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INTEGRATING AUGMENTED REALITY IN PROSTHODONTICS: THE ROLE OF NURSING IN ENHANCING PATIENT COMMUNICATION AND COLLABORATIVE TREATMENT PLANNING

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Abstract

AR technology is now fast paced in modifying clinical dentistry, especially in prosthodontics, where it supports better visualization, patient education, and interdisciplinary treatment planning. Unfortunately, AR integration tends to be approached from either a purely technical or dental specialist perspective, thus neglecting the crucial role of nurses in patient communication and co-care. Therefore, the paper analyzes how nursing contributes to AR-supported prosthodontic care, aimed at enhancing patient understanding, emotional preparedness, and decision-making. It synthesizes state-of-the-art use of AR in dental surgery, diagnostics, and education, into a nursing communicative framework. The article focuses on nurses as communicative mediators between advanced technologies and patients, especially during patient preparation for extensive prosthodontic treatments. Through an interdisciplinary approach, this article identifies barriers to adoption and analyses case study applications, outlining strategies to improve cooperative workflows. This review aims to provide a future vision on applying immersive technology to patient-oriented prosthodontics, wherein nurses are assisted to become effective communicators and facilitators of digital care.

Keywords: *Augmented Reality (AR), Prosthodontics, Nursing Communication, Patient Education, Dental Technology, Interprofessional Collaboration, Digital Treatment Planning, Immersive Healthcare, AR In Dentistry, Nursing Informatics.*

1. INTRODUCTION

The penetration of digital innovations into healthcare has transformed every aspect of patient care, professional training, and interprofessional collaboration. Among these novel disruptive technologies, AR has been touching the clinical practices with utmost importance, particularly in the field of prosthodontics. The AR allows trustworthy medical practitioners to overlay digital information over real-world scenarios, providing real-time interactive visualization to augment diagnosis, treatment planning, and patient communication (Meto & Halilaj, 2025; Monterubbianesi et al., 2022). While AR applications in prosthodontics have remained mostly within the ambit of practitioners and dental specialists, there seems to be more of an interprofessional emphasis due to AR use in prosthodontics now that nurses too must be considered in the process.

Prosthodontics being in relation to tooth restorations and the replacement thereof is, in essence, the complex field of dental treatment. It often warrants detailed patient counseling and multi-disciplinary coordination with a long-term outlook for rehabilitation. With a growing list of AR applications in smile design, implant planning, and guided surgery, the nurse's role is augmenting alongside the AR scenario in prosthodontics not just with respect to clinical workflow and support but also regarding patient communication and psychological preparedness (Lin et al., 2024; Al-Enezi et al., 2024).

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Nurses become what could be termed as mediators of education, conveying the high-tech visualizations in language easy for patients to grasp. They guarantee that patients really understand what is about to be done, what to expect, and what are the possible results.

In today's healthcare ecosystem, patient-centered care is all about transparency, shared decision-making, and personalized education with AR equipping those values when used right. Nurses tend to bridge the gap between the technological and humanistic aspects of care by fostering communication between patients and prosthodontists (Nazari & Borna, 2025; Kashwani et al., 2024). The bigger the scope of emotionality, financial significance, and difficult-to-visualize alternatives with traditional methods of treatment, the more pertinent this collaborative role becomes.

Recent studies indicate that although immersive technologies, including AR, Virtual Reality (VR), and Mixed Reality (MR), are gaining ground in dental pedagogy and surgical simulation, they still do not highlight the actual usage of the technologies and the role of nursing support in routine clinical encounters (Perry et al., 2025; Aliwi et al., 2023). Moreover, while improvements in technological training for dentists increase, the nursing front-line staff engaging most with patients rarely gains equal attention.

In addition, from the standpoint of technological disparity in the delivery of healthcare more so in underserved communities nurses become indispensable in interpreting those digital diagnostics to pursue further care toward fair access (Alrashidi et al., 2024; Mohammadi et al., 2024). Nurses in their functioning are often first-contact points through prosthodontic workflows, either behind the scenes at technical support or in front, issuing emotional guarantees. As AR achieves widespread use, the real challenge lies in how to train nursing staff for involvement in active interactive discussions, walkthroughs of digital treatments, and real-time visualizations of procedures.

The focus of this manuscript is to provide a review of the state of AR implementation in prosthodontics with an emphasis on nurses aiding enhanced communication and collaborative treatment planning. Framing the discussion in an interprofessional healthcare model builds on an argument for repositioning nurses as digital communication facilitators in technologically sophisticated dental environments. The subsequent sections review the history of AR in dentistry, expand on the communication enhancement capacity of AR, adopt a case-based approach involving nursing roles, and present ideas for overcoming barriers undergoing implementation.

2. BACKGROUND AND LITERATURE REVIEW

2.1 Evolution of AR in Dental Surgery, Diagnostics, and Education

Augmented Reality (AR) sees some drastic changes in dental medicine, going from a niche technology to something immediately available for surgical and educational use. AR was initially used in maxillofacial simulations and now is applied in methods training, prosthodontic diagnosis, and treatment visualization (Lin et al., 2024; Dută et al., 2011). At the surgical level, AR overlays based on cone beam CT data are used to project anatomical landmarks, nerve canals, and bone structures onto the patient's oral cavity, thereby refining implant placement and sinus lift techniques (Meto & Halilaj, 2025).

The introduction of AR in education has changed how dental and nursing students learn about complex prosthodontic concepts. Aided by these AR simulators, learners can interact with virtual models of craniofacial structures, configure different aspects of prosthetics, and visualize occlusal forces in 3-D (Perry et al., 2025). Such immersive simulations thus remove from the equation costly cadaveric models, while simultaneously allowing for repeated procedural rehearsals with real-time feedback-a strategy that improves learning outcomes and professional confidence.

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Using such tools in diagnostics, radiographic data is superimposed upon patient anatomy for detecting bone density abnormalities, malocclusion, and prosthetic misalignments. AR increasingly interfaces with Artificial Intelligence (AI) systems to increase diagnostic accuracy and to propose treatment options automatically (Shankar et al., 2024). AR and AI together realize the synergy of early detection, guided surgery, and customized planning of prosthodontics.

2.2 Comparative Use of AR vs. VR in Prosthodontics

Although both VR and AR are utilized in dentistry, they have remarkable differences based on their applications. VR can provide a completely immersive environment suited for preclinical training and procedural simulation; meanwhile, AR overlays digital information instructions onto the real clinical environment (Monterubbianesi et al., 2022). In prosthodontics, VR is used mostly to acquire skills in a risk-free environment, such as virtual wax-ups or simulation of full-mouth reconstruction-building technologies (Quintero & Erazo, 2024).

AR applications, contrarywise, are mainly applied into actual clinical treatment to promote superior visibility on the proceedings. For example, AR-based headsets can guide crown placement by displaying prep margins, interocclusal distances, and angulations in real-time during treatment (Lin et al., 2024). Moreover, integrated AR systems with intraoral scanners and digital design software allow clinicians to adjust prosthetic parameters while the patient is presented chairside, thus reducing errors and improving satisfaction (DaSilva et al., 2022).

From a patient engagement perspective, AR is more usable and more acceptable than VR, probably because AR patients are less likely to feel sensory discomfort, and on the see-through interface, they can carry on a real-time discussion with the provider-it is a very important consideration for nursing-based education and facilitation of consent (Iqbal et al., 2024).

Table 1: AR vs VR in Dental Applications – Functional Comparison

Feature	Augmented Reality (AR)	Virtual Reality (VR)
Use in Prosthodontics	Chairside overlays for real-time treatment guidance	Simulation of full treatment in virtual space
Training Applications	Enhances real-world tasks with added data	Immersive procedural learning in isolated setting
Patient Education	Interactive visuals with live explanation	Detached visualization; less interaction
Nursing Application	Supports communication, real-time counseling	Limited to pre-procedure training
Hardware	Smart glasses, tablets, projection systems	Head-mounted VR displays, hand controllers
Clinical Integration	High (live procedures, planning)	Moderate (training, preoperative planning)
Sensory Feedback	Limited haptic feedback	Immersive with potential for haptic integration

2.3 Literature on Interdisciplinary Care in Prosthodontics

Prosthodontics is inherently multidisciplinary and requires an intimate collaboration between dentists, dental technicians, radiologists, and nurses, plus digital technicians of late. The emergence of AR and AI in prosthodontics has further added to the necessity of interprofessional seamless workflows. More recent studies point out that working in team settings ensures the full utilization of digital tools. Al-Enezi et al. (2024), for example, reiterate that nurses, radiologists, and prosthetics members must coordinate their roles to provide digitally enhanced patient-centered care usingthods such as AR visualizations, intraoral scans, and 3D-printing of prostheses.

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Usually, the nursing staff coordinates these services by handling patient expectations and clarifying treatment pathways through digital documentation (Albalawi et al., 2024). Coordination especially becomes important when complicated prosthodontic treatments such as full arch restorations or implant-retained dentures require multidisciplinary input through several appointment visits. Such nursing staff also ensures that the continuity of care is maintained through technological prowess in all parties involved, especially the patient.

Secondly, AR-interprofessional case conferences view occlusion, tissue contouring, and implant positioning collectively and reduce ambiguity in the procedural steps' final outcome (Own et al., 2024).

2.4 Nursing Interventions on Digital Workflows

While nursing is marginalized in prosthodontics literature, increasingly its members are being recognized as key contributors in enabling digital dental workflows. In the AR-assisted clinical environment, nurses set up the calibration of devices, orient the patients, and explain the digitally projected visuals as they unfold (Alrashidi et al., 2024). For instance, during guided implant placement procedures, nurses would help patients interpret the AR visuals they see through the AR glasses or tablets while also assisting the provider in managing the digital interface and tracking surface progress markers.

In addition to the technical facilitation, nurses conduct motivational interviews and informed consents wherein AR makes the represented concepts more tangible. Nurses help to visualize prosthesis outcomes, anatomical changes, or surgical steps that alleviate patient anxieties and build confidence toward the proposed treatment plan (Nazari & Borna, 2025). AR further supports post-operative teaching about hygiene protocols, appliance care, and signs of complications from overlays.

Literature points out the need to incorporate Nursing staff within AR training programs. If not adequately trained, Nurses may feel excluded and grossly unprepared in this tech-driven environment. Malla and Amin (2023) have argued for the existence of Nursing-specific modules for digital health tools so they may take their place as equals in the advancement of technologically modified care.

2.5 Conceptual Frameworks

The theoretical foundations for AR in nursing-prosthodontics are found in several interdependent theories:

- Health Communication Theory emphasizes accuracy, empathy, and exchange of information that is adapted to the needs of the patient, all of which are facilitated by the visual storytelling functions of AR (Aliwi et al., 2023).
- Nursing informatics provides the foundation to bring data-driven decision-making into bedside practice. AR tools function as real-time informatics aids to help nurses retrieve and visually communicate personalized information (Kumar et al., 2025).
- Technology Acceptance Model (TAM) is a behavioral model that explains healthcare workers' propensity of adopting digital innovations. Perceived usefulness and ease of use, tied to interface design and prior training, affect how easily nurses accept AR tools in their workflows (Dinh et al., 2023).

Taken together, these provide a framework to develop interdisciplinary care models which view nursing professionals as active participants in AR-assisted prosthodontic care rather than just as supporting personnel, bridging communicators, educators, and technology integrators.

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3. AR TECHNOLOGIES IN PROSTHODONTICS: OVERVIEW AND FUNCTIONS

3.1 Smile Design and Esthetic

Visualization Smile design is surely one of those few areas in prosthodontics where AR can be put to immediate use in the patient arena. AR platforms enable the patient to see an esthetic outcome in real-time by overlaying the superimposition of a digitally generated smile on the patient's facial image. Such visual simulations help in patient education and engagement and can lead to increased patient satisfaction with treatments such as veneers, crowns, or implant-retained prostheses (Xuebo, 2025; Lin et al., 2024).

These systems enable the dentist or nurse to show the differences between tooth shapes, shades, and alignments so that the patients can participate in the planning. The nurses act as mediators who interpret these digital visuals into lay terms, helping the patients to make decisions about their appearance (Nazari & Borna, 2025).

3.2 Implant Planning and Surgical

Guidance In implantology, AR methods allow improved planning and surgical navigation. During the implant placement, the AR software merges CBCT scan data and intraoral scanning data to generate a detailed virtual environment superimposed on the patient's oral anatomy. This real-time visualization helps the surgeon to instantly identify many anatomical landmarks such as the mandibular canal, sinus floor, or cortical bone thickness (Meto & Halilaj, 2025).

Surgeons wearing AR headsets or smart glasses are then provided with visual prompts during drilling or implant insertion to avoid deviation and reduce iatrogenic injury (Perry et al., 2025). Nurses are needed to support the calibration of the devices, interpret the visual overlays for the patient, and ensure the sterility of the interface during use (Al-Enezi et al., 2024).

3.3 Real-Time Procedural

Visualization Besides diagnosis and planning, an AR system can provide the clinician with vital information intraoperatively while avoiding breaking sterility or diverting focal attention. For instance, digital visual overlays may show depth indicators, outline of prep margins, or occlusal clearance while simultaneously projecting the radiographic profile of the patient. It enhances the clinical workflow and decision-making, especially concerning full arch rehabilitation and guided prosthodontic surgical procedures (DaSilva et al., 2022).

Here, nurses extend their role by handling the AR device applications, instructing the patient in the use of 3D visuals for treatment steps, and using overlay graphics to explain treatment progress to patients across multiple visits (Mohammadi et al., 2024). Such immersive visual visualization boosts patient comprehension, adherence, and confidence in their treatment agenda.

3.4 Integration with CBCT, AI, and 3D

Printing In prosthodontics, the strength of AR grows in interplay with other digital possibilities. CBCT sets the anatomical baseline, providing volumetric datasets to construct physical or virtual models. AI algorithms sift through these scans to forecast treatment outcomes, alert for possible complications, or suggest optimum implant positions (Shankar et al., 2024; Alanazi et al., 2024).

In addition, AR setups are currently integrated with CAD/CAM systems, enabling the immediate 3D print of surgical guides or provisional prostheses, thus creating a closed loop between the digital designs and physical implementations, which reduces their turnaround times and possible errors (Kashwani et al., 2024).

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Nurses working in the interference often act as intermediaries between software-produced results and the patient's experience, managing appointment scheduling, checking surgical guide fit, and providing AR-based education on caring for post-operative appliances (Nazari & Borna, 2025).

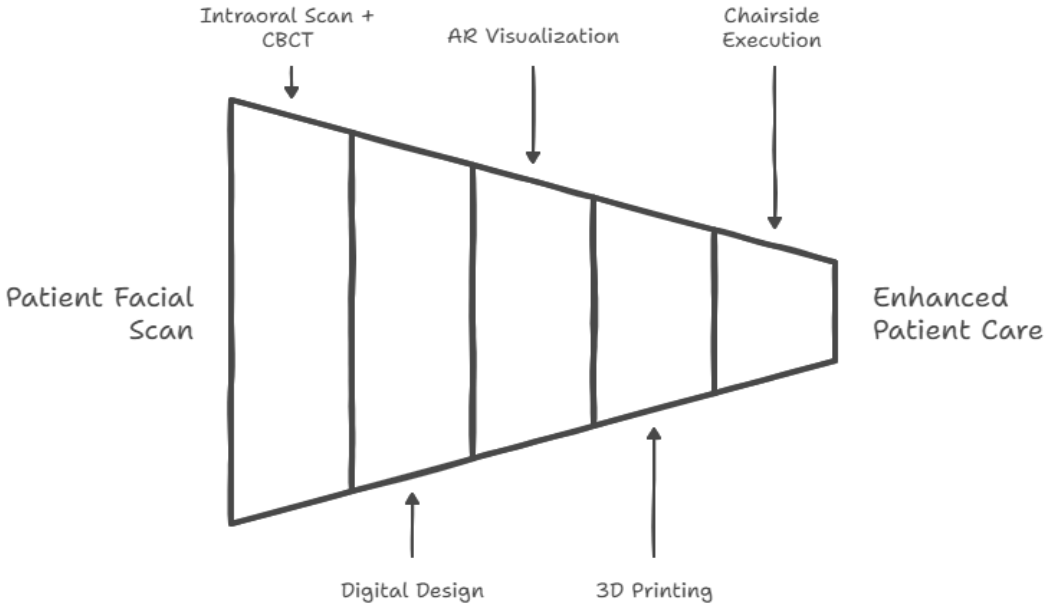

Figure 1: Components of AR-Assisted Prosthodontic Workflow

Table 2: Applications of AR in Prosthodontic Procedures

Application Area	AR Functionality	Nursing Role
Smile Design	Live preview of prosthetic outcomes on patient's face	Educate patients, assist in esthetic decision-making
Implant Planning	Virtual placement guidance based on CBCT data	Calibrate AR tools, support procedural visualization
Surgical Assistance	Overlay of depth, angulation, and margin indicators	Maintain sterile interface, explain intra-op feedback
Digital Workflow	Linkage with CAD/CAM, AI, and 3D printing	Coordinate guide production, manage patient readiness
Post-Op Education	Visual explanation of hygiene, care, and outcome expectations	Deliver AR-enhanced discharge instructions

3.5 AR Hardware and Software Platforms in Dentistry

A variety of platforms now offer the possibility of AR integrations for dental settings. Hardware commonly used includes smart glasses (Microsoft HoloLens, Magic Leap), projection mapping systems, and AR-capable tablets. These help with intraoral tracking, facial mapping, and gesture-interface control (Perry et al., 2025; Dută et al., 2011). Software-wise, SmileFy, 3D4Medical, and Planmeca Romexis have AR modules that work well with CBCT scanners and digital impression systems.

Some high-end platforms employ automated AI-backed recommendations on prosthetic parameters so the treatment plan can be co-designed by humans and algorithms (Shankar et al., 2024).

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Familiarity with the platforms is becoming critical for nurses as they move from being observers to co-interpreters and educators in AR environments.

4. THE ROLE OF NURSES IN PATIENT COMMUNICATION

Communication in prosthodontics is of paramount importance when the procedures carried out include complex planning, high costs, and long-term commitment. Nurses come between the patients and processes and are uniquely qualified to foster understanding and ease anxiety to see that patient adherence is assured during the length of the procedure. With an augmented reconstruction of the processes in prosthodontics, nurses are now armed with formidable tools to realize their purposes more successfully, particularly in that area of patient education, informed consents, shared decision-making, and digital empathy.

4.1 AR as a Tool for Education and Informed Consent

The stage of providing informed consent in prosthodontics goes beyond the simple signature; it requires patients to understand the procedure, anticipate the outcomes, and decide upon alternatives. Verbal explanations and 2D visuals traditionally have not really sufficed in making the patient comprehend the intricacies of surgical or prosthetic interventions. AR fills this void by offering patients interactive 3D visualizations that hover over their anatomy (Nazari & Borna, 2025; Lin et al., 2024).

Utilizing an AR tablet or glasses, nurses can demonstrate to patients how the new dental bridge or implant would appear and behave in their mouths. This demonstration grounds the patient's comprehension of procedural steps. Nurses serve as communication facilitators by interpreting clinical language into layman's terms and answering any spontaneous queries; they also assess the patients' comfort with the planned intervention (Alrashidi et al., 2024; Mohammadi et al., 2024).

Plus, visual AR overlays can be rendered dynamically to allow for side-by-side comparison of treatment options for example, one option might be a fixed implant while another is a removable denture—thereby assisting patients in assessing their choices with regards to function and esthetics.

4.2 Preoperative Counseling and Anxiety Reduction

Many prosthodontic procedures, such as full arch rehabilitations or implant surgeries, generate considerable anxiety in the patient, especially those who have suffered traumatic experiences at the dentist or who are medically compromised. Nurses lay great stress on preoperative counseling, which is rendered even more effective with AR.

By means of AR, nurses can walk patients through a “day of surgery” experience by demonstrating the procedure to the patient on an avatar or digital twin. The virtual walkthrough demystifies the surgical sequence, lessens anticipatory fears, and builds trust in the clinicians (Savaş et al., 2025). AR can also be used to set expectations post-op by allowing the patient to visualize the improvements.

Nurses assess the emotions of patients to AR-induced visualizations and adjust the communication accordingly. For example, children and elders generally respond well to colorful cartoon-like overlays that make medical education fund (Aliwi et al., 2023; Bharadwaj et al., 2024).

4.3 Digital Empathy and Patient-Centered Interactions

Though AR is a tech device, what matters is human-to-human interaction, not tradeoff. Nurses trained in empathetic communication use AR to stir emotions, clear doubts, or co-navigate options with patients.

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The concept of digital empathy stresses the nurse's ability to assess patient reactions during AR implementations and act with compassion, reassurance, or clarifications (Kumar et al., 2025; Albalawi et al., 2024).

If a patient reacts emotionally witnessing the digital simulation of their deteriorated dental condition, the nurse may guide the patient to focus on the restorative prognosis, or share the experience of another patient who successfully underwent a similar transformation. So, AR is a means for not only technical instruction but also a more heartfelt emotional discourse.

Moreover, AR offers communication customization. Nurses may tailor the language, pace, and details in their explanations to the patient's interaction. Along these lines, AR-assisted nursing becomes inherently patient-centered and adaptive.

4.4 Ethical Considerations: Accuracy, Consent, and Trust

With the increasing implementation of AR, certain ethical duties arise for nursing professionals. One key concern is accuracy: AR systems must offer clinically validated information, and nurses must be trained to recognize possible misrepresentations. For example, if a 3D simulation exaggerates esthetic outcomes, patients would then have false expectations, thereby damaging trust and satisfaction (Al-Enezi et al., 2024; Dinh et al., 2023).

Additional considerations are the need for data privacy and informed consent for visualization: Patients should be informed about which data are used for producing AR simulations (CBCT scans, digital photos) and who can access the data.

Nurses are usually the ones disclosing this information and thus should be familiar with institutional policies and regulations on patient data, particularly when AR is integrated with AI or cloud computing (Le et al., 2018).

Trust is a core aspect of nursing care. If patients see the AR as a mere gimmick or cold impersonal tool, then it may very well lose its educational value. It is precisely through the nurse's associations with AR that it will either be accepted or rejected by the patient as a legitimate tool for aiding understanding.

Fostering trust requires clear communication, sensitivity, and genuine care—a professional nursing trait (Malla & Amin, 2023).

Table 3: Nursing Tasks Enhanced by AR in Prosthodontics

Nursing Task	How AR Enhances the Task	Impact on Patient Care
Informed Consent Facilitation	Real-time visualization of procedure and alternatives	Improves understanding and satisfaction
Preoperative Counseling	Step-by-step walkthrough of surgical procedures	Reduces anxiety and builds confidence
Patient Education	Overlay explanations of prostheses, anatomy, and post-op care	Enhances comprehension and compliance
Emotional Support (Digital Empathy)	Responds to patient reactions during AR interactions	Fosters trust and comfort
Communication for Pediatric/Geriatric Care	Uses tailored AR content for vulnerable populations	Increases engagement and learning outcomes
Ethical Oversight	Guides proper disclosure and consent regarding AR-generated content	Protects patient rights and expectations
Interprofessional Liaison	Explains AR insights during team briefings with dentists and techs	Improves communication across care team

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4.5 Implication for Nursing Education and Policy

Sustaining AR-based communication in prosthodontics will require institutional support for nursing education in digital technologies, which includes literacy on the technologies themselves, ethical reasoning, privacy implementation, and adaptive communication skills. Alrashidi et al. (2024) insist that nursing curricula must incorporate digital health modules that cover AR case scenarios, consent simulations, and interdisciplinary role-playing.

On the policy level, hospitals and dental care facilities should recognize AR workflows nursing activities, including documentation of activities, standards of patient education, and protocols for device use. Only with such formal integration will AR realize its fullest potential in communication within patient-centered prosthodontic care.

5. COLLABORATIVE TREATMENT PLANNING AND INTERDISCIPLINARY WORKFLOWS

As prosthodontic procedures become more technologically advanced, the chances of success get reduced, especially if working with multiple disciplines within a unified treatment planning framework. In its true sense, collaborative care involves communication between nurses, dentists, technologists, and other allied professionals to ensure that digital tools such as AR are not just available but are used appropriately, which brings out the best in patient care. Essentially, AR-intensified workflows create the shared platform where the interdisciplinary expertise can converge, allowing it to further enhance diagnostics with greater precision, treatment planning customized to the case, and patient involvement with information.

5.1 Nurse–Dentist–Technologist Collaboration

They begin treatment planning in traditional prosthodontics whilst relying on the dental technician for some assistance and on nurses for some occasional input regarding patient management and other clinical support. Once engineers entered the AR landscape, a different set of rules was needed whereby all collaborators engage apprising each other rather than interact linearly. Dentists ensure clinical intent and deliver the prosthetic design, technologists develop AR systems and digital tools, while nurses provide communication with patients, coordination, and liaison services (Al-Enezi et al., 2024; Alanazi et al.,2024)

Bringing technology and scientific data closer to patient comprehension and closing the conceptual gap remain the responsibilities of nurses. They also validate the set-up of AR tools for applications in pre-treatment patient consultations, chairside demonstrations, and procedure walkthroughs. Technicians calibrate devices, maintain the software, and integrate it with diagnostic data such as CBCT and intraoral scans. Such a seamless coordination makes sure that AR applications stay correct, patient-specific, and handy through all stages of treatment (Meto & Halilaj, 2025).

5.2 Team-Based Digital Care Planning

Good prosthodontic care carries a chain of sequential planning that might occur during many visits and interspersed phases. A dynamic and highly collaborative system becomes ready during the AR-assisted environment's digital planning. For instance, in implant-supported-prosthesis case planning, the dentist may begin with digital models and AI-generated design templates. These models are then refined into AR-compatible visualizations by the technologists, and the nurses utilize these simulations for discussion with the patient, on education, and consent.

Coordination amongst such workflows must be tight with clearly demarcated roles. Shared digital platforms allow every care team member to update treatment plans, consult the visuals, and contribute to the clinical notes on an ongoing basis.

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They can highlight patient concerns that were recorded during the AR simulations; such feedback may be used by technologists to adjust overlays or tweak simulation fidelity. This cycle of feedback augments responsiveness and creates interprofessional synergy that has been shown to improve care quality and speed (Albalawi et al., 2024; Dinh et al., 2023).

Furthermore, AR eliminates ambiguity in communicating team members. If the team members decide on the implant angulation or margin misalignment, instead of explaining it verbally or putting it into writing, they can immediately refer to the visual data. Such a method fast-tracks the decision-making and lessens errors (Quintero & Erazo, 2024).

5.3 Case Discussions Based on Shared AR Visualizations

Augmented reality systems foster interactive case discussions that serve well in educational institutions, hospitals, and multidisciplinary dental clinics. Shared AR interfaces project the 3-D reconstructions of the patient's dentition and craniofacial structures into a collaborative meeting area, so that each team member may observe the case from his or her very own device or through a common display (Perry et al., 2025; DaSilva et al., 2022).

During these conversations, nurses might contribute perspectives about patient concerns, fears, or communication barriers that could change treatment decisions. For example, if the patient is not so willing to go full arch replacement as to ethics and/or economics, nurses might promote more gradual options or enhanced education. Such discussion leads to comprehensive treatment planning that balances clinical objectives with humanistic concerns.

Case conferences with AR could even have served as training exercises where nurse students, technologists in training, and dental residents all explored treatment simulations together. The model fosters team learning and promotes respect for, and understanding among, the various disciplines (Kumar et al., 2025).

5.4 Integration with Telehealth and Digital Health Platforms

Telehealth platforms once took a leap into dental and medical care as an offspring of the COVID-19 pandemic, providing new avenues for AR-enabled collaborations at a distance. During virtual consultations in Prosthodontics, the AR-aided images or 3D models may be shared with the patients to educate them about the treatment alternatives or postoperative care (Shankar et al., 2024; Mohammadi et al., 2024).

This feature is extremely valuable to the patients out in rural areas or underserved localities who may not get an opportunity to visit some specialized centers for prosthodontics.

Nurses lead a good part of remote interactions. During teleconsultations, nurses ensure the patient knows how to use the AR apps, interpret visual information, and troubleshoot technical issues. AR models might also be shared asynchronously—with nurses preparing patients through narrated AR walkthroughs that can be watched at home by the patient before the scheduled procedure.

Moreover, integrating with electronic health records (EHRs) and digital treatment dashboards allow care teams to visually follow patient progress through time.

As an example, a patient for staged implant placement might get new AR overlays on his/her treatment status upon each phase of treatment for increased transparency and accountability (Le et al., 2018).

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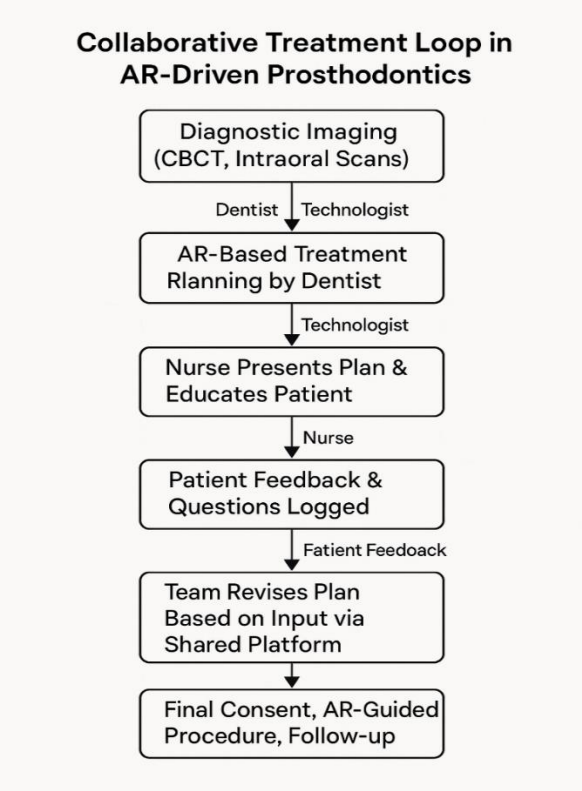

Figure 2: Collaborative Treatment Loop in AR-Driven Prosthodontics

This loop illustrates how patient-centered, AR-assisted care is the product of repeated input and collaboration among clinicians, technologists, and nursing professionals.

5.5 Collaborative AR workflows benefits

Some aspects of interdisciplinary AR integration beyond clinical outcome assessment are pertinent:

- Speed and Efficiency: Faster turnaround times in treatment planning and modifications.
- Reduction of Errors: The users can visually confirm scenarios of angulations, spacing, and anatomical obstacles.
- Patient Satisfaction: Sharing decisions and mutual understanding.
- Documentation: AR-supported treatment data integrated with the EHR.
- Empowered Nursing Staffs: Whereas nurses traditionally were in passive roles, they are now digital facilitators.

However, these benefits are realized only when institutional support, interoperability standards, and training are established in support of the integrated care model (Own et al., 2024; Alrashidi et al., 2024).

6. CLINICAL CASE APPLICATIONS AND SIMULATED INTERVENTIONS

Augmented reality (AR) technologies in prosthodontics progressed from being experimental tools to the actual clinical assets. Relying on their real-world use, the areas need application of AR: implant placement, smile esthetics, maxillofacial rehabilitation, and full arch solutions. Critical are nursing professionals who actively participate in setting up simulations, mock surgeries, patient education,

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and anxiety alleviation of vulnerable groups, mainly pediatric and geriatric patients. This section provides selected case summaries that give insights into the dynamics and how AR facilitates the collaborative process and communication.

6.1 AR in Implant-Supported Prosthesis

Planning The multi-centric study reviewed by Lin et al. (2024) had AR-assisted implant planning for more than 150 cases of full-arch restorations. The surgeons placed implants from less than 0.5 mm deviation from the digital plan by using CBCT-integrated AR overlay. Nurses arose in the foreground in this process: nurses would preload patient data into the AR system, verify the accuracy of the 3D scans, and conduct patient walkthroughs prior to surgery. The patients felt increased confidence because explanations were given in real time using AR headsets during consultations. Nurses converted implant lingo into visual experiences, words such as "drilling trajectory" or "sinus safety zone" to make the daunting procedure more understandable. Postoperative care was further upgraded by AR-based discharge videos to show patients oral hygiene care.

6.2 Smile Design and Patient Empowerment

According to Mohammadi et al. (2024), one private office in Dubai would use the AR smile design tool alongside digital photography and intraoral scanning. Using smart mirrors, patients were able to see candid versions of their future smiles superimposed over their live image. In one exemplary scenario, a young teacher was very anxious about public speaking due to the discoloration of teeth and uneven spacing. This nurse would ensure a smooth decision process for the final prosthesis design by cycling through the various AR previews together with the patient. During the final prosthesis try-in, the nurse presented a side-to-side comparison with AR, giving the patient enough reassurance regarding the esthetic qualities of the outcome. This enhanced patient satisfaction and reduced revision requests.

6.3 Simulated Interventions in Training Hospitals

At the academic level, Kashwani et al. (2024) highlighted an AR-simulated mock surgery training module for dental residents and nurse practitioners, presenting a clinical scenario of an edentulous elderly patient requiring complete denture fabrication with implant anchorage.

6.4 Pediatric Communication

Using AR Children are essentially a difficult population under extreme prosthodontics, particularly when space maintainers or pediatric crowns are required. Bharadwaj et al. (2024) presented a pediatric case wherein a 7-year-old boy was scheduled for zirconia crown placement after pulp therapy. The AR application was designed to show an animated cartoon version of the procedure. The nurses would perform the projection of the AR simulation onto the ceiling above the dental chair while perfectly narrating the steps in a language understandable to a child. The child could interact with the animation, touch virtual buttons to "test" crown colors, and simulate brushing once the procedure was done. This is a gamified process led by the nurse that lessens fear, promotes cooperation, thus avoiding the need for sedation and cutting down the whole appointment time significantly.

6.5 Geriatric Case

Cognitive Support Through Visual Reinforcement in a Canadian long-term care facility (per Iqbal et al., 2024), AR was utilized to aid communication with elderly patients undergoing prosthodontic rehabilitation. Most of the patients suffered mild cognitive impairment (MCI), which meant Abstract treatment explanations were beyond their coping ability. Using AR overlays, nurses could provide a visual reference of the progress recorded over time—for example, conditions such as "before" and "after" states of edentulous arches were shown. One 78-year-old patient was initially uncertain about implant-supported dentures but was able to recognize the prosthetic frame overlaid against his facial

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profile; during this, the nurse made narrations interspersed with empathetic cues, reassuring the patient convincingly through repeated touch. According to the patient, "Seeing is believing," emphasizing how much the visuals restored his confidence not only in the procedure itself but also in the team involved in improving his wellbeing.

6.6 Interdisciplinary Surgical Simulation

Before the actual procedure, the simulation surgery took place at a digital dentistry center in Europe (Monterubbianesi et al., 2022), where the prosthodontic intervention with zygomatic implants was practically rehearsed with the AR overlays. This interdisciplinary team consisted of prosthodontists, oral surgeons, nurses, and biomedical engineers.

The AR system enabled the following actions:

- Present view of the anatomical challenge projections on a shared screen.
- Configure implant trajectory virtually before incision.
- Rehearse the communication sequence with the patient.

The nurse would oversee the running of the simulation, manage digital inputs and going over the patient education materials that would be used postoperatively. The simulation exposed various communication failures within the actual workflow that were amended before proceeding into surgery, culminating in improved outcomes and better team cohesion.

Table 4: Case-Based Nursing Interventions Using AR

Case Scenario	AR Use	Nursing Role	Outcome
Full-arch implant planning	AR-guided CBCT visualization	Data entry, real-time explanation, post-op education	Improved understanding and reduced post-op errors
Smile design for anxious patient	AR live smile previews with overlays	Aesthetic counseling, support during try-in	High satisfaction, reduced revisions
Mock surgery simulation (students)	AR-based implant placement training	Simulation setup, actor interaction, emotional documentation	Improved empathy and communication skills
Pediatric prosthetic case	Animated AR simulation and gamified visualization	Interactive narration, behavioral support	Increased cooperation, reduced fear
Geriatric implant planning (MCI)	Time-lapse overlays and facial profile mapping	Gentle visual walkthrough, reassurance, cognitive reinforcement	Consent achieved, improved trust
Interdisciplinary zygomatic case	AR collaborative planning and shared visualization	Simulation coordination, patient material preparation	Enhanced team synergy and workflow clarity

6.7 Lessons Learned Across

Cases A few universal lessons, however, emerge from the diverse cases:

- AR is most effective when paired with human intervention and not used in isolation.
- Nurses serve as key interpreters, especially in situations laden with emotional or cognitive implications.
- Communication via AR empowers patients while limiting the potential for misunderstandings.
- AR enhances efficiency and clinical precision, fostering interprofessional collaboration.

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Integrating AR in simulated interventions therefore creates a safe, scalable, and highly interactive training opportunity for nurses and dentists, allowing teams to rehearse procedures, obtain feedback, refine protocols, and then carry out procedures on real patients, thus reducing medical errors and enhancing preparedness.

7. BARRIERS TO IMPLEMENTATION AND NURSING-SPECIFIC CHALLENGES

Barriers in Implementation and Nursing-Unique Challenges Despite multiple benefits with AR implementation on a prosthodontic platform, its development suffers under several barriers. These problems are at technological or financial levels and organizational or behavioral to an extent when it alters how nurses interact with the technology. If these barriers can be understood and addressed, it will be conducive in designing a sustainable interdisciplinary model of AR-supported care.

7.1 Technology Access and Cost Constraints

The cost of deploying AR systems, smart glasses, imaging software with AR capability, and CBCT integrations is the biggest limitation for most dental institutes. According to Al-Enezi et al. (2024), more than 60% of the clinics enlisted in a multinational study identified the affordability of equipment as their biggest deterrent. Especially smaller ones or facilities with limited resources, usually located in rural or underfunded healthcare settings, may not easily justify the cost of investing in AR tools with the chances of an immediate income.

The lack of any standardized procurement protocol among suppliers and differing degrees of compatibility between different platforms creates a far-reaching fragmentation of implementation across organizations. Nurses complain that they are often delayed or confused upon switching between systems used by technologists and the ones available in-patient care rooms (Dinh et al., 2023).

7.2 Lack of Training for Nursing Staff

One of the barriers to the full involvement in AR workflows by the nursing profession is the lack of structured training-to-date. Unlike dentists or technologists, nurses are rarely included in the first round of vendor-led training, as well as the onboarding of new AR tools (Alrashidi et al., 2024). This results in nurses feeling disadvantaged and alienated from the conversations of digital treatment, which undermines their confidence and compromises how they communicate with patients.

The barrier is especially wide in institutions where nursing curricula do not have digital health in their programs. According to Malla and Amin (2023), only 40% of nursing programs included any form of AR or digital simulation training as part of their core education. This causes a generational divide where younger nurses may have the advantage of being more adaptable, while older nurses are hard pressed to even distinguish the tech language.

7.3 Patient-Literacy and Device Barriers

Besides that, patients pose some barriers due to their low level of digital literacy. Older adults, people with some cognitive impairments, and individuals in underserved communities may confront understanding AR overlays or interacting with smart devices by themselves (Iqbal et al., 2024). Nurses have to find ways around by simplifying the explanations, switching to verbal analogies, or just abandoning ARa the tool's efficiency thereby greatly compromised (Le et al., 2018). Limitations within hardware also hamper the process. For instance, smart glasses would not fit over prescription eyewear, some AR interface methods might experience some lag, spatial distortion, or poor calibration depending on the lighting conditions.

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The usual suspects in this case are the nurses responsible for remaining supportive in helping patients while operating the tool, thereby interrupting the communication process.

7.4 Resistance to Change in Interdisciplinary Teams

There remains a small yet ceaseless resistance to change. The scene changes when the young generation of clinicians and researchers are fast to embrace AR, so disbelief sets in amongst those in established practice concerning its practicality.

AR is being viewed by dental teams as an extra layer of complexity instead of a facilitator of care.

Because of the presence of nurses between those deciding clinically and the patients, they often become the emotional bucket of this resistance.

This resistance sees the position of nurses within some teams as almost untouchable or acknowledges their role in digital workflows too limited to foster an enthusiastic engagement with the technology (Own et al., 2024).

To vanquish this inertia, transformation in culture will have to take place, policies will have to align, and this change will have to be loudly championed.

The bar chart below illustrates key implementation barriers as reported by nursing and dental staff across clinical settings:

- High Equipment Cost (85%)
- Training Deficit Among Nurses (72%)
- Low Patient Tech Literacy (65%)
- Device Usability Issues (60%)
- Team Resistance to Change (50%)

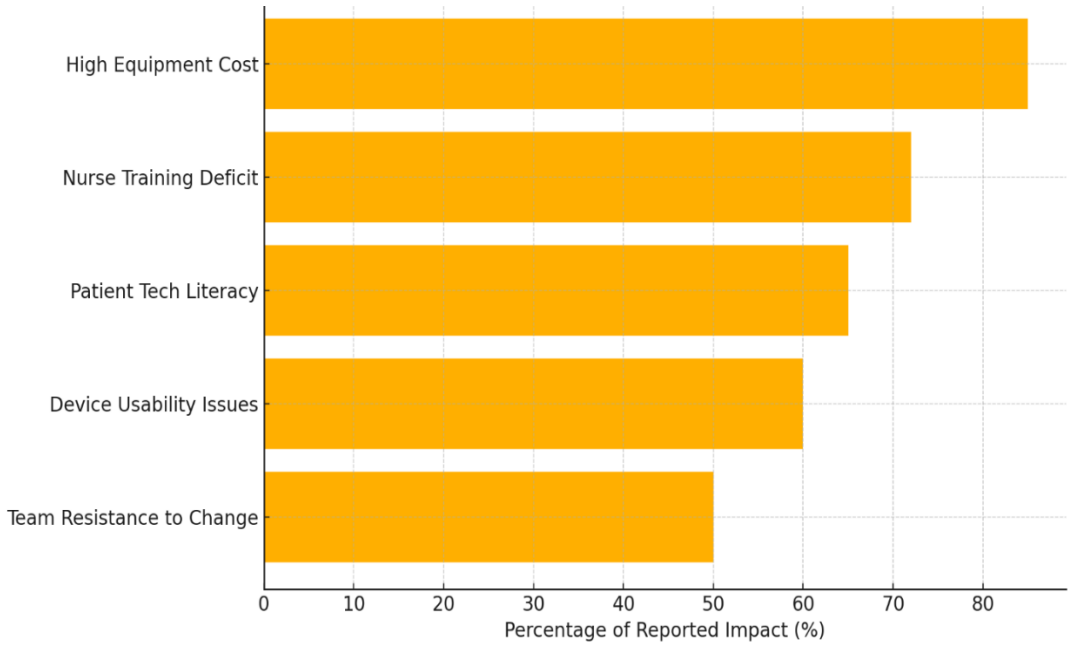

Figure 3: Major Barriers to AR Adoption in Dental Care Teams

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Table 5: Challenges to AR Adoption in Interprofessional Dental Teams

Barrier	Description	Nursing-Specific Impact
High Equipment Cost	Expensive hardware and software integration with existing systems	Limited access to tools in nursing areas
Lack of AR Training	No formal onboarding or inclusion in device instruction	Exclusion from digital planning sessions
Patient Literacy Gap	Difficulty among patients understanding or interacting with AR	Extra time spent translating visuals into verbal explanations
Device Usability/Ergonomics	Problems with fit, calibration, and usability of AR interfaces	Nurses must troubleshoot devices while maintaining rapport
Team Resistance to Change	Clinical inertia or reluctance from senior staff to adopt new tools	Nurses caught between tech advocates and conservative teams
Data Privacy and Consent	AR tools involving facial scans and medical records may raise concerns	Nurses must manage consent protocols and explain data usage

7.5 Overcoming Barriers

Recommendations In order to meaningfully advance the integration of AR into healthcare systems, the following must be accomplished:

- Subsidize Implementation of AR: Public-private partnerships or grants to lessen upfront capital burden.
- Training Specific to Nursing: AR simulation should be incorporated into continuing education and nursing programs.
- Patient-Facing Design: The design of AR interfaces should target low-literacy populations and consider the age factor.
- Institutional Policy Shift: Make it mandatory that tech planning and tool selection are done at the interdisciplinary level.

By ensuring that technology development moves in tandem with workforce readiness and patient inclusivity, these barriers could potentially be taken down.

8. FUTURE DIRECTIONS IN AR AND NURSING COLLABORATION

As the application of Augmented Reality grows in prosthodontics, its long-term value will also depend on the various developmental aspects of integration between nursing and digital dental care ecosystems. Nurses are often underutilized in tech-forward dental clinics, though they remain essential to fostering patient buy-in, communicating clinical decisions, and overseeing post-procedural care. Future directions must formally incorporate their inclusion in training, policymaking, team collaboration, research, and technology design.

8.1 Recommendations for Training and Skill Development

Recommendations for Training and Skill Development To bridge the present gap in digital readiness among nurses, contextualized training modules ought to be introduced at undergraduate and continuing professional development levels. AR instruction would go beyond just interface interaction; it must also incorporate patient-centered visualization, digital empathy, informed visualization consent, and technology ethics (Alrashidi et al., 2024; Malla & Amin, 2023).

Institutions also become capable of developing AR simulation laboratories wherein nurses can practice running through procedures explanation with patients and interdisciplinary briefings using

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real-time overlays and wearable tech. In terms of clinical training inside settings, such should also conjoin nurses going through future onboarding and training being conducted by underwriter vendors during the roll-out of the AR devices. Nurses would do well in the role of adopting super-user status as well as being the main communicators with the workflow, being able to troubleshoot and explain to patients and junior staff alike. International accreditation bodies and licensing organizations could work towards embedding AR competency as part of the core professional standards for nursing specialties in dentistry, geriatrics, or patient education (Le et al., 2018).

8.2 Research and Innovation Opportunities

Nurses should be supported to co-lead research examining the communicational and behavioral impacts of AR dental care. While most AR studies center on technical improvements, the psychosocial aspect(s), such as trust, anxiety alleviation, or health literacy, remain underascribed. Owing to their long patient engagement lifeline, nurses could best investigate these soft-skill issues (Aliwi et al., 2023; Nazari & Borna, 2025). Moreover, nurse researchers may develop metrics to assess the effectiveness of AR tools at the real site with, e.g., time savings during the consent process, accuracy in patient recall after AR-oriented briefings, and reduced rates of no-shows when treatment was better understood. Such evidence-backed metrics will be vital to justify institutional funding in AR technologies (Shankar et al., 2024). Grant programs, especially in developing countries or underserved areas, ought to fund nurse-led pilot innovations for the implementation of AR, VR, and other immersive technologies in the dental field. This ensures that implementation is equitable and context-aware, not limited to elite or urban institutions.

8.3 Frameworks for Nurse Inclusion in Technology

Rollouts Healthcare institutions should adopt structured frameworks for integrating nurses at every phase of AR technology deployment from tech selection, though testing and policy development, to outcomes evaluation. A model for best practice should look like:

- Stakeholder Inclusion: Nurses sit on selection committees alongside dentists, administrators, and IT personnel.
- Pre-Deployment Workshops: Hands-on simulations where nurses can test the AR device for the efficacy of its usability and patients' response.
- Post-Deployment Feedback Loops: Nurses should be actively involved in the audits and evaluations of AR tools with respect to patient communication at regular intervals.
- Nurse Ambassadors: Institutions can designate tech-savvy nurses to train others and serve as their liaison for updates with vendors.

Institutions that neglect nurse feedback during tech implementation will face hindrances such as poor adoption rates, inefficient workflows, and patient dissatisfaction stemming from the misalignment of tech interfaces with their communication ecosystem (Al-Enezi et al., 2024; Own et al., 2024).

8.4 Interprofessional Curricula for Digital Dentistry

Dental and nursing education must no longer operate in vacuum environments. Universities and training institutes should embark on interprofessional courses for digital dentistry, wherein dental, nursing, and biomedical engineering students jointly attend AR, simulation planning, and patient-centered visual communication classes. These courses are to focus on joint case simulations, whereby each discipline charts out their real-world roles. For example, dental students focus on prosthesis design and placement, while nursing students focus on consent, emotional response, and post-op education—all in a digitally simulated AR environment (Kumar et al., 2025).

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Such programs nurture mutual respect, minimize barriers of hierarchy, and prepare students to work as nimbly functioning team members within the increasingly digital care environment. More importantly, it is a pathway towards interdisciplinary certification that validates competency in digital care in and across professions.

8.5 Policy and Clinical Protocol Implications

Wider AR adoption, however, will require supporting policies at the institutional, regional, and national metalayer. Notable subjects that must be addressed include:

- Scope of Practice: Defining and expanding the legal scopes of AR that can be use by nurses in dental care.
- Consent Protocols: Building protocols on how to seek information consent related to AR visualization and recording such consent.
- Data Governance: Enforcement of safeguards on facial scans, intraoral images, or treatment simulations generated through AR.
- Reimbursement Models: Lobbying for recognition under dental insurance codes of AR-facilitated communication services which are primarily nurse-led (Mohammadi et al., 2024).

Clinically, the protocol updates must come in, too, such as having AR device readiness and staff competency signoffs included in the preoperative checklist. Ensuring that discharge procedures allow the patients access to AR-based follow-up materials narrated by nursing staff with competence becomes another anchor that firmly establishes AR as not merely some "cool tool" but actual standard care provisioning.

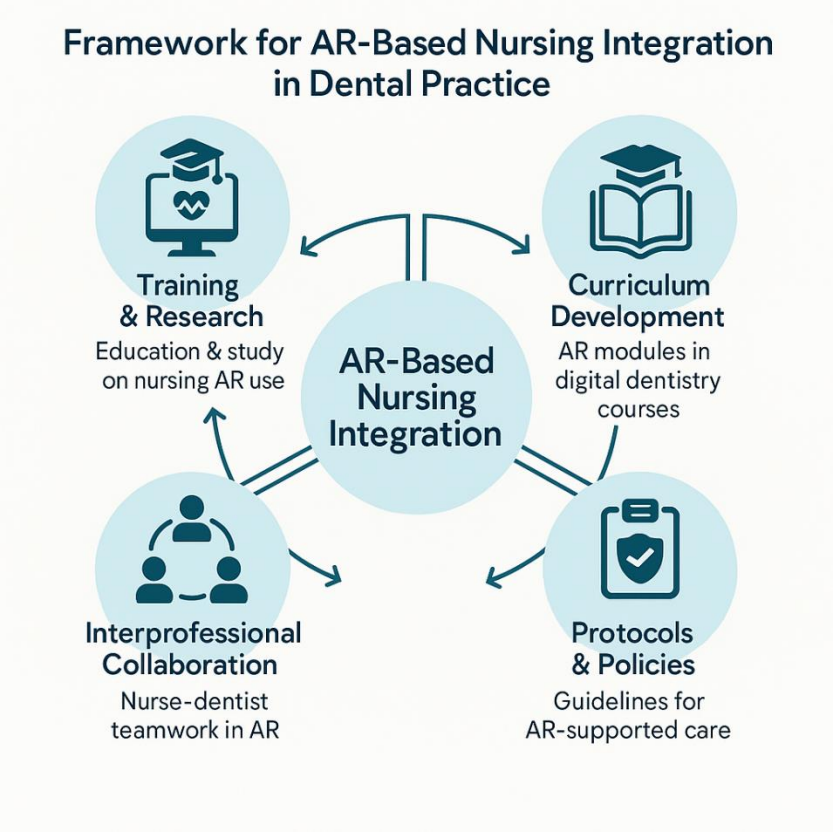

Figure 4: Framework for AR-Based Nursing Integration in Dental Practice

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8.6 Final Thoughts on the Future

Prosthodontics' future will exist not only in digital precision but human-centered implementation. Nurses are the ones acting as a bridge between the high-tech systems and the emotional, informational, and psychological needs of patients. The integration of nurses into AR ecosystems is not an option; it simply must happen.

With the complete digitalization of dental care, nursing collaboration will be necessary to ensure that technology will serve humanity and not the other way.

9. CONCLUSION

The interplay of augmented reality into prosthodontics is more than a mere addition to technology; it is a true paradigm shift in how dentistry is communicated, experienced, and delivered. While everyone agrees on some contributions of AR that enhance clinical precision in smile design or implant placements, it is only when put in the hands of those who translate this innovation to a patient-understood reality that the deeper potential of AR can be realized-nurses.

In this paper, we have analyzed the existing enhancements to prosthodontic workflows in AR: making invisible structures visible, abstracting procedures that are otherwise abstract forms into concrete ones, and managing patient expectations. However, these functions will require a human interface of empathy, clarity, and flexibility. There are virtually no human beings better qualified for such a task than nursing professionals. Be it in presenting treatment plans in an AR-dependent method through overlays, alleviating anxiety in some preoperative counseling, or guiding the patient through post-operative care with AR-technology, the need for nursing appears far more essential than ever to digital dentistry.

The nursing, however, is not an ancillary element to the implementation of AR. On the contrary, integrating nursing in AR workflows fosters an environment of enhanced patient education and more aware patient consent while encouraging the collaborative curing project. Patients cease to be passive recipients of care; through AR, aided by a competent nurse, they start to actively collaborate in project planning and decision-making. In certain emotionally challenging treatments such as full-arch implants and even esthetic rehabilitations, the ramifications of such collaboration are highly relevant to outcomes and satisfaction levels. A few examples and cases from this paper-from pediatric gamification to geriatric visualization tools-show that AR combined with well-trained nursing communication shores up the reduction of treatment fear, increase in understanding, and enhancement of the feeling of trust. And these implications supersede individual patient experiences. They serve as a larger systemic opportunity of redefining the interdisciplinary borders of prosthodontic care by placing nurses at the epicenter of the digital transformation.

There will, of course, be some challenges sympathetically faced in this evolution. The cost remains a very important factor, especially for institutions that lack infrastructure. The lack of a solid baseline curriculum for nurses that would comprehensively train them in AR systems is the biggest obstacle to adoption, aside from the hardware itself. Added to this, is the unfamiliarity that an older or underserved population has with technology, leaving nurses even more at risk of simplifying these interactions. The uphill battle gets more complicated in many clinical settings, where disruptions to established hierarchies and workflows are resisted. However, the path ahead is clear. The full adoption of AR in Prosthodontics will require far more than enthusiasm; structural commitment must be made.

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This will require investment in simulation-based education for nurses, a reimagining of the training strategy used for interdisciplinary teams, and a guarantee that nurses are included at every step of AR deployment-well before the actual deployment. This means the selection of AR systems, the implementation thereof, and the assessment while ensuring that their inclusion is backed by policy and institutional frameworks that recognize their communicative as well as clinical value brought toward AR-care.

What will also affect and assist in this integration are the reimagining of the nursing roles. Nurses should no longer be considered peripheral to digital innovation; instead, they should be educated and positioned as digital guides - those who interpret, contextualize, and humanize the visual data provided by AR. In their role as stewards of patient-centered communication, their skills go beyond technical understanding into the emotional intelligence that becomes particularly valuable in environments where patients feel overwhelmed or unsure.

Equally important to the development of nursing in AR-enhanced prosthodontics should be curricular reform. Interprofessional training environments in which nurses, dentists, and digital technologists study together are necessary to remove silos and engender mutual respect. These environments constitute fertile soil for nurturing a shared vocabulary, shared objectives, and shared capabilities for the digital delivery of care. Beyond readying future caregivers, when developed, these systems will ready organizations to lead in the next chapter of healthcare.

There are definite implications for policy as well. Health systems will have to begin wholeheartedly defining and protecting the scope of nursing practice in AR-supported interaction, including responsibilities dealing with visualization consent, digital documentation, and patient data handling in immersive formats. Ethical governance must ensure that the enthusiasm around innovative developments already showcased in the technology does not drown the rightful claims patients have to privacy, transparency, and equitable access.

At its heart, this paper is affirming that the most successful use of AR in prosthodontics is not defined by the technology itself but by the human experience that comes from it. When a patient can see the smile that they will one day have, fully comprehend the treatment options available to them, and support the decision process behind it through the knowledge of not just the software but of a nurse, that is where AR begins to present true value. And when the interdisciplinary team is able to work fluidly around this interaction based on shared protocol that benefits all its members equally, it makes the promise of digital transformation a successful reality.

We are standing on the threshold of change. The tools are in place, and the infrastructure for operation is implementing rapidly. What is required right now is for us to go through change with how we look at communication, collaboration, and the nursing role in high-tech care. AR will not replace human touch; it will amplify human touch and make human touch way more precise, empathetic, and effective, hence never-before-achievable moments with which nurses will guide.

References

1) Lin, P. Y., Chen, T. C., Lin, C. J., Huang, C. C., Tsai, Y. H., Tsai, Y. L., & Wang, C. Y. (2024). The use of augmented reality (AR) and virtual reality (VR) in dental surgery education and practice: A narrative review. Journal of Dental Sciences, 19, S91–S101.

2) Kashwani, R., Kulkarni, V., Salam, S., Sharma, S., Rathi, P., Gupta, S., ... & Sharma, A. (2024). Virtual vs augmented reality in the field of dentistry. Community Practitioner, 21(3), 597–603.

3) Meto, A., & Halilaj, G. (2025). The integration of cone beam computed tomography, artificial intelligence, augmented reality, and virtual reality in dental diagnostics, surgical planning, and education: A narrative review. Applied Sciences, 15(11), 6308.

DOI: 10.5281/zenodo.16743518
Vol: 62 | Issue: 08 | 2025

4) Al-Enezi, F. M. M., Alruwaili, Y. S. D., Alruwaili, H. S. D., Alshammari, A. L. M., Alanazi, A. S. D., Daheshi, M. M., ... & Oalrowais, O. G. O. (2024). Technological advancements in healthcare: Examining the role of digital tools in strengthening interprofessional collaboration among nursing, radiology, physiotherapy, prosthetics, and dental practitioners. Journal of International Crisis and Risk Communication Research, 7(S11), 3103.

5) Monterubbianesi, R., Tosco, V., Vitiello, F., Orilisi, G., Fraccastoro, F., Putignano, A., & Orsini, G. (2022). Augmented, virtual and mixed reality in dentistry: A narrative review on the existing platforms and future challenges. Applied Sciences, 12(2), 877.

6) Perry, R., Singh, G., Dame, A., Mohamed, S. A., Idiculla, A. M., & Garg, R. (2025). The integration of artificial intelligence and augmented reality in dental education: Current applications and future potential. Compendium of Continuing Education in Dentistry, 46(5).

7) Kashwani, R., Ahuja, G., Narula, V., Jose, A. T., Kulkarni, V., Hajong, R., & Gupta, S. (2024). Future of dental care: Integrating AI, metaverse, AR/VR, teledentistry, CAD & 3D printing, blockchain and CRISPR innovations. Community Practitioner, 21(5), 123–137.

8) Alanazi, W. T., Al-Shahrani, A. A., Albishe, S. S., Alshaer, S. M., Al Shmry, F. K., Al Muhaidib, S. A., ... & Al Nasaib, M. J. A. (2024). Future of AI integration in dental assisting: Revolutionizing patient care and professional training. Journal of International Crisis & Risk Communication Research, 7.

9) Mohammadi, A. T., Far, Y. K., Ghazanfarpour, M., Neshanifard, N., Zobeydi, A. M., Zahmatkesh, H., ... & Khajeh, F. R. (2024). Revolutionizing healthcare: Exploring the future of medical and dental innovations. Nobel Sciences.

10) Thavasimuthu, R., Abinaya, K., Divya, G., & Latha, G. C. P. (2024). Artificial intelligence-based augmented reality and virtual reality models for healthcare industry. In Metaverse Technologies in Healthcare (pp. 85–101). Academic Press.

11) Own, M. A. I., Al Farhan, A. S., Basrawi, T. A., Algithmi, D. M., Salamah, Z. M., Almehmadi, S. A., ... & Alyami, I. A. M. (2024). Integrated approaches in emergency care and radiological support in prosthodontics for optimal dental treatment. Journal of International Crisis and Risk Communication Research, 7(S6), 365.

12) Bharadwaj, R. S., Kalgeri, S. H., Shivakumar, A. T., Doddawad, V., Shankar, P. M., & BB, S. K. (2024). Revolutionizing dental health care: An in-depth exploration of technological advancements. European Journal of General Dentistry, 13(1), 1–14.

13) Iqbal, A. I., Aamir, A., Hammad, A., Hafsa, H., Basit, A., Oduoye, M. O., ... & Jabeen, S. (2024). Immersive technologies in healthcare: An in-depth exploration of virtual reality and augmented reality in enhancing patient care, medical education, and training paradigms. Journal of Primary Care & Community Health, 15, 21501319241293311.

14) Albalawi, N. S., Almutery, M. M., Almutairi, M. N., Al-Anzi, F. R., Almutairi, R. M., Alharbi, A. O., ... & Alqahtani, S. A. S. (2024). Advancing public oral health: Collaborative approaches between dentists, hygienists, and dental assistants in managing special needs patients. Journal of International Crisis and Risk Communication Research, 7(S3), 680.

15) Dută, M., Amariei, C. I., Bogdan, C. M., Popovici, D. M., Ionescu, N., & Nuca, C. I. (2011). An overview of virtual and augmented reality in dental education. Oral Health and Dental Management, 10(1), 42–49.

16) Nazari, A., & Borna, S. (2025). Patient education and communication in oral and maxillofacial treatments. In Handbook of Oral and Maxillofacial Surgery and Implantology (pp. 1–153). Springer Nature Switzerland.

17) Alrashidi, S. A., Alluhaibi, S. R., Alsaedi, A. N. A., Alsaedi, A. N., Alowfi, A. S. S., Aljohani, A. S., ... & Alharbi, W. O. (2024). Integrative review of nursing and medical devices: The role of digital health in enhancing dental and public health outcomes. Journal of International Crisis and Risk Communication Research, 7(S11), 3203.

DOI: 10.5281/zenodo.16743518
Vol: 62 | Issue: 08 | 2025

18) Le, D. N., Van Le, C., Tromp, J. G., & Nguyen, G. N. (Eds.). (2018). Emerging technologies for health and medicine: Virtual reality, augmented reality, artificial intelligence, internet of things, robotics, industry 4.0. Academic Press.

19) Quintero, J. D. P., & Erazo, C. M. (2024). Augmented reality applied to health sciences: A literature review. Scientia et Technica, 29(4), 181–189.

20) Aliwi, I., Schot, V., Carrabba, M., Duong, P., Shievano, S., Caputo, M., ... & Biglino, G. (2023). The role of immersive virtual reality and augmented reality in medical communication: A scoping review. Journal of Patient Experience, 10, 23743735231171562.

21) Nazari, A. (2025). Integration of global surgery principles in maxillofacial practice. In Handbook of Oral and Maxillofacial Surgery and Implantology (pp. 1–104). Springer Nature Switzerland.

22) Kar, S. (2025). Digital prosthodontics: CAD/CAM, AI, and 3D printing. Prachi Digital Publication.

23) Savaş, E. H., Coşkun, A. B., Elmaoğlu, E., Semerci, R., & Şahiner, N. C. (2025). Investigating the effects of augmented reality-based interventions on pediatric patient outcomes in the clinical setting: A systematic review. Journal of Pediatric Nursing, 85, 39–47.

24) DaSilva, A. F., Robinson, M. A., Shi, W., & McCauley, L. K. (2022). The forefront of dentistry—Promising tech-innovations and new treatments. JDR Clinical & Translational Research, 7(1_suppl), 16S–24S.

25) Kumar, R., Jain, V., Han, G. T. W., & Touzene, A. (Eds.). (2023). Immersive virtual and augmented reality in healthcare: An IoT and blockchain perspective. CRC Press.

26) Damar, M. (2022). What the literature on medicine, nursing, public health, midwifery, and dentistry reveals: An overview of the rapidly approaching metaverse. Journal of Metaverse, 2(2), 62–70.

27) Pasupuleti, M. K., Salwaji, S., Dantuluri, M., Raju, M. A. K. V., Ramaraju, A. V., Marrapodi, M. M., ... & Minervini, G. (2024). Newer technological advances: A step towards better dental care: A systematic review. The Open Dentistry Journal, 18(1).

28) Xuebo, L. (2025). The role of digital smile design in enhancing aesthetic dentistry outcomes. Peta International Journal of Public Health, 2(2), 1–13.

29) Adeghe, E. P., Okolo, C. A., & Ojeyinka, O. T. (2024). A review of the integration of virtual reality in healthcare: Implications for patient education and treatment outcomes. International Journal of Science and Technology Research Archive, 6(1), 79–88.

30) Dinh, A., Yin, A. L., Estrin, D., Greenwald, P., & Fortenko, A. (2023). Augmented reality in real-time telemedicine and telementoring: Scoping review. JMIR mHealth and uHealth, 11, e45464.

31) Lakshmikantha, H. T. (2024). Leveling up orthodontic education: Game-based learning as the new frontier in orthodontic curriculum. Research and Development in Medical Education, 13(1), 13.

32) Hiran, K. K., Doshi, R., & Patel, M. (Eds.). (2024). Applications of virtual and augmented reality for health and wellbeing. IGI Global.

33) Parra-Quintero, J. D., & Mueses-Erazo, C. A. (2024). Augmented reality applied to health sciences. Scientia et Technica, 29(4), 181–189.

34) Suh, I., McKinney, T., & Siu, K. C. (2023, April). Current perspective of metaverse application in medical education, research and patient care. In Virtual Worlds (Vol. 2, No. 2, pp. 115–128). MDPI.

35) Lastrucci, A., & Giansanti, D. (2024). Radiological crossroads: Navigating the intersection of virtual reality and digital radiology through a comprehensive narrative review of reviews. Robotics, 13(5), 69.

36) Malla, A. M., & Amin, U. (2023). Scope of technology in health care, special focus on nursing. Journal of Integrative Nursing, 5(4), 300–310.

DOI: 10.5281/zenodo.16743518
Vol: 62 | Issue: 08 | 2025

37) Kumar, S. N., Fred, A. L., Ajay Kumar, H., Miriam, L. J., Jane, I. C., Padmanabhan, P., & Gulyás, B. (2025). Role of augmented reality and virtual reality in medical imaging. In Introduction to Extended Reality (XR) Technologies (pp. 157–171). Springer.

38) Shankar, A., Monisha, T. R., Kumar, S. S., Anurag, A., & Narayan, A. (2024, August). Advancements in AI-driven dentistry: Tooth genAI's impact on dental diagnosis and treatment planning. In 2024 2nd International Conference on Networking, Embedded and Wireless Systems (ICNEWS) (pp. 1–7). IEEE.

39) Qiao, J., Xu, J., Li, L., & Ouyang, Y. Q. (2021). The integration of immersive virtual reality simulation in interprofessional education: A scoping review. Nurse Education Today, 98, 104773.

40) Lastrucci, A., & Giansanti, D. (2024). Radiological crossroads: Navigating the intersection of virtual reality and digital radiology through a comprehensive narrative review of reviews. Robotics, 13(5), 69.

41) Malla, A. M., & Amin, U. (2023). Scope of technology in health care, special focus on nursing. Journal of Integrative Nursing, 5(4), 300–310.

42) Kumar, S. N., Fred, A. L., Ajay Kumar, H., Miriam, L. J., Jane, I. C., Padmanabhan, P., & Gulyás, B. (2025). Role of augmented reality and virtual reality in medical imaging. In Introduction to Extended Reality (XR) Technologies (pp. 157–171). Springer.

43) Yüzbaşioğlu, M. A. (2023). Muhasebe Denetiminin Türk Hukuk Sistemindeki Yerinin İncelenmesi (İcra İflas Kanunu, Türk Ticaret Kanunu, Vergi Usul Kanunu Açisindan)

44) Karahan, M., & Yüzbaşıoğlu, M. A. (2021). Estimating Re-evaluation of The Risk Report Obtained Using the Altman Z-score Model in Mergers with Neutrosophic Numbers. Neutrosophic Sets and Systems, 43, 54-60.

45) Karahan, M., & Çoban, M. A. (2017). Muhasebe Ve FinanS PersonelleriniN DenetimE Bakiş Açilari (Gaziantep). International Journal of Social and Humanities Sciences Research (Jshsr), 4(14), 1785-

46) Yüzbaşioğlu, M. A. (2024). A Current Approach to The Problem of Businesses in Turkey Keeping Two Different Computerized Accounting Records, Official and Informal, For the Purpose of Avoiding Taxes. Ijsat-international Journal on Science and Technology, 15(2).

47) Yüzbaşioğlu, M. A. (2024). BilgisayarLi Muhasebe Programlarinda Yapay Zekâ Destekli DenetiM Ve Bu DenetimiN Türk TicareT Kanunu İle Mali Hukuk Açisindan Etkileri. Journal Of Pure Social Sciences (Puresoc)-pak Sosyal BilimlEr Dergisİ (Paksos),

48) Yüzbaşioğlu, M. A. (2024). Accounting, Integration into Computerized Accounting Programs, Seigniorage Rights, Taxation and Current Discussion Topics for Cryptocurrencies.

49) Yüzbaşioğlu, M. A. (2024). Accounting, Integration into Computerized Accounting Programs, Seigniorage Rights, Taxation and Current Discussion Topics for Cryptocurrencies.

50) Yüzbaşioğlu, M. A. (2024). BilgisayarLi Muhasebe Programlarinda Yapay Zekâ Destekli DenetiM Ve Bu DenetimiN Türk TicareT Kanunu İle Mali Hukuk Açisindan Etkileri. Journal Of Pure Social Sciences (Puresoc)-pak Sosyal BilimlEr Dergisİ (Paksos),

51) Yüzbaşioğlu, M. A. (2024). A Current Approach to The Problem of Businesses in Turkey Keeping Two Different Computerized Accounting Records, Official and Informal, For the Purpose of Avoiding Taxes. Ijsat-international Journal on Science and Technology, 15(2).

52) Yüzbaşioğlu, M. A. (2024). BilgisayarLi Muhasebe Programlarinda Yapay Zekâ Destekli DenetiM Ve Bu DenetimiN Türk TicareT Kanunu İle Mali Hukuk Açisindan Etkileri. Journal Of Pure Social Sciences (Puresoc)-pak Sosyal BilimlEr Dergisİ (Paksos),