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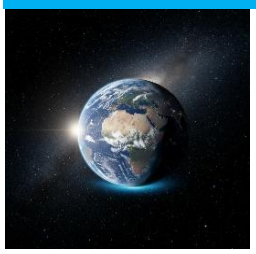

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Telemedicine in Postoperative Monitoring After Oral Surgery: Clinical Outcomes, Patient Satisfaction, and Health Equity Implications

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Abstract

Background. Telemedicine has become an important component of postoperative care in oral and maxillofacial surgery, especially after the COVID-19-driven expansion of remote clinical services. Current evidence suggests potential benefits in safety, convenience, and resource utilization, but implementation challenges remain.

Aim. To synthesize current evidence on telemedicine in postoperative monitoring after oral surgery, with emphasis on clinical outcomes, patient satisfaction, operational efficiency, and health equity implications.

Material and methods. A narrative literature review was conducted using PubMed/MEDLINE, Scopus, and Google Scholar, focusing primarily on studies published between 2006 and 2026. Eligible studies evaluated telemedicine-based postoperative follow-up in oral and maxillofacial surgery and reported outcomes related to clinical safety, complication detection, patient-reported experience, access, or economic impact.

Results. Across low-risk oral surgery pathways, remote follow-up showed outcomes comparable to in-person care for symptom monitoring and complication screening. Patient satisfaction was consistently high, with many patients preferring telemedicine after direct use. Telemedicine reduced travel burden, waiting time, and patient-side costs, and supported more efficient allocation of clinical resources. At the same time, limitations included restricted physical examination and potential inequities related to digital literacy and connectivity.

Conclusions. Telemedicine is a safe and effective adjunct for postoperative monitoring in selected oral surgery patients and should be integrated within hybrid, risk-stratified care models.

Wider implementation requires clear escalation protocols, inclusive digital design, and supportive policy frameworks to ensure quality and equitable access.
Key words. telemedicine; oral surgery; postoperative monitoring; patient satisfaction; health equity

Contents

1 Introduction

Telemedicine, defined by the World Health Organization as “healing from a distance,” uses information and communication technologies to deliver remote medical services, diagnosis, monitoring, and therapy [1, 2]. While digital tools have been available for decades, the COVID-

19 pandemic served as a pivotal catalyst for their integration into oral and maxillofacial surgery (OMFS), forcing a rapid transition to remote care to preserve patient access while minimizing viral transmission risks [1, 3, 4, 5]. In the post-pandemic landscape, telemedicine has evolved into a stable component of surgical workflows, serving as a pragmatic adjunct for triage, consultation, and postoperative monitoring [5].

In the context of postoperative monitoring, current evidence suggests that remote consultations for routine, low-risk procedures—such as third molar extractions and dental implant surgery—are non-inferior to traditional face-to-face evaluations [5, 3, 6, 7]. The reliability of these assessments is frequently anchored in structured telephone interviews or high-resolution video calls that use "red flag" screening systems to monitor key parameters such as pain, swelling, and neurosensory deficits [8, 9]. These digital modalities also offer significant operational benefits, including improved clinic attendance rates, optimized resource utilization, and reduced unnecessary travel [4, 2, 9].

Beyond clinical outcomes, telemedicine addresses critical health equity and economic challenges within the healthcare system [10, 5, 4, 2]. While it can bridge geographic and mobility barriers for rural and underserved populations, implementation also brings the "digital divide" to the forefront, as technological literacy and internet infrastructure remain uneven across socioeconomic groups [1, 2, 11, 5].

This narrative review synthesizes the current landscape of telemedicine in postoperative OMFS monitoring. It evaluates clinical outcomes and diagnostic reliability across surgical diagnostic groups, examines patient satisfaction and user experience compared with in-person care, and explores broader implications for health equity, geographic access, and healthcare economics.

2 Methodology

2.1 Study Design

This study was conducted as a narrative literature review examining the use of telemedicine for postoperative monitoring in oral and maxillofacial surgery (OMFS). Relevant studies were identified through searches of PubMed/MEDLINE, Scopus, and Google Scholar, focusing primarily on literature published in the last 20 years (2006-2026).

Search terms included combinations of keywords such as telemedicine, teledentistry, oral surgery, postoperative follow-up,postoperative monitoring and patient satisfaction. Studies were included if they evaluated telemedicine-based postoperative monitoring and reported outcomes related to clinical safety, complication detection, patient experience, or healthcare efficiency. Studies from other surgical specialties were incorporated selectively to provide contextual comparison

Relevant findings were extracted and synthesized thematically, focusing on clinical outcomes, patient satisfaction, operational efficiency, and health equity implications associated with telemedicine follow-up. As a narrative review, this study does not include formal meta-analysis or risk-of-bias assessment.

2.2 AI

AI was utilized for two specific purposes in this research. Text analysis of clinical reasoning narratives to identify linguistic patterns associated with specific logical fallacies. Assistance in refining the academic English language of the manuscript, ensuring clarity, consistency, and adherence to scientific writing standards. AI were used for additional linguistic refinement of the research manuscript, ensuring proper English grammar, style, and clarity in the presentation of results. It is important to emphasize that all AI tools were used strictly as assistive instruments

under human supervision. The final interpretation of results, classification of errors, and conclusions were determined by human experts in clinical medicine and formal logic. The AI tools served primarily to enhance efficiency in data processing, pattern recognition, and linguistic refinement, rather than replacing human judgment in the analytical process.

3 Clinical Outcomes and Diagnostic Reliability

3.1 Equivalence in Clinical Outcomes and Complication Detection

Substantial empirical evidence indicates that telemedicine-based follow-up protocols demonstrate clinical equivalence to traditional in-person examinations for postoperative oral and maxillofacial surgery patients. Prospective randomized clinical trials have established that there is no statistically significant difference in the frequency of reported symptoms or objective complication rates between cohorts receiving telephone follow-up and those receiving conventional face-to-face care [2]. Pilot studies focusing on specialized procedures, such as dental implant surgery, have similarly confirmed that clinical outcomes—including the assessment of wound healing and the incidence of implantrelated complications—are comparable between remote and physical follow-up groups [6].

Diagnostic reliability is further supported by studies showing high concordance between virtual video consultations and subsequent clinical examinations regarding key inflammatory markers, such as swelling, muscle pain, temporomandibular joint sounds, and the presence of pus drainage [12]. These results underscore the efficacy of remote monitoring as a robust screening tool; for example, longitudinal audits indicate that roughly 90% of patients can be safely discharged via telephone review, with only 10% requiring in-person intervention due to identified complications [9]. Thus, telemedicine appears to effectively identify patients requiring urgent clinical attention without compromising the overall standard of care [4].

3.2 Monitoring Key Postoperative Parameters and Utilization of "Red Flag" Screening Systems

The efficacy of remote monitoring in oral surgery relies on standardized assessment of specific clinical indicators that mirror traditional physical examinations. Primary parameters evaluated include pain intensity—typically quantified via a Numerical Rating Scale (NRS) or Visual Analog Scale (VAS)—as well as the progression of swelling and the presence of neurosensory disturbances such as numbness or tingling in the lip, tongue, or chin [8, 12]. Functional recovery is objectively assessed through measurement of maximal incisal opening, often utilizing a "finger stack" test [8, 9]. Furthermore, clinicians monitor for systemic or local signs of infection, including fever, chills, and dysphagia [2, 9].

To ensure patient safety, these telemedical protocols integrate "red flag" screening systems designed to trigger immediate clinical escalation. Specific "red flag" responses include increasing pain or swelling, numbness, pain that prevents sleep, and difficulty swallowing [8, 9]. Reporting of any such symptom typically mandates a face-to-face clinical review within 24 hours to prevent postsurgical morbidity [8, 9]. In video-based consultations after more robust procedures, this screening can be further augmented by visual assessment, including evaluation of neck mobility and visualization of the uvula and faucial pillars [4]. This structured approach allows efficient triage of the vast majority of patients while ensuring that the approximately 6–10% who present with potential complications receive timely in-person intervention [9, 2].

4 Patient Satisfaction and Experience

4.1 Overall Satisfaction Levels and Non-Inferiority to In-Person Care

Current oral surgery studies show high satisfaction with telemedicine (TM), usually similar to inperson follow-up. In dentoalveolar cohorts, up to 95.9% of patients report satisfaction with telephone review [7]. Prospective trials also report statistical non-inferiority for overall satisfaction [13]. For third molar surgery, mean satisfaction scores (out of 50) were 48.78 in telemedicine groups and 46.46 in in-person groups (p =0.11), indicating no significant difference in patient experience [3].

Findings are similar in implant follow-up, where pilot data showed nearly identical scores (virtual: 4.6±0.3; in-person: 4.7±0.2) [6]. Experience with remote care also seems to increase acceptance: 83.3% of patients randomized to telephone follow-up preferred it for future care, compared with lower preference in patients exposed only to conventional visits [2]. Overall, oral surgery evidence supports telemedicine as an acceptable alternative that preserves perceived care quality [1, 2].

As contextual support, in general surgery, high quality randomized and comparative studies report similar or non-inferior satisfaction with telemedical follow-up, often above 80%, with many patients willing to use virtual care again [14, 15, 16].

4.2 User Experience: Ease of Use and Scheduling

In oral and maxillofacial surgery, users generally describe telemedicine as easy to use and easier to fit into daily life. In messaging-based follow-up pathways (e.g., WhatsApp or Telegram), 73% of patients and 97% of clinicians reported high usability [1]. In another cohort, all patients reported that they could express concerns during video visits as effectively as in-person [12]. Randomized data also show no significant difference in self-rated technology familiarity between telemedicine and clinic groups [13].

Scheduling and attendance findings are also favorable. In a randomized third molar study, easeof-scheduling scores were 9.70/10 for telemedicine and 9.46/10 for in-person follow-up (p = 0.46) [3]. Ease-of-attendance scores were 9.52/10 and 9.00/10, respectively (p =0.30) [3]. Remote followup reduced waiting and travel burden, including an average reduction of 12.8 minutes of in-office waiting and substantial travel-time savings for rural patients [2]. Together, these findings suggest better convenience without loss of communication quality [2, 12].

As contextual support (not primary evidence for this review), studies in other surgical fields report the same pattern: convenience drives satisfaction through reduced travel, fewer missed work hours, and lower ancillary costs such as parking or childcare [17, 16]. Some programs also improve reassurance when patients have flexible channels to contact the care team [15, 16].

4.3 Patient Preferences for Remote vs. Face-to-Face Care

Patient preference for remote follow-up is high and often increases after direct use of telemedicine [1, 2]. About 78% of patients in one cohort preferred telemedicine over conventional visits after using it [1]. In a randomized trial, 83.3% of patients in the telephone group preferred remote follow-up for future care, compared with 60% in the in-person group [2]. Longitudinal data show a similar shift: the proportion of patients requesting face-to-face review fell from 29% after an initial virtual visit to 5% after experience with both modalities [12].

Taken together, these results suggest that familiarity reduces initial hesitation and strengthens acceptance of remote postoperative monitoring. When compared with in-person pathways, telemedicine more often shows a directional advantage in preference, even when group differences are not always statistically significant [3].

5 Health Equity and Access Implications

5.1 Bridging Geographic and Mobility Barriers

Telemedicine functions as a vital mechanism for surmounting spatial and temporal constraints in postoperative care, particularly for cohorts residing in rural or medically underserved regions. Empirical data indicate that rural patients frequently traverse distances between 25 and 50 miles for specialized oral surgery consultations, whereas urban populations typically travel fewer than 10 miles [18]. By facilitating remote monitoring, telemedicine mitigates significant travel and parking costs associated with in-person visits—which can exceed EUR 60 for long-distance travel—while saving patients an average of over one hour in total encounter time [2]. Furthermore, this modality is uniquely advantageous for patients with restricted mobility, those who are bedridden, or individuals requiring specialized nursing care, as it provides a bridge to high-quality surgical follow-up without the physical and logistical strain of clinical attendance [2, 6]. Consequently, telemedicine addresses the fundamental healthcare disparity between patient requirements and the localized availability of oral and maxillofacial expertise [2].

5.2 The Digital Divide: Technological Literacy and Infrastructure Requirements

While telemedicine offers significant potential for enhancing access, its implementation is constrained by the "digital divide," a multifaceted barrier encompassing both hardware infrastructure and individual technological proficiency [5]. Success in teledentistry is predicated upon patients possessing high-speed broadband and functional smartphones or computers, yet clinical trials frequently exclude participants who lack such resources, highlighting a systemic bias toward technologically equipped populations [3, 6]. Furthermore, a lack of technical competence—particularly among geriatric patients—remains a critical impediment [2]. Empirical findings suggest that older cohorts, such as those requiring dental implants or treatment for medication-related osteonecrosis of the jaws (MRONJ), exhibit lower acceptance of remote modalities, likely due to difficulties in navigating complex digital interfaces [12].

Infrastructure limitations also introduce diagnostic risks; technical artifacts resulting from poor lighting, motion blur, or low-resolution sensors can distort the clinical picture, potentially leading to non-detection of subtle pathologies [5]. Even in established systems, a non-negligible proportion of patients remain unreachable or experience connection failures during scheduled encounters [3, 9]. Consequently, without robust strategies to address varying levels of digital literacy and the associated costs of requisite hardware, telemedicine may paradoxically exacerbate health disparities for the most vulnerable populations [5, 18].

5.3 Strategies for Equitable Implementation

To ensure equitable delivery of postoperative care, implementation strategies must move beyond proof-of-concept and toward "co-designed" pathways that involve both clinicians and patient stakeholders [5]. Providing necessary hardware, such as smartphones or tablets, directly to participants can overcome immediate socioeconomic barriers and prevent exclusion of otherwise eligible patients [17, 19]. Furthermore, "assisted-digital" options—such as

community-based “spoke” sites that facilitate high-quality image capture—can support patients who lack the digital literacy or infrastructure required for home-based monitoring [5]. Targeted research involving representative populations is necessary to assess the capability of vulnerable groups, such as elderly or low-income patients, to complete specific telemedicine protocols [15, 19]. Ultimately, telemedicine should be viewed as an augment rather than a full replacement for postoperative follow-up, maintaining a vital safety mechanism that allows patients to revert to face-to-face appointments whenever concerns arise [16, 19]. Implementation must also include regular auditing of access-related metrics, such as failed connection rates and uptake across different demographic groups, to detect and mitigate unintended disparities in care [5]. Clinically, equitable telemedicine pathways require proactive support for connectivity and literacy so that access gains are distributed across, rather than away from, vulnerable populations.

6 Operational Efficiency and Healthcare Economics

6.1 Clinical Workflow and Cost-Effectiveness

The integration of telemedicine into postoperative oral surgery protocols significantly enhances clinical workflow by allowing strategic delegation of routine follow-ups to non-surgical staff. Evidence suggests that structured telephone questionnaires can be effectively administered by study nurses, secretaries, or ambulatory nurses [8]. This delegation optimizes resource allocation by reserving the surgeon’s time for complex cases and interventions [2]. Furthermore, telemedicine consultations are inherently more time-efficient; research indicates that the average duration of a telephone follow-up is approximately 3.9 minutes compared to 4.7 minutes for in-person visits [2]. This efficiency is compounded by elimination of clinical preparation and post-processing requirements for treatment rooms, which further reduces institutional workload [2].

Although outside oral surgery scope, cross-specialty perioperative studies provide supporting context for efficiency gains. General surgery data show shorter virtual consultations, potentially due to a decrease in "small talk" and more focused clinical interactions [14]. Orthopedic evidence similarly reports reduced total encounter time, and automated telemonitoring pathways may further reduce manual nursing workload [16].

From an institutional cost-effectiveness perspective, the disparity between telemedicine and conventional follow-up is substantial. Staffing costs for telephone reviews have been estimated at approximately £3.05 per patient, whereas in-person clinic reviews cost roughly £23.55 per patient [9]. Such cost reductions, combined with mitigation of consumable use—such as personal protective equipment—contribute to significant departmental savings, which in one study were estimated at £18,162 per annum [9, 12]. These savings and reclaimed clinic hours allow institutions to reallocate appointment slots to new patients, thereby increasing overall surgical throughput and optimizing revenue streams [9, 13]. Additionally, while pilot studies in dental implantology have noted a 30% reduction in total follow-up care costs [6], institutional benefit is reinforced by insurance reimbursement models, such as those in the United States, where telephone interviews are reimbursed at an average of $98.07 [8]. By minimizing “overtreatment” in the form of unnecessary physical examinations for the vast majority of healthy patients, telemedicine serves as a robust tool for institutional resource optimization [8, 7].

6.2 Impact on Clinic Attendance and Reliability

The integration of telemedicine into postoperative monitoring significantly alters the dynamics of clinic attendance by transitioning a substantial volume of traditional face-to-face reviews to digital platforms. Evidence from analogous surgical disciplines demonstrates that implementing remote monitoring can facilitate a rapid and massive increase—in some cases up to forty-fold—in the utilization of telemedical appointments, which allows for the effective management of both new and returning patient cohorts [20] This digital shift ensures the continuity of follow-up schedules even during periods of restricted institutional access or environmental crises, thereby maintaining the rigor of postoperative surveillance [20] . Furthermore, telemedical modalities have been shown to enhance patient compliance with rehabilitation protocols by eliminating geographic barriers and travel requirements that traditionally impede physical clinic attendance [21] . In terms of clinical reliability, remote surveillance systems allow for sophisticated triage, enabling surgical teams to prioritize on-site resources for patients exhibiting suboptimal recovery while safely managing stable individuals through remote data review [22]Such systems have been associated with a reduction in unnecessary in-person emergency visits; for instance, postoperative virtual follow-ups have been shown to successfully resolve patient concerns with only approximately 6. However, the impact of telemedicine on institutional reliability is characterized by complex trade-offs. While remote systems optimize the schedules of surgical staff and reduce the demand for physical examination rooms, they may concurrently lead to an increase in "no-shows" for digital appointments, potentially resulting in a waste of specialized healthcare resources [20]Despite these operational challenges, the ability to provide rapid consultations without the traditional wait times associated with physical queues contributes to greater overall organizational efficiency and patient satisfaction [23, 24] Ultimately, by minimizing physical patient traffic within surgical departments, healthcare institutions can better manage scarce human resources and reduce the overall burden of hospitalizations [25, 26] . This structured remote presence strengthens the provider-patient relationship by offering a more flexible, multidimensional approach to postoperative care [20].

6.3 Patient-Side Economic Impact

Telemedicine significantly alleviates the financial burden on patients by eliminating direct travelrelated expenses such as fuel, vehicle maintenance, and parking fees [12]. Quantitative analyses have estimated average travel savings of €10.84 per patient, with expenditures potentially exceeding €60 for those residing in remote regions [2]. Remote monitoring also mitigates indirect opportunity costs associated with missed employment or education for both the patient and required escorts, as many oral surgery patients are unable to drive themselves postoperatively [8, 7]. On average, patients save approximately 1.09 hours per follow-up by avoiding transit and clinical waiting periods [2]. These factors culminate in an estimated 30% reduction in total follow-up care costs for the patient [6].

7 Conclusion and Future Directions

Current evidence indicates that telemedicine can safely support postoperative monitoring in oral and maxillofacial surgery when used in appropriately selected, low-risk cases. Across dentoalveolar and implant-focused pathways, remote follow-up demonstrates outcomes comparable to conventional in-person review for symptom surveillance, complication screening, and patient-reported recovery, while reducing travel, waiting time, and avoidable

clinic utilization [2, 6, 7, 9]. These findings suggest that telemedicine should be treated neither as a universal replacement nor as a temporary pandemic workaround, but as a durable component of modern, hybrid postoperative care systems
[5].
At the same time, safe scaling requires a risk-stratified model with clear escalation criteria. Structured “red flag” protocols, standardized symptom checklists, and low thresholds for conversion to face-to-face assessment remain essential to mitigate the limitations of remote examination, particularly for complex procedures, ambiguous findings, and medically vulnerable patients [8, 4, 12]. Future multicenter trials should prioritize harmonized outcome definitions, subgroup analyses by procedure type and comorbidity burden, and longer follow-up windows to clarify where telemedicine is equivalent, where it is superior, and where in-person care remains indispensable [5, 19].
The next phase of implementation should also address equity, infrastructure, and governance in parallel with clinical performance. Policy and operational frameworks must reduce digital exclusion through multilingual support, accessible platform design, and alternatives for patients with limited connectivity or digital literacy. In addition, reimbursement parity, interoperable documentation workflows, and explicit standards for data security are needed to sustain high-quality deployment at scale [1, 2, 18, 5]. With these safeguards in place, telemedicine-enabled postoperative follow-up can strengthen quality, patient experience, and system efficiency while advancing a more equitable model of surgical aftercare.

Disclosure

Author Contributions

Conceptualization, P.S., K.N. and M.S.; methodology, P.S., K.A. and J.S.; software, K.A.; check, P.S., K.N., K.O., D.W. and M.S.; formal analysis, P.S., K.A., N.H. and J.S.; investigation, K.N., N.H., K.O., D.W., K.K. and M.M.; resources, K.N., K.O. and D.W.; data curation, N.H., K.K. and M.M.; writing – rough preparation, P.S., K.A. and N.H.; writing – review and editing, J.S., M.S., K.N., K.O. and D.W.; visualization, K.K. and M.M.; supervision, M.S.; project administration, P.S. and M.S. All authors have read and agreed to the published version of the manuscript.

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