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ORAL COMPLICATIONS AND DENTAL MANAGEMENT IN PATIENTS RECEIVING CAR T-CELL THERAPY AND T-CELL-ENGAGING BISPECIFIC ANTIBODIES

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ABSTRACT

Background: CAR T-cell therapy and T-cell-engaging bispecific antibodies have transformed the treatment of relapsed or refractory hematological malignancies, but their oral and dental consequences remain incompletely characterized.

Objective: To synthesize open-access evidence on oral complications associated with CAR T-cell therapy and bispecific antibodies and to propose a practical dental-management algorithm.

Methods: A structured narrative search of open-access literature published from 2015 through July 28, 2026 was conducted, with emphasis on PubMed/MEDLINE, PubMed Central, open-access publisher platforms, and reference-list screening. Evidence was synthesized according to treatment mechanism, molecular target, oral manifestation, and phase of care.

Results: CAR T-cell therapy and BCMA-targeting bispecific antibodies are primarily relevant to dental care because of cytopenias, hypogammaglobulinemia, impaired immune recovery, and infection risk. GPRC5D-targeting treatment, particularly talquetamab, is additionally associated with dysgeusia, oral dryness, swallowing difficulties, mucosal changes, dietary restriction, and weight loss. Direct oral evidence after CAR T-cell therapy remains sparse.

Conclusions: Dental care should be individualized according to treatment phase, molecular target, immune status, blood counts, infection risk, and functional effects of oral toxicity. The proposed algorithm is expert-informed and requires prospective validation.

KEYWORDS

CAR T-cell Therapy, Bispecific Antibodies, Oral Complications, Dental Management, Talquetamab, Dysgeusia, Xerostomia, Infection

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Introduction

T-cell–redirecting immunotherapies, including chimeric antigen receptor T-cell therapy (CAR-T) and T-cell–engaging bispecific antibodies, have substantially changed the treatment of relapsed or refractory hematological malignancies. CAR-T therapy involves the genetic modification of a patient’s T lymphocytes to recognize selected tumor antigens, most commonly CD19 in B-cell malignancies and B-cell maturation antigen (BCMA) in multiple myeloma. Bispecific antibodies are off-the-shelf agents that simultaneously bind a tumor-associated antigen and CD3 on T cells, promoting immune-synapse formation and targeted cytotoxicity (Mitra et al., 2023; Devasia et al., 2024; Parrondo et al., 2024).

The increasing number of treated patients and long-term survivors has shifted attention from acute cytokine release syndrome and neurotoxicity toward prolonged cytopenias, immune dysfunction, infections, late complications, and quality-of-life impairment. Clinically relevant effects may occur beyond 90 days after infusion and require sustained multidisciplinary followup (Cappell & Kochenderfer, 2023; Epperly et al., 2023; Bishop, 2024). Patient-reported outcome research also indicates that standard clinician-reported adverse-event systems may incompletely capture symptoms that are important to patients, including oral discomfort, altered taste, and eating-related limitations (Wang & Srour, 2024).

CAR-T therapy may produce prolonged neutropenia, thrombocytopenia, anemia, B-cell aplasia, hypogammaglobulinemia, and delayed immune reconstitution. These abnormalities increase susceptibility to bacterial, viral, and fungal infection and may complicate invasive dental care (Jain et al., 2023; Yang et al., 2024; Wudhikarn & Perales, 2022). In a large retrospective study, post-CD19 CAR-T hypogammaglobulinemia was common and was associated with serious infection and mortality, supporting continued immunological monitoring after the acute treatment period (Sutherland et al., 2025).

Similar concerns apply to BCMA-targeting bispecific antibodies. Clinical trials and real-world studies of elranatamab and teclistamab have identified substantial rates of infection, neutropenia, and humoral immune impairment (Lesokhin et al., 2023; Frerichs et al., 2024; Nooka et al., 2024; Tan et al., 2025). These findings are relevant to dentistry because odontogenic and periodontal infection, oral candidiasis, and herpesvirus reactivation may become clinically significant in profoundly immunocompromised patients (Mohan et al., 2023; Raje et al., 2023; Sim et al., 2023).

A distinct toxicity pattern is associated with G protein-coupled receptor class C group 5 member D (GPRC5D)-targeting therapy, particularly talquetamab. Reported manifestations include dysgeusia or ageusia, oral dryness, dysphagia, alterations of the tongue and keratinized mucosa, reduced appetite, dietary limitation, and weight loss (Laheij & van de Donk, 2024; Naqvi et al., 2024; Fleischer et al., 2025; Alves et al., 2026). Patient-reported outcomes from MonumenTAL-1 further indicate that symptom burden and health-related quality of life may change over time, emphasizing the importance of longitudinal assessment (Schinke et al., 2025).

Direct evidence on oral complications after CAR-T therapy is limited. A dedicated retrospective study of 10 patients described xerostomia, dysgeusia, opportunistic infection, and odontogenic discomfort, but its small sample and retrospective design precluded reliable estimates of incidence or causality (de Paula Eduardo et al., 2026). Much of current dental practice is therefore informed by evidence from hematopoietic stem cell transplantation (HSCT), conventional chemotherapy, and expert consensus. Such evidence is clinically useful but should be clearly distinguished from direct CAR-T or bispecific-antibody data.

The aim of this narrative review is to synthesize current open-access evidence concerning oral complications associated with CAR-T therapy and T-cell–engaging bispecific antibodies. Particular attention is given to differences between BCMA- and GPRC5D-targeted therapies, their relevance to dental treatment, and practical strategies for assessment, prevention, symptom management, and long-term follow-up. A further objective is to propose an expert-informed clinical algorithm for dental care before, during, and after treatment.

Materials and Methods

This work was designed as a structured narrative review and prepared in accordance with the principles of the Scale for the Assessment of Narrative Review Articles (SANRA), including explicit justification of the topic, defined objectives, transparent literature searching, appropriate referencing, critical reasoning, and presentation of clinically relevant outcomes (Baethge et al., 2019).

