses for learners to address a concern that was not already in the survey to improve accessibility, engagement, and instruction. In addition, as previously mentioned, information gathered from the low-stakes trial run during the first week with the dental staff and interactive activities and assessments will help to revise activity and assessment instructions as well as scenario understanding. Data will be collected using surveys and analyzed using quantitative analysis. In short, the continuous feedback after each module will clearly depict the necessary revisions, allowing the design team to make changes to content, alter quizzes, and revise simulation activities and assessments so the instructional materials stay aligned with learner progress and the fast-paced environment of dental infection control standards.

A summative evaluation plan will be done after the dental infection control simulation training modules are completed by the dental personnel. The summative evaluation will concentrate on examining the overall effectiveness of the dental infection control simulation-based training modules and how well they align with the learning objectives, while also incorporating the four levels of Kirkpatrick's Model (1996), which include reaction, learning, behavior, and results. Level 1 of the Kirkpatrick Model (1996), which is reaction, will be examined through learners' end-of-module satisfaction surveys to determine their attitudes towards the modules, specifically module usability, content revision needs, and activities and assessment changes to help the design team. Learners' performance on post-training quizzes, interactive simulation assessments, and achievement of at least 90% competency will be

evaluated to address learning, which is Level 2 (Kirkpatrick & Kirkpatrick, 1996). Furthermore, improved compliance with dental infection control procedures will be evaluated through the comparison of pre- and post-training quizzes to assess learner improvement to make further revisions about the training modules and how the dental staff will incorporate the dental infection control procedures, which will help measure behavior, which is Level 3 (Kirkpatrick & Kirkpatrick, 1996). In addition, the overall impact of improved infection control practices on clinical outcomes will be associated with results, which is Level 4 (Kirkpatrick & Kirkpatrick, 1996). Further, the design team will conduct interviews with the learners to obtain qualitative data to improve the modules. As stated before, data will be gathered through surveys and assessed using quantitative analysis. Additionally, data will be collected from the interviews and analyzed using qualitative analysis. To summarize, the design team's summative evaluation plan will help ensure that measuring learning outcomes and assessing the simulation training modules as a whole will be done effectively.

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