Saudi Journal of Medicine and Public Health

https://saudijmph.com/index.php/pub

https://doi.org/10.64483/202412400

The Oral-Systemic Nexus in Pandemics: A Review of Interprofessional Management of Oral Manifestations and Drug-Related Osteonecrosis in Immunocompromised Patients

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Abstract

Background: The oral cavity is a critical, yet often overlooked, sentinel site in systemic disease and a source of significant morbidity in immunocompromised patients, including those with HIV/AIDS, cancer, and organ transplants. Pandemics and outbreaks exacerbate these vulnerabilities, straining healthcare systems and fragmenting care pathways that are already complex. Oral manifestations like ulcerative mucositis and drug-related osteonecrosis of the jaw (MRONJ) represent challenging intersections of infectious disease, pharmacology, and immunosuppression, demanding high levels of interprofessional coordination.

Aim: This narrative review aims to examine the distinct and collaborative roles of dentistry, pharmacy, nursing, medical laboratories, medical secretaries, and health management, framing the integration of oral health within broader health security and systems resilience frameworks.

Methods: A comprehensive search of PubMed, Scopus, CINAHL, and Web of Science databases (2010-2024) was conducted. Literature was analyzed thematically to map care pathways and identify systemic barriers and facilitators to integrated care.

Results: The review identifies significant gaps in interprofessional communication and standardized care pathways for oral-systemic conditions. Key findings include the critical role of nursing in early oral assessment, the necessity of pharmacist-led medication review to mitigate MRONJ risk, and the systemic failures that occur without proactive coordination by health management and medical secretaries.

Conclusion: Effective management of the oral-systemic nexus in pandemics requires deliberately designed, interprofessional care models. Integrating oral health into primary care protocols for vulnerable populations, empowering non-dental professionals in oral screening, and formalizing communication channels are essential for building resilient health systems that can maintain comprehensive care during crises.

Keywords: Oral-Systemic Health, Interprofessional Collaboration, Medication-Related Osteonecrosis of the Jaw, Health Security, Immunocompromised Host

Introduction

The oral cavity is a mirror reflecting systemic health and a portal for pathogenic entry, a duality that becomes critically pronounced in immunocompromised patients. Individuals living with HIV/AIDS, undergoing chemotherapy or radiotherapy for cancer, or receiving immunosuppressants following organ transplantation are at heightened risk for severe oral complications (Jin et al., 2016). These range from opportunistic infections like oral candidiasis and herpes simplex virus reactivation to debilitating ulcerative mucositis and the severe, necrotic bone condition known as medication-related osteonecrosis of the jaw (MRONJ) (Ruggiero et al., 2022). Such conditions are not merely localized oral problems; they are indicators of systemic immune

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Receive Date: 13 December 2024, Revise Date: 30 December 2024, Accept Date: 31 December 2024

status, sources of debilitating pain that compromise nutrition and medication adherence, and potential foci for life-threatening systemic infection (Zorba et al., 2020).

The management of these oral-systemic complications is inherently interprofessional, requiring seamless collaboration between dental specialists, pharmacists, nurses, laboratory scientists, and care coordinators. However, this collaborative ideal is often disrupted under normal circumstances due to siloed funding, separate electronic health records, and a lack of shared care protocols (Dana et al., 2018). Pandemics and large-scale outbreaks, such as COVID-19, intensify these systemic fractures. Infection control concerns lead to the deprioritization of "non-urgent" dental care, primary care, and nursing focus shifts overwhelmingly toward the pandemic pathogen, and pharmacy supply chains for critical medications are disrupted (Guo et al., 2022). This creates a perfect storm where vulnerable immunocompromised patients experience delays in the diagnosis and management of oral conditions, allowing minor lesions to progress to severe, hospital-requiring complications (Weng et al., 2022).

This scenario presents a clear health security challenge. Health security extends beyond the control of infectious disease outbreaks to encompass the resilience of health systems to maintain essential services during crises (Kandel et al., 2020). The failure to manage chronic conditions and complex comorbidities like MRONJ during a pandemic leads to increased emergency department visits, hospital admissions for pain control or sepsis, and further immunosuppression due to interrupted oncology regimens—all of which strain the very system responding to the outbreak (Qazi et al., 2023). Therefore, integrating robust, interprofessional oral health management into the care continuum for immunocompromised patients is not a peripheral concern but a core component of health system resilience (Duong et al., 2022).

This narrative review aims to critically synthesize the literature from 2010 to 2024 on the interprofessional management of key oral manifestations and MRONJ in immunocompromised patients, with a specific lens on lessons applicable to health security and pandemic response. It will deconstruct the roles of dentistry, pharmacy, nursing, medical laboratories, medical secretaries, and health management, analyze the points of failure and synergy in their collaboration, and propose integrated frameworks that can withstand the pressures of health system shocks.

Methodology

A systematic search strategy was designed to identify relevant English-language literature published between January 2010 and December 2024. The electronic databases PubMed, Scopus, CINAHL, and Web of Science were queried using a combination of Medical Subject Headings (MeSH) terms and keywords. The search strategy integrated four conceptual clusters: (1) Patient Population and Conditions: ("Immunocompromised Host" OR "HIV" OR "Neoplasms" OR "Organ Transplantation" OR "Medication-Related Osteonecrosis of the Jaw" OR "Stomatitis" OR "Oral Manifestations"); (2) Professional Domains: ("Dentistry" OR "Pharmacy" OR "Nursing" OR "Clinical Laboratory Techniques" OR "Medical Secretaries" OR "Health Care Administration"); (3) Collaborative Framework: ("Interprofessional Relations" OR "Patient Care Team" OR "Integrated Delivery of Health Systems"); and (4) Context: ("Pandemics" OR "Health Security" OR "Delivery of Health Care" OR "System Resilience").

Inclusion criteria encompassed peer-reviewed original research (qualitative, quantitative, mixed-methods), systematic and narrative reviews, clinical guidelines, and case series that explicitly addressed the management of oral conditions in immunocompromised adults through a multi-disciplinary or interprofessional lens. Commentaries and editorials were included if they provided substantial analytical frameworks. Exclusion criteria comprised studies on pediatric populations only, articles focusing solely on technical dental procedures without systemic or collaborative context, and publications not available in full text. Data were charted to extract information on professional contributions, reported collaboration models, communication pathways, and outcomes related to patient care and system efficiency.

Oral Manifestations and MRONJ in the Immunocompromised Host

Immunosuppression, whether from disease or iatrogenic sources, disrupts the delicate ecological and immunological balance of the oral cavity. The resulting pathologies are diverse, painful, and functionally devastating (Debta et al., 2022). Oral mucosal manifestations are among the most common. In patients with HIV, oral candidiasis and hairy leukoplakia serve as clinical markers of disease progression, while recurrent aphthous ulceration can be severe and persistent (Patil et al., 2015). In oncology patients, chemotherapy and radiotherapy-induced oral mucositis (CIOM/RIOM) is a dose-limiting toxicity, characterized by erythema, ulceration, and severe pain that impairs speaking, swallowing, and oral hygiene, increasing the risk of systemic infection and malnutrition (Sonis, 2004).

A more insidious and complex condition is Medication-Related Osteonecrosis of the Jaw (MRONJ). This is associated primarily with antiresorptive agents (bisphosphonates, denosumab) used to manage bone metastases in cancer or osteoporosis, and with antiangiogenic medications (Ruggiero et al., 2022). MRONJ is defined by exposed, necrotic bone in the maxillofacial region that persists for more than eight weeks in a patient with a history of such medication exposure, without a history

of radiation therapy to the jaws. The pathophysiology involves suppressed bone turnover and impaired healing, often triggered by a dentoalveolar procedure like an extraction, but it can also occur spontaneously (Khan et al., 2015). The management of established MRONJ is notoriously challenging, requiring long-term, often surgical, intervention from oral and maxillofacial surgeons, alongside meticulous medical management of infection and pain (Sacco et al., 2023).

The pandemic context exacerbates the risks associated with these conditions. Firstly, the immunocompromised state itself often confers increased susceptibility to and severity from pandemic infections like COVID-19 (Docherty et al., 2020). Secondly, public health measures and healthcare reallocation lead to deferred dental screenings and preventive care, allowing oral disease to progress undetected. Thirdly, the stress and logistical chaos of a pandemic can disrupt medication adherence and access to specialist follow-up, increasing the risk for MRONJ development or progression (Fiorillo et al., 2020). Thus, the oral cavity becomes a frontline where individual vulnerability and systemic healthcare failure converge during a crisis (Table 1).

Table 1: Common Oral Complications in Immunocompromised Patients and Key Management Considerations

Condition	Primary Patient Groups	Etiology/Associated Medications	Key Interprofessional Management Needs
Oral Mucositis	Oncology patients (chemotherapy/radiotherapy).	Direct cytotoxic damage to mucosal epithelium.	**Nursing:** Pain management, oral hygiene support. **Pharmacy:** Analgesic regimens, topical agents. **Dentistry:** Pre-therapy screening, management of complications.
Oral Candidiasis	HIV/AIDS, oncology, transplant recipients.	Opportunistic overgrowth of *Candida spp.* due to immunosuppression.	**Medical Laboratories:** Culture and sensitivity. **Pharmacy:** Antifungal prescribing. **Nursing/Dentistry:** Diagnosis, application of topical therapy.
Medication-Related Osteonecrosis of the Jaw (MRONJ)	Patients with bone metastases (e.g., breast, prostate) or osteoporosis on long-term antiresorptives/antiangiogenics.	Bisphosphonates, Denosumab, antiangiogenic tyrosine kinase inhibitors.	**Dentistry:** Surgical & non-surgical management. **Pharmacy:** Medication review, risk assessment. **Medical Laboratories:** Microbiology of secondary infection. **Health Management:** Care pathway coordination.
Recurrent Aphthous Ulceration	HIV/AIDS, autoimmune conditions.	Immune dysregulation; can be severe (Major Aphthae).	**Dentistry:** Diagnosis, topical/intralesional therapy. **Pharmacy:** Compounding topical formulations. **Nursing:** Pain and nutritional impact assessment.
Viral Reactivation (HSV, VZV)	Transplant recipients, hematologic malignancies.	Latent virus reactivation due to immunosuppression.	**Medical Laboratories:** PCR confirmation. **Pharmacy:** Antiviral therapy. **Dentistry/Nursing:** Symptomatic management and diagnosis.

Deconstructing the Interprofessional Ecosystem

Effective management of oral-systemic disease requires moving beyond a referral model to a truly integrated, interprofessional ecosystem. Each profession holds a piece of the diagnostic, therapeutic, and supportive puzzle (Table 2).

Dentistry

The dental team, including general dentists and oral medicine/maxillofacial surgery specialists, is responsible for definitive diagnosis, preventive strategies, and surgical management. A critical role is pre-therapy dental evaluation for patients scheduled to start bisphosphonates, chemotherapy, or head/neck radiation, aimed at eliminating infectious foci and stabilizing oral health to prevent later complications (Yarom et al., 2019). During active treatment, they manage established MRONJ and severe mucosal diseases. However, their effectiveness is contingent on timely referral and access to the patient's complete medical and pharmacological history, which is often gatekept by other parts of the system.

Pharmacy

Pharmacists are central to preventing MRONJ and managing the pharmacological aspects of oral complications. They conduct medication therapy reviews to identify patients at high risk for MRONJ due to prolonged antiresorptive use and can initiate referrals for pre-treatment dental clearance (Mücke et

al., 2016; Buchbender et al., 2022). They manage complex analgesic and antimicrobial regimens for mucositis and osteonecrosis-related infection. During drug shortages or supply chain disruptions—common in pandemics—their role in therapeutic substitution and patient counseling becomes even more vital to maintain continuity of care (Piatek et al., 2020).

Nursing

Nurses, particularly in oncology, transplant, and primary care settings, are often the first to perform systematic oral assessments. They monitor for early signs of mucositis, candidiasis, or mucosal breakdown, providing essential patient education on oral hygiene protocols and symptom management (Eilers & Million, 2011). Their continuous presence at the bedside allows for real-time assessment of pain, nutritional intake, and medication adherence, information that is crucial for the entire team but often poorly communicated to dental and pharmacy colleagues (Bezerra et al., 2022).

Medical Laboratories

Laboratory scientists provide the definitive microbiological diagnosis for oral infections (e.g., fungal culture for refractory candidiasis, PCR for viral ulcers), which is essential for targeted therapy (Lewis & Williams, 2017). They also monitor systemic inflammatory markers (C-reactive protein) and therapeutic drug levels for immunosuppressants, data that informs both the management of oral inflammation and the overall immune status. Rapid, reliable laboratory services are a cornerstone of health security, and their disruption during outbreaks directly impacts the precision of managing oral-systemic conditions.

Medical Secretaries and Coordinators

The administrative role is frequently undervalued but is arguably the linchpin of interprofessional collaboration. Medical secretaries and care coordinators schedule multidisciplinary appointments, ensure the transfer of medical records, imaging, and lab results between dental and medical providers, and facilitate insurance pre-authorizations for complex dental procedures (Doyle et al., 2021). In their absence, referrals are lost, appointments are delayed, and clinicians operate with incomplete information, directly contributing to adverse outcomes.

Health Management

Health managers and administrators design the care pathways, allocate resources, and implement the information technology systems that either enable or hinder interprofessional work. They are responsible for creating formal agreements between dental and medical services, funding integrated clinic models, and developing performance indicators that reward collaborative care and preventive oral health management in high-risk populations (Chan et al., 2023). Their commitment is essential for moving from ad-hoc collaboration to a standardized, resilient system of care.

Table 2: Systemic Barriers and Facilitators to Interprofessional Oral Health Management

Domain	Common Systemic Barriers	Proposed Facilitators & Integrative Strategies
Communication & Information	Separate dental and medical EHRs; lack of standardized referral forms; delayed result reporting.	Implement integrated health records with a shared oral health module; use structured electronic referral templates with mandatory fields (medication list, diagnosis); establish alert systems for high-risk patients.
Clinical Workflow	Reactive vs. preventive care models; lack of defined care pathways for MRONJ; dental access barriers during pandemics.	Embed mandatory pre-therapy dental clearance protocols into oncology/ rheumatology pathways; develop telehealth triage for oral complaints in immunocompromised patients; create "Dental Urgent Care" access within cancer centers.
Education & Training	Limited oral assessment training for non-dental clinicians; lack of interprofessional education (IPE) on oral-systemic health.	Incorporate standardized oral screening tools (e.g., Oral Assessment Guide) into nursing and medical education; develop shared IPE simulations on managing MRONJ or severe mucositis.
Financial & Structural	Disjointed insurance (medical vs. dental); lack of reimbursement for interdisciplinary case conferences; under-resourcing of dental services in hospitals.	Advocate for policy changes to fund integrated medical-dental care for chronic conditions; create bundled payment models for MRONJ management; fund dedicated oral medicine positions within transplant/oncology teams.
Pandemic Response	Total shutdown of "non-essential" dental care; PPE shortages;	Develop crisis standards of care for oral health, prioritizing immunocompromised

	redeployment of nursing/pharmacy staff.	patients; establish clear dental PPE protocols aligned with infection control; maintain virtual pharmacy and nursing consultations for oral symptom management.

Frameworks for Resilient, Interprofessional Care

Building a system capable of managing the oral-systemic nexus, especially under pandemic duress, requires intentional design. The literature points to several key strategies for integration.

First, the adoption of shared, interoperable electronic health records (EHRs) is non-negotiable. A dedicated oral health module within the primary medical EHR, visible to all authorized providers, would contain dental history, current oral findings, periodontal charting, and panoramic radiographs (Simon et al., 2019). This allows a pharmacist to see a patient's dental status before approving a refill of a high-risk medication, and an oncologist to view a "dental clearance" note before initiating chemotherapy (Jayatissa & Hewapathirane, 2023).

Second, formalized clinical pathways must be co-designed by all relevant professions. For example, an "Oncology Oral Health Pathway" would mandate a dental assessment within a specific timeframe after a cancer diagnosis, trigger automatic pharmacy review for MRONJ risk if antiresorptive therapy is planned, and provide nurses with a validated tool for daily oral mucositis grading (Hong et al., 2019). These pathways reduce variation and ensure all team members are working from the same playbook (Miranda-Silva et al., 2021).

Third, leveraging telehealth can maintain continuity during disruptions. Virtual consultations can allow oral medicine specialists to triage problems, nurses to conduct visual oral assessments with patient selfies, and pharmacists to provide medication counseling (Estai et al., 2020). This hybrid model can preserve access while conserving in-person resources for procedures that absolutely require them (Gellert et al., 2023).

Finally, success depends on leadership from health management to champion oral health as a system priority. This includes allocating resources for interprofessional positions (a nurse-dentist liaison), funding training programs, and measuring outcomes like "reduction in hospital admissions for dental sepsis in oncology patients" as a key performance indicator (Paisi et al., 2022). By framing integrated oral health management as a critical component of health security—preventing costly complications and preserving systemic capacity during crises—administrators can justify the necessary investment. Figure 1 illustrates the oral–systemic interface in immunocompromised patients during pandemics, highlighting common oral manifestations (oral ulcers and candidiasis) and medication-related osteonecrosis of the jaw (MRONJ) associated with antiresorptive and chemotherapeutic agents.

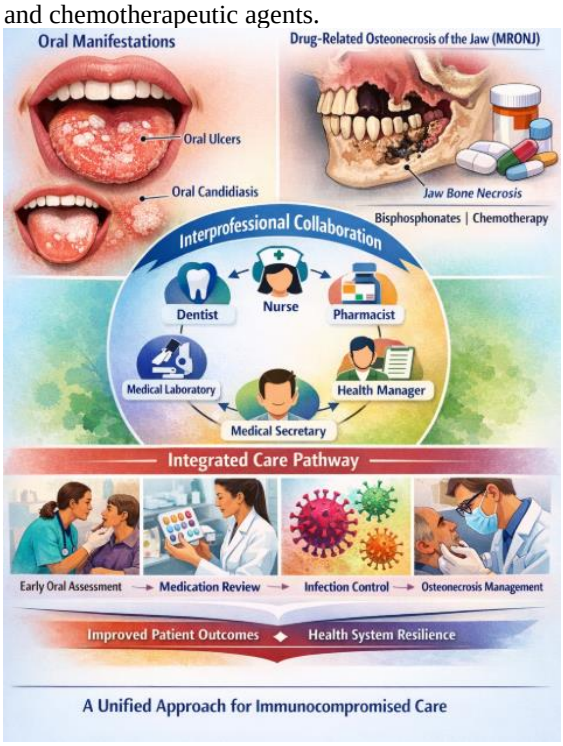

Figure 1: The Oral–Systemic Nexus in Pandemics in Immunocompromised Patients.

Conclusion

The oral health of immunocompromised patients is a complex, interprofessional challenge that illuminates broader weaknesses in healthcare system design and resilience. Oral manifestations and MRONJ are not niche dental issues but significant sources of morbidity that, when poorly managed, escalate into systemic crises, consuming emergency resources and worsening patient outcomes—particularly during pandemics. This review has delineated the essential, yet often disconnected, roles of dentistry, pharmacy, nursing, medical laboratories, medical secretaries, and health management.

The path forward is not merely to encourage better communication but to architect systems that make collaboration inevitable and efficient. This requires technological integration through shared records, procedural integration through co-designed care pathways, and financial integration through innovative funding models. Investing in these integrative frameworks is a direct investment in health security. A resilient health system can continue to provide comprehensive, coordinated care to its most vulnerable populations even under the immense pressure of an outbreak. Strengthening the oral-

systemic nexus of care is a vital, and often overlooked, step toward that resilience.

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