A structured search was conducted for peer-reviewed, English-language publications issued between January 1, 2015, and July 28, 2026. PubMed/MEDLINE and PubMed Central were used as the principal sources. Searches were supplemented by open-access publisher platforms and manual screening of reference lists in eligible articles, guidelines, and consensus statements.

Search concepts included combinations of the following terms: ‘CAR T-cell’, ‘chimeric antigen receptor T-cell’, ‘bispecific antibody’, ‘T-cell engager’, ‘BCMA’, ‘GPC5D’, ‘teclistamab’, ‘elranatamab’, ‘talquetamab’, ‘oral health’, ‘dental management’, ‘dental assessment’, ‘mucositis’, ‘ulceration’, ‘xerostomia’, ‘salivary dysfunction’, ‘dysgeusia’, ‘ageusia’, ‘dysphagia’, ‘oral infection’, ‘cytopenia’, and ‘nutrition’. Only publications with legally available open-access full text were retained.

Eligible sources included clinical trials, cohort and observational studies, case series, case reports, systematic and narrative reviews, clinical practice guidelines, and expert consensus statements. Conference abstracts without complete peer-reviewed articles, preprints, duplicate reports, and publications without clinically relevant oral, dental, hematological, infectious, or supportive-care information were excluded.

Because study designs, populations, interventions, definitions, and follow-up periods were heterogeneous, the evidence was synthesized narratively rather than statistically. Direct data from patients treated with CAR-T cells or bispecific antibodies were distinguished from recommendations extrapolated from HSCT or conventional cancer therapy. The proposed clinical algorithm was developed by integrating direct evidence, open-access guidelines, and expert statements and is presented as a nonvalidated clinical proposal.

Overview of CAR T-Cell Therapy and Bispecific Antibodies

CAR T-cell therapy

CAR-T therapy is a personalized cellular treatment in which autologous T cells are collected, genetically modified to express a chimeric antigen receptor, expanded *ex vivo*, and reinfused after lymphodepleting chemotherapy. The receptor enables antigen recognition independently of conventional major histocompatibility complex presentation. CD19 is the principal target in B-cell malignancies, whereas BCMA is commonly targeted in multiple myeloma (Mitra et al., 2023).

CAR-T products are generally administered as a single infusion, followed by *in vivo* expansion and variable persistence. This persistence may contribute to durable antitumor activity but also to prolonged B-cell or plasma-cell depletion, hypogammaglobulinemia, cytopenias, and late infectious complications (Cappell & Kochenderfer, 2023; Epperly et al., 2023).

T-cell-engaging bispecific antibodies

T-cell-engaging bispecific antibodies bind CD3 on T lymphocytes and a selected antigen on malignant cells, thereby creating an immune synapse and activating cytotoxicity. Unlike autologous CAR-T products, bispecific antibodies are ready-to-use agents and are typically administered repeatedly until disease progression, unacceptable toxicity, or a protocol-defined endpoint (Devasia et al., 2024; Parrondo et al., 2024).

In multiple myeloma, clinically important targets include BCMA and GPRC5D. Elranatamab and teclistamab target BCMA, whereas talquetamab targets GPRC5D. BCMA-targeting therapies are strongly associated with humoral immune impairment and infection risk, while GPRC5D targeting additionally produces characteristic sensory, epithelial, dermatological, and nutritional toxicities (Rodriguez-Otero et al., 2024; Labanca et al., 2025).

Table 1. Treatment characteristics relevant to dental care

Feature	CAR T-cell therapy	BCMA-targeting bispecific antibodies	GPRC5D-targeting bispecific antibodies
Exposure pattern	Usually single infusion with in vivo persistence	Repeated dosing; prolonged exposure	Repeated dosing; prolonged exposure
Principal dental concern	Cytopenias, immune recovery, infection and bleeding risk	Hypogammaglobulinemia, neutropenia and infection risk	Direct oral toxicity plus infection and cytopenia risk
Characteristic oral issues	Limited direct evidence; xerostomia, dysgeusia, candidiasis and dental pain reported	Opportunistic and odontogenic infection; direct oral toxicity poorly characterized	Dysgeusia, oral dryness, dysphagia, tongue/mucosal changes and nutritional impairment

Pathogenesis and Classification of Oral Complications

Oral complications can be classified into direct treatment-specific toxicities, indirect effects of cytopenias and immune dysfunction, and complications related to previous or supportive treatment. This distinction is clinically important because similar findings may require different diagnostic and therapeutic approaches.

Direct oral toxicity is most clearly documented with GPRC5D-targeting treatment. Dysgeusia, ageusia, oral dryness, dysphagia, changes in tongue papillae, and lesions involving keratinized oral mucosa may reflect on-target, off-tumor activity related to GPRC5D expression in nonmalignant tissues (Rodriguez-Otero et al., 2024; Alves et al., 2026). Subjective xerostomia may occur without objectively reduced salivary flow, suggesting that epithelial, sensory, or qualitative salivary changes may contribute in addition to gland hypofunction (Laheij & van de Donk, 2024).

Indirect complications result from neutropenia, lymphopenia, thrombocytopenia, B-cell aplasia, hypogammaglobulinemia, and delayed immune reconstitution. Hematological toxicities after CAR-T therapy may be prolonged or biphasic, increasing the risk of infection, oral bleeding, impaired healing, and postponement of invasive procedures (Jain et al., 2023; Yang et al., 2024).

HSCT evidence provides biological and clinical context. In a prospective pediatric multicenter study, clinically important oral mucositis and oral symptoms were common after allogeneic HSCT (Agholme et al., 2023). A longitudinal study of autologous HSCT demonstrated reductions in salivary flow, pH, immunoglobulin A, and antimicrobial components during the early post-transplant period (van Leeuwen et al., 2021). These findings support attention to mucosal integrity and salivary function but remain indirect evidence for CAR-T and bispecific-antibody recipients.

Additional contributing factors include lymphodepleting chemotherapy, corticosteroids, antimicrobial therapy, previous transplantation, prior chemotherapy or radiotherapy, poor oral hygiene, active dental disease, traumatic prostheses, diabetes, malnutrition, smoking, and previous or concurrent antiresorptive therapy. Oral findings should therefore be interpreted in relation to baseline status, symptom timing, molecular target, treatment phase, blood counts, immune parameters, and concomitant medication.

Dental Assessment Before Therapy

Dental evaluation should be performed as early as possible after CAR-T therapy or bispecific-antibody treatment is planned. Its goals are to identify active oral infection, reduce mucosal trauma, prevent dental emergencies during immunosuppression, document baseline findings, and establish an individualized preventive-care plan (Elad et al., 2015; Zadik et al., 2025).

Assessment should include medical and dental history; examination of the teeth, periodontium, oral mucosa, implants, and prostheses; evaluation of salivary symptoms, taste, and swallowing; and radiographic imaging when clinically indicated. Baseline photographs may be useful for patients expected to receive GPRC5D-targeted treatment.

Treatment should prioritize acute odontogenic infection, symptomatic teeth, advanced periodontal inflammation, non-restorable teeth, and traumatic dental or prosthetic factors. Elective and aesthetic procedures should be postponed. Studies in patients preparing for HSCT demonstrate a substantial burden of untreated

caries and dental-treatment need, supporting early referral and structured assessment (Dean et al., 2024; Skallsjö et al., 2023). A Brazilian consensus similarly recommends prioritizing active infection and conditions with a high probability of acute exacerbation before intensive hematological treatment (Correa et al., 2023).

HSCT evidence should not be applied mechanically to CAR-T candidates. Treatment planning must consider the urgency of leukapheresis, bridging therapy, lymphodepletion, or antibody initiation; the time available for healing; and the potential harm of delaying oncological treatment. Stable chronic lesions may sometimes be monitored when intervention presents a greater immediate risk than observation.

Before invasive dental treatment, the dentist should consult the hematology team and review blood counts, current systemic therapy, expected cytopenia, infection history, antimicrobial prophylaxis, anticoagulants, prior radiotherapy, and exposure to bisphosphonates or denosumab. No single neutrophil or platelet threshold is appropriate for all patients; decisions should be individualized according to procedure, systemic status, urgency, and local protocols (Zadik et al., 2025).

Patients should receive instructions on twice-daily brushing with a soft toothbrush, careful interdental cleaning, fluoride use, denture hygiene, and prompt reporting of pain, swelling, bleeding, ulceration, dry mouth, or altered taste. Mechanical plaque control should generally be maintained during cytopenia because plaque accumulation may worsen inflammation and bleeding (Raber-Durlacher et al., 2024).

Oral Complications Associated with CAR T-Cell Therapy

Evidence directly describing oral complications after CAR-T therapy remains sparse. In the first dedicated retrospective study, 10 patients were assessed before treatment, during lymphodepletion, and after infusion. Reported manifestations included transient xerostomia, dysgeusia, oral candidiasis, and odontogenic discomfort. No oral mucositis was documented, although the sample was too small and heterogeneous to establish incidence or exclude underrecognition (de Paula Eduardo et al., 2026).

The relationship between these findings and CAR-T cells themselves is uncertain. Xerostomia, altered taste, mucosal symptoms, and dental discomfort may also be influenced by lymphodepleting chemotherapy, supportive medication, reduced oral intake, previous therapy, and cytopenias. Prospective baseline and post-treatment assessment is required to distinguish new toxicity from pre-existing disease.

Infection is a major indirect oral concern. During the first year after CD19 CAR-T therapy, bacterial, viral, and fungal infections may occur, with the highest risk generally observed during early neutropenia and intensive immunosuppression (Wudhikarn et al., 2020). Later risk is influenced by B-cell aplasia, hypogammaglobulinemia, lymphopenia, corticosteroid exposure, and delayed immune reconstitution (Los-Arcos et al., 2021; Wudhikarn & Perales, 2022; Arya & Shahid, 2024; Tabbara et al., 2024).

Hypogammaglobulinemia deserves particular attention. A large cohort study found a high prevalence after CD19-targeted CAR-T therapy and an association with serious infection and mortality (Sutherland et al., 2025). Oral candidiasis, herpesvirus reactivation, periodontal infection, and odontogenic infection should therefore remain in the differential diagnosis during both early and late follow-up.

Prolonged thrombocytopenia and neutropenia may increase oral bleeding, impair healing, and restrict invasive treatment. Late complications can persist beyond discharge from the cellular-therapy center and beyond 90 days after infusion (Bishop, 2024). Dental treatment planning should not assume that clinical discharge indicates complete hematological or immunological recovery.

Oral monitoring should include mucosal examination, assessment for fungal or viral infection, salivary symptoms, taste disturbance, dental pain or swelling, spontaneous bleeding, trauma, and reduced oral intake. Larger prospective studies using standardized oral examinations and patient-reported outcome measures are required.

Oral Complications Associated with Bispecific Antibodies

BCMA-targeting bispecific antibodies

The dental relevance of BCMA-targeting bispecific antibodies is primarily associated with immune impairment. By targeting BCMA on malignant plasma cells, these drugs can also affect normal plasma cells and B-cell compartments, producing hypogammaglobulinemia, impaired vaccine responses, neutropenia, and clinically significant infection risk (Frerichs et al., 2024).

In the phase 2 MagnetisMM-3 study, elranatamab was associated with frequent infections and neutropenia (Lesokhin et al., 2023). In MajesTEC-1, infections were also common among teclistamab-treated patients, including severe infections (Nooka et al., 2024). Real-world international data confirm that infection remains a major safety concern in more heterogeneous and heavily pretreated populations (Tan et al., 2025).

Specific oral adverse effects have not been systematically evaluated in most BCMA bispecific trials. Nevertheless, sustained immune dysfunction provides a strong rationale for surveillance for oral candidiasis, herpesvirus reactivation, periodontal inflammation, and odontogenic infection. Consensus recommendations emphasize screening, vaccination where appropriate, antimicrobial prophylaxis, monitoring of immunoglobulins, and consideration of immunoglobulin replacement in selected patients (Mohan et al., 2023; Raje et al., 2023; Sim et al., 2023).

GPRC5D-targeting bispecific antibodies

Talquetamab, a GPRC5D×CD3 bispecific antibody, has a distinctive oral and functional toxicity profile. Dysgeusia or ageusia, subjective oral dryness, dysphagia, tongue changes, keratinized-mucosal alterations, reduced appetite, dietary restriction, and weight loss may occur alone or in combination (Laheij & van de Donk, 2024; Naqvi et al., 2024; Fleischer et al., 2025; Alves et al., 2026).

Objective testing has shown that dysgeusia can be more pronounced with talquetamab than with BCMA-targeting bispecific antibodies. Subjective xerostomia does not consistently correspond to reduced salivary flow, indicating that sensory and epithelial mechanisms may contribute (Laheij & van de Donk, 2024; Fleischer et al., 2025).

These effects can alter food texture tolerance, enjoyment of eating, social participation, nutritional intake, and body weight. Patient-reported outcomes from MonumenTAL-1 indicate early deterioration in several symptom and quality-of-life domains followed by improvement in some patients who remain on therapy, but general instruments may not fully capture specific oral symptoms (Schinke et al., 2025).

The therapeutic target therefore has practical significance. BCMA-targeting therapies are primarily relevant to dental care because of infection and immune dysfunction, whereas GPRC5D-targeting treatment additionally produces direct oral, sensory, and nutritional toxicities. Both mechanisms can coexist.

Symptom-Oriented Oral and Dental Management

Oral mucositis, ulceration, and mucosal lesions

Mucosal lesions should be evaluated according to their site, morphology, duration, pain severity, functional effects, and relationship to treatment. Differential diagnosis includes trauma, fungal infection, herpesvirus reactivation, bacterial infection, immune-mediated disease, conventional treatment-related mucositis, and direct target-specific toxicity (Fregnani et al., 2025).

Supportive management may include gentle mechanical hygiene, bland saline or sodium bicarbonate rinses, avoidance of alcohol-containing or irritating products, and appropriate analgesia. Persistent, severe, or atypical lesions may require microbiological testing, biopsy, or specialist oral-medicine assessment. Standardized clinician-reported and patient-reported tools should be used when possible because inconsistent mucositis scoring limits comparison across studies (Elad et al., 2020; Abdalla-Aslan et al., 2024).

Xerostomia and salivary dysfunction

Subjective xerostomia should be distinguished from objective salivary gland hypofunction. Assessment may include symptom history, medication review, oral examination, evaluation for candidiasis and caries, and measurement of unstimulated or stimulated salivary flow when available (Hong et al., 2024a).

Management may include regular hydration, saliva substitutes, oral moisturizers, stimulation of residual salivary function when appropriate, and avoidance of irritating products. Because oral dryness increases the risk of caries and candidiasis, fluoride-based prevention and regular dental monitoring are essential (Hong et al., 2024b).

Dysgeusia, dysphagia, and nutritional impairment

Taste disturbance should be assessed together with oral dryness, tongue changes, swallowing difficulty, appetite, food texture tolerance, dietary intake, and weight trends. Supportive strategies may include individualized modification of food texture, temperature, and seasoning, maintenance of oral hygiene, treatment of coexisting infection, and early dietetic consultation.

Coughing during meals, suspected aspiration, dehydration, rapidly progressive dysphagia, or substantial weight loss requires prompt specialist evaluation. The evidence for a specific pharmacological or procedural treatment of talquetamab-related dysgeusia remains insufficient, and supportive interventions should be presented as symptom-oriented rather than validated disease-modifying therapy (Naqvi et al., 2024; Schinke et al., 2025).

Standard quality-of-life tools should be supplemented with treatment-specific questions because clinically meaningful oral symptoms may be underrepresented in generic patient-reported outcome instruments (Wang & Srour, 2024).

Oral infections

Oral candidiasis, herpesvirus infection, periodontal infection, and odontogenic infection should be recognized promptly. Fever, facial swelling, spreading inflammation, severe trismus, or systemic deterioration requires immediate communication with the hematology team. Antimicrobial selection should account for immune status, current prophylaxis, microbiological findings, drug interactions, and local antimicrobial-resistance patterns (LosArcos et al., 2021; Mohan et al., 2023; Raje et al., 2023).

Bleeding and invasive dental procedures

Before extraction, periodontal surgery, or another invasive procedure, current blood counts, coagulation status, medications, treatment phase, and systemic condition should be reviewed. The decision should be individualized in consultation with the hematology team. Local hemostatic measures, atraumatic technique, primary closure where feasible, and close postoperative monitoring may be required. Elective invasive treatment should be postponed when the expected risk exceeds the benefit (Zadik et al., 2025).

Proposed Dental Management Algorithm

The proposed algorithm integrates the available evidence and expert recommendations. It should be regarded as an expert-informed clinical proposal rather than a prospectively validated guideline.

Before therapy

1. Perform clinical and clinically indicated radiographic assessment.
2. Identify active odontogenic or periodontal infection and sources of mucosal trauma.
3. Prioritize urgent, symptomatic, non-restorable, or actively infected teeth.
4. Record baseline mucosal status, oral dryness, taste function, swallowing symptoms, and bodyweight trend.
5. Introduce individualized hygiene instruction, denture care, and fluoride-based caries prevention.
6. Coordinate invasive treatment and healing time with the hematology team.
7. Postpone elective and aesthetic treatment.

During active therapy

1. Determine whether the patient is clinically and hematologically stable.
2. Assess oral pain, ulceration, infection, bleeding, dryness, altered taste, swallowing, and nutritional intake.
3. Prefer conservative treatment when clinically acceptable.
4. Escalate urgently for spreading infection, uncontrolled bleeding, severe pain, dehydration, suspected aspiration, or inability to maintain oral intake.
5. Use infection-focused surveillance during CAR-T and anti-BCMA therapy.
6. Add systematic taste, dryness, swallowing, mucosal, nutritional, and weight monitoring during anti-GPRC5D therapy.
7. Consult the hematology team before invasive procedures or major medication changes.

Long-term follow-up

1. Monitor hematological and immune recovery and ongoing treatment exposure.
2. Reassess caries, periodontal status, recurrent infection, and prosthetic trauma.
3. Continue individualized fluoride prevention and professional preventive care.
4. Monitor persistent xerostomia, dysgeusia, dysphagia, and nutritional impairment.
5. Review the safety of invasive treatment whenever systemic status changes.
6. Maintain communication with the hematology team and refer to oral medicine or nutrition specialists when needed.

Long-term follow-up is justified because oral and dental complications may extend beyond the acute treatment period. HSCT survivorship research suggests that caries, periodontitis, and tooth loss may remain relevant over time, although the certainty of evidence is limited (van Gennip et al., 2023).

Discussion

The available evidence indicates that oral complications of T-cell–redirecting therapies are heterogeneous and treatment-specific. Dental management should not be uniform across CAR-T, BCMA-targeting bispecific antibodies, and GPRC5D-targeting therapy. A target- and treatment-phase-specific approach is more appropriate than the uncritical transfer of protocols developed for conventional chemotherapy or HSCT.

The most important limitation is the scarcity of direct oral research. Large CAR-T studies describe cytopenias, hypogammaglobulinemia, immune reconstitution, and infection but generally do not include calibrated dental examinations, objective salivary testing, taste assessment, oral photography, or structured oral patient-reported outcomes. The dedicated CAR-T dental study included only 10 patients (de Paula Eduardo et al., 2026). Consequently, the incidence, timing, and causality of oral manifestations remain uncertain.

CAR-T survivorship literature demonstrates that late cytopenias, hypogammaglobulinemia, and infections are clinically meaningful and may persist after intensive monitoring has ended (Bishop, 2024; Cappell & Kochenderfer, 2023; Sutherland et al., 2025). This supports continued dental risk assessment rather than restricting oral care to the pre-infusion and inpatient phases.

The infection burden of BCMA-targeting bispecific antibodies is supported by clinical trial, mechanistic, and real-world evidence. MagnetisMM-3, MajesTEC-1, immunological studies of teclistamab, and international real-world data consistently identify infection and humoral immune impairment as major concerns (Lesokhin et al., 2023; Frerichs et al., 2024; Nooka et al., 2024; Tan et al., 2025). Dental infection prevention is therefore biologically and clinically justified, although direct evidence that pre-treatment dental intervention reduces systemic infection in this population is not yet available.

Talquetamab requires a different monitoring strategy because direct oral, taste, swallowing, and nutritional effects may coexist with immune dysfunction. The available studies consistently describe dysgeusia, oral dryness, texture intolerance, and weight-related effects, but sample sizes remain modest and interventions are not validated (Laheij & van de Donk, 2024; Naqvi et al., 2024; Fleischer et al., 2025; Alves et al., 2026).

Patient-reported outcomes are essential because clinician-rated toxicity may underestimate the effect on eating and social function (Schinke et al., 2025).

Evidence extrapolated from HSCT demonstrates that mucositis, salivary alterations, oral infection, and dental disease can affect pain, eating, swallowing, and quality of life (Agholme et al., 2023; Skallsjö et al., 2023; van Leeuwen et al., 2021). However, the mechanisms and exposure patterns differ, and HSCT findings should support clinical reasoning rather than be presented as direct CAR-T evidence.

Future prospective studies should incorporate baseline dental examinations, standardized mucositis grading, objective salivary-flow assessment, validated xerostomia and taste measures, photographic documentation, microbiological testing when indicated, nutritional and weight endpoints, and treatment-specific patient-reported outcomes. Multicenter cohorts comparing CD19 CAR-T, BCMA CAR-T, BCMA-targeting bispecific antibodies, and GPRC5D-targeted treatment would provide the strongest basis for evidence-based protocols.

The proposed algorithm translates the current literature into a practical pathway, but it has not undergone prospective validation. Its purpose is to support structured assessment and multidisciplinary communication, not to replace individualized clinical judgment or institutional protocols.

Conclusions

Patients receiving CAR-T therapy or T-cell-engaging bispecific antibodies may develop oral complications related to cytopenias, immune dysfunction, infection, previous anticancer treatment, supportive medication, and treatment-specific toxicity.

CAR-T and BCMA-targeting therapies require particular attention to hematological recovery, hypogammaglobulinemia, and opportunistic or odontogenic infection. GPRC5D-targeting treatment additionally requires systematic monitoring of taste, oral dryness, mucosal changes, swallowing, dietary intake, and body weight.

Dental evaluation should be performed before treatment whenever clinically feasible and continued during active therapy and long-term follow-up. Close collaboration among hematologists, dentists, oral-medicine specialists, dietitians, and swallowing specialists is essential when oral symptoms compromise safety, nutrition, or quality of life.

The proposed clinical algorithm may support decision-making, but it remains an expert-informed model. Prospective multicenter studies are required to validate dental assessment, prevention, and treatment protocols for this growing patient population.

REFERENCES

1. Abdalla-Aslan, R., Bonomo, P., Keefe, D., Blijlevens, N., Cao, K., Cheung, Y. T., Fregnani, E. R., Miller, R., Raber-Durlacher, J., Epstein, J., van Seville, Y., Kauark-Fontes, E., Kandwal, A., McCurdy-Franks, E., Finkelstein, J., McCarvell, V., Zadik, Y., Ottaviani, G., Mendes, R. A., ... Bossi, P. (2024). Guidance on mucositis assessment from the MASCC mucositis study group and ISOO: An international delphi study. *eClinicalMedicine*, 73, Article 102675. <https://doi.org/10.1016/j.eclinm.2024.102675>
2. Agholme, M. B., Dahllöf, G., Karlsson Törlén, J., Majorana, A., Brennan, M. T., von Bültzingslöwen, I., Tan, P. L., Hu, S., Sim, Y. F., & Hong, C. (2023). Incidence, severity, and temporal development of oral complications in pediatric allogeneic hematopoietic stem cell transplant patients: A multicenter study. *Supportive Care in Cancer*, 31, Article 702. <https://doi.org/10.1007/s00520-023-08151-1>
3. Alves, F. A., Perez Perez, A., Jaguar, G. C., Schmidt Filho, J., Kim, M. K., & Villa, A. (2026). On-target, off-tumor oral toxicities of talquetamab in heavily pretreated multiple myeloma. *Supportive Care in Cancer*, 34, Article 347. <https://doi.org/10.1007/s00520-026-10583-4>
4. Arya, S., & Shahid, Z. (2024). Overview of infectious complications among CAR t-cell therapy recipients. *Frontiers in Oncology*, 14, Article 1398078. <https://doi.org/10.3389/fonc.2024.1398078>
5. Baethge, C., Goldbeck-Wood, S., & Mertens, S. (2019). SANRA—A scale for the quality assessment of narrative review articles. *Research Integrity and Peer Review*, 4, Article 5. <https://doi.org/10.1186/s41073-019-0064-8>
6. Bishop, M. R. (2024). Late complications and long-term care of adult CAR t-cell patients. *Hematology: American Society of Hematology Education Program*, 2024(1), 109–115. <https://doi.org/10.1182/hematology.2024000534>
7. Cappell, K. M., & Kochenderfer, J. N. (2023). Long-term outcomes following CAR t cell therapy: What we know so far. *Nature Reviews Clinical Oncology*, 20(6), 359–371. <https://doi.org/10.1038/s41571-023-00754-1>

8. Correa, M. E. P., Granzotto, F. C. N., Innocentini, L. M. A. R., Reis, T. C., de Lima, E. M., Varanda, R. F., Santos, P. S. S., Soares Junior, L. A. V., Bezinelli, L. M., de Paula Eduardo, F., Melo, W. R., Antunes, H. S., & De Macedo, L. D. (2023). Brazilian dental consensus on dental management in hematopoietic stem cell transplantation—Part i—pre-hsct. *Hematology, Transfusion and Cell Therapy*, 45(3), 358–367. <https://doi.org/10.1016/j.htct.2023.04.001>
9. Dean, D., Lee, S. J., Cutler, C., Gooley, T. A., Hujuel, P., Oh, U. Y., Bennett-Johnson, L., Hagstrom, M. K., Rothen, M., Lloid, M., Sroussi, H., & Treister, N. (2024). Dental evaluation and clearance prior to allogeneic hematopoietic cell transplantation. *Oral Diseases*, 30(4), 2635–2644. <https://doi.org/10.1111/odi.14717>
10. de Paula Eduardo, F., Menti, L. D., Ferreira, M. H., de Carvalho, D. L. C., Novaes, C. de P., Martins, B. H. da S., Kerbauy, L. N., Hamerschlag, N., & Bezinelli, L. M. (2026). Oral manifestations and dental management in patients undergoing CAR-T cell therapy: A retrospective observational study. *Supportive Care in Cancer*, 34, Article 621. <https://doi.org/10.1007/s00520-026-10824-6>
11. Devasia, A. J., Chari, A., & Lancman, G. (2024). Bispecific antibodies in the treatment of multiple myeloma. *Blood Cancer Journal*, 14, Article 158. <https://doi.org/10.1038/s41408-024-01139-y>
12. Elad, S., Raber-Durlacher, J. E., Brennan, M. T., Saunders, D. P., Mank, A. P., Zadik, Y., Quinn, B., Epstein, J. B., Blijlevens, N. M. A., Waltimo, T., Passweg, J. R., Correa, M. E. P., Dahlöf, G., Garim-Legert, K. U. E., Logan, R. M., Potting, C. M. J., Shapira, M. Y., Soga, Y., Stringer, J., ... Jensen, S. B. (2015). Basic oral care for hematology–oncology patients and hematopoietic stem cell transplantation recipients: A position paper from the joint task force of MASCC/ISOO and EBMT. *Supportive Care in Cancer*, 23(1), 223–236. <https://doi.org/10.1007/s00520-014-2378-x>
13. Elad, S., Cheng, K. K. F., Lalla, R. V., Yarom, N., Hong, C., Logan, R. M., Bowen, J., Gibson, R., Saunders, D. P., Zadik, Y., Ariyawardana, A., Correa, M. E. P., Ranna, V., Bossi, P., & Mucositis Guidelines Leadership Group of MASCC/ISOO (2020). MASCC/ISOO clinical practice guidelines for the management of mucositis secondary to cancer therapy. *Cancer*, 126(19), 4423–4431. <https://doi.org/10.1002/cncr.33100>
14. Epperly, R., Giordani, V. M., Mikkilineni, L., & Shah, N. N. (2023). Early and late toxicities of chimeric antigen receptor t-cells. *Hematology/Oncology Clinics of North America*, 37(6), 1169–1188. <https://doi.org/10.1016/j.hoc.2023.05.010>
15. Fleischer, A., Roll, M., Frenking, J. H., Panther, F., Gelbrich, G., Strunz, P.-P., Riedhammer, C., Peter, J., Mersi, J., Waldschmidt, J., Kortüm, M., Einsele, H., Raab, M.-S., Maatouk, I., & Rasche, L. (2025). Talquetamab-related dysgeusia in multiple myeloma compared to bcma-targeted bispecifics and high-dose melphalan. *Cancer Medicine*, 14(23), Article e71401. <https://doi.org/10.1002/cam4.71401>
16. Fregnani, E. R., Epstein, J. B., Blijlevens, N. M. A., Yarom, N., Villa, A., Raber-Durlacher, J. E., Gardner, P. J., Shem, D., Beaumont, S., Bossi, P., & Elad, S. (2025). MASCC/ISOO clinical practice statement: Management of oral complications of immunotherapy. *Supportive Care in Cancer*, 33, Article 851. <https://doi.org/10.1007/s00520-025-09806-x>
17. Frerichs, K. A., Verkleij, C. P. M., Mateos, M. V., Martin, T. G., Rodriguez, C., Nooka, A. K., Banerjee, A., Chastain, K., Perales-Puchalt, A., Stephenson, T., Uhlar, C., Kobos, R., van der Holt, B., Kruyswijk, S., Kuipers, M. T., Groen, K., Vishwamitra, D., Skerget, S., Cortes-Selva, D., ... van de Donk, N. W. C. J. (2024). Teclistamab impairs humoral immunity in patients with heavily pretreated myeloma: Importance of immunoglobulin supplementation. *Blood Advances*, 8(1), 194–206. <https://doi.org/10.1182/bloodadvances.2023011658>
18. Hong, C., Epstein, J. B., Jensen, S. B., Gueiros, L. A., van Leeuwen, S. J. M., Kandwal, A., Vissink, A., & Elad, S. (2024a). MASCC/ISOO clinical practice statement: Clinical assessment of salivary gland hypofunction and xerostomia in cancer patients. *Supportive Care in Cancer*, 32, Article 551. <https://doi.org/10.1007/s00520-024-08691-0>
19. Hong, C., Jensen, S. B., Vissink, A., Bonomo, P., Santos-Silva, A. R., Gueiros, L. A., Epstein, J. B., & Elad, S. (2024b). MASCC/ISOO clinical practice statement: Management of salivary gland hypofunction and xerostomia in cancer patients. *Supportive Care in Cancer*, 32, Article 548. <https://doi.org/10.1007/s00520-024-08688-9>
20. Jain, T., Olson, T. S., & Locke, F. L. (2023). How i treat cytopenias after CAR t-cell therapy. *Blood*, 141(20), 2460–2469. <https://doi.org/10.1182/blood.2022017415>
21. Labanca, C., Martino, E. A., Vigna, E., Bruzzese, A., Mendicino, F., Lucia, E., Olivito, V., Puccio, N., Neri, A., Morabito, F., & Gentile, M. (2025). Talquetamab in multiple myeloma: Efficacy, safety, and future directions. *European Journal of Haematology*, 114(3), 386–399. <https://doi.org/10.1111/ejh.14353>
22. Laheij, A. M. G. A., & van de Donk, N. W. C. J. (2024). Characterization of dysgeusia and xerostomia in patients with multiple myeloma treated with the t-cell redirecting GPRC5D bispecific antibody talquetamab. *Supportive Care in Cancer*, 32, Article 20. <https://doi.org/10.1007/s00520-023-08233-0>
23. Lesokhin, A. M., Tomasson, M. H., Arnulf, B., Bahlis, N. J., Prince, H. M., Niesvizky, R., Rodríguez-Otero, P., Martínez-López, J., Koehne, G., Touzeau, C., Jethava, Y., Quach, H., Depaus, J., Yokoyama, H., Gabayan, A. E., Stevens, D. A., Nooka, A. K., Manier, S., Raje, N., ... Mohty, M. (2023). Elranatamab in relapsed or refractory multiple myeloma: Phase 2 magnetism-3 trial results. *Nature Medicine*, 29(9), 2259–2267. <https://doi.org/10.1038/s41591-023-02528-9>

24. Los-Arcos, I., Iacoboni, G., Aguilar-Guisado, M., Alsina-Manrique, L., Díaz de Heredia, C., Fortuny-Guasch, C., García-Cadenas, I., García-Vidal, C., González-Vicent, M., Hernani, R., Kwon, M., Machado, M., Martínez-Gómez, X., Ortiz Maldonado, V., Pinto Pla, C., Piñana, J. L., Pomar, V., Reguera-Ortega, J. L., Salavert, M., ... Ruiz-Camps, I. (2021). Recommendations for screening, monitoring, prevention, and prophylaxis of infections in adult and pediatric patients receiving CAR t-cell therapy: A position paper. *Infection*, 49(2), 215–231. <https://doi.org/10.1007/s15010-020-01521-5>
25. Mitra, A., Barua, A., Huang, L., Ganguly, S., Feng, Q., & He, B. (2023). From bench to bedside: The history and progress of CAR t cell therapy. *Frontiers in Immunology*, 14, Article 1188049. <https://doi.org/10.3389/fimmu.2023.1188049>
26. Mohan, M., Chakraborty, R., Bal, S., Nellore, A., Baljevic, M., D'Souza, A., Pappas, P. G., Berdeja, J. G., Callander, N., & Costa, L. J. (2023). Recommendations on prevention of infections during chimeric antigen receptor t-cell and bispecific antibody therapy in multiple myeloma. *British Journal of Haematology*, 203(5), 736–746. <https://doi.org/10.1111/bjh.18909>
27. Naqvi, S. A. H., Shrestha, A., Alzubi, M., Alrawabdeh, J., Thanendrarajan, S., Zangari, M., van Rhee, F., Schinke, C., & Al Hadidi, S. (2024). Weight loss and dysgeusia in relapsed/refractory multiple myeloma patients treated with talquetamab. *eJHaem*, 5(4), 789–792. <https://doi.org/10.1002/jha2.971>
28. Nooka, A. K., Rodriguez, C., Mateos, M. V., Manier, S., Chastain, K., Banerjee, A., Kobos, R., Qi, K., Verona, R., Doyle, M., Martin, T. G., & van de Donk, N. W. C. J. (2024). Incidence, timing, and management of infections in patients receiving teclistamab for the treatment of relapsed/refractory multiple myeloma in the majestec-1 study. *Cancer*, 130(6), 886–900. <https://doi.org/10.1002/cncr.35107>
29. Parrondo, R. D., Ailawadhi, S., & Cerchione, C. (2024). Bispecific antibodies for the treatment of relapsed/refractory multiple myeloma: Updates and future perspectives. *Frontiers in Oncology*, 14, Article 1394048. <https://doi.org/10.3389/fonc.2024.1394048>
30. Raber-Durlacher, J. E., Zadik, Y., Treister, N. S., Stempler, N., Bruno, J. S., Epstein, J. B., & Elad, S. (2024). MASCC/ISOO clinical practice statement: Current understanding on controversies in basic oral care in hemato-oncology and hematopoietic cell transplantation. *Supportive Care in Cancer*, 32, Article 550. <https://doi.org/10.1007/s00520-024-08690-1>
31. Raje, N., Anderson, K., Einsele, H., Efebera, Y., Gay, F., Hammond, S. P., Lesokhin, A. M., Lonial, S., Ludwig, H., Moreau, P., Patel, K., Ramasamy, K., & Mateos, M.-V. (2023). Monitoring, prophylaxis, and treatment of infections in patients with MM receiving bispecific antibody therapy: Consensus recommendations from an expert panel. *Blood Cancer Journal*, 13, Article 116. <https://doi.org/10.1038/s41408-023-00879-7>
32. Rodriguez-Otero, P., van de Donk, N. W. C. J., Pillarisetti, K., Cornax, I., Vishwamitra, D., Gray, K., Hilder, B., Tolbert, J., Renaud, T., Masterson, T., Heuck, C., Kane, C., Verona, R., Moreau, P., Bahlis, N. J., & Chari, A. (2024). GPRC5D as a novel target for the treatment of multiple myeloma: A narrative review. *Blood Cancer Journal*, 14, Article 24. <https://doi.org/10.1038/s41408-023-00966-9>
33. Schinke, C., Touzeau, C., Oriol, A., Mateos, M.-V., Stevens, D., Rasche, L., Qin, X., Kato, K., Bathija, S., Katz, E. G., Gries, K. S., Campagna, M., Masterson, T., Hilder, B. W., Tolbert, J., Renaud, T., Heuck, C., Tomlinson, C., Moreau, P., ... Chari, A. (2025). Talquetamab improves patient-reported symptoms and health-related quality of life in relapsed or refractory multiple myeloma: Results from the phase 1/2 monumental-1 study. *Cancer*, 131(14), Article e35927. <https://doi.org/10.1002/cncr.35927>
34. Sim, B. Z., Longhitano, A., Er, J., Harrison, S. J., Slavin, M. A., & Teh, B. W. (2023). Infectious complications of bispecific antibody therapy in patients with multiple myeloma. *Blood Cancer Journal*, 13, Article 34. <https://doi.org/10.1038/s41408-023-00808-8>
35. Skallsjö, K., von Bültzingslöwen, I., Hasséus, B., Johansson, J.-E., Öhman, J., Raber-Durlacher, J. E., Huysmans, M.-C. D. N. J. M., Laheij, A. M. G. A., van Leeuwen, S. J. M., Hovan, A. J., Legert, K. G., Nguyen, H. M., Turk, P. J., Rozema, F. R., Blijlevens, N. M. A., & Brennan, M. T. (2023). Oral health in patients scheduled for hematopoietic stem cell transplantation in the orastem study. *PLOS ONE*, 18(5), Article e0285615. <https://doi.org/10.1371/journal.pone.0285615>
36. Sutherland, N. M., Zhou, B., Zhang, L., Ong, M.-S., Hong, J. S., Pak, A., Liu, K. J., Frigault, M. J., Maus, M. V., Hill, J. A., Reynolds, K., Walter, J. E., Camargo, C. A., Jr., & Barmettler, S. (2025). Association of cd19+-targeted chimeric antigen receptor t-cell therapy with hypogammaglobulinemia, infection, and mortality. *Journal of Allergy and Clinical Immunology*, 155(2), 605–615. <https://doi.org/10.1016/j.jaci.2024.10.021>
37. Tabbara, N., Dioverti-Prono, M. V., & Jain, T. (2024). Mitigating and managing infection risk in adults treated with CAR t-cell therapy. *Hematology: American Society of Hematology Education Program*, 2024(1), 116–125. <https://doi.org/10.1182/hematology.2024000535>
38. Tan, C. R., Asoori, S., Huang, C.-Y., Brunaldi, L., Popat, R., Kastiris, E., Martinez-Lopez, J., Bansal, R., Silva Corraes, A. D. M., Chhabra, S., Parrondo, R., Ailawadhi, S., Fotiou, D., Dimopoulos, M. A., Yong, K., Mactier, C., Lau, C., Corona, M., Sáez Marin, A. J., ... Lin, Y. (2025). Real-world evaluation of teclistamab for the treatment of relapsed/refractory multiple myeloma: An international myeloma working group study. *Blood Cancer Journal*, 15, Article 53. <https://doi.org/10.1038/s41408-025-01259-z>

39. van Gennip, L. L. A., Bulthuis, M. S., Blijlevens, N. M. A., Huysmans, M.-C. D. N. J. M., van Leeuwen, S. J. M., & Thomas, R. Z. (2023). Caries, periodontitis and tooth loss after haematopoietic stem cell transplantation: A systematic review. *Oral Diseases*, 29(7), 2578–2591. <https://doi.org/10.1111/odi.14358>
40. van Leeuwen, S. J. M., Proctor, G. B., Laheij, A. M. G. A., Potting, C. M. J., Smits, O., Bronkhorst, E. M., Hazenberg, M. D., Haverman, T. M., Brennan, M. T., von Bültzingslöwen, I., Raber-Durlacher, J. E., Huysmans, M.-C. D. N. J. M., Rozema, F. R., & Blijlevens, N. M. A. (2021). Significant salivary changes in relation to oral mucositis following autologous hematopoietic stem cell transplantation. *Bone Marrow Transplantation*, 56(6), 1381–1390. <https://doi.org/10.1038/s41409-020-01185-7>
41. Wang, X. S., & Srour, S. A. (2024). Patient-reported outcomes after CAR t-cell therapy in patients with hematological malignancies. *Hematology: American Society of Hematology Education Program*, 2024(1), 102–108. <https://doi.org/10.1182/hematology.2024000536>
42. Wudhikarn, K., Palomba, M. L., Pennisi, M., Garcia-Recio, M., Flynn, J. R., Devlin, S. M., Afuye, A., Silverberg, M. L., Maloy, M. A., Shah, G. L., Scordo, M., Dahi, P. B., Sauter, C. S., Batlevi, C. L., Santomasso, B. D., Mead, E., Seo, S. K., & Perales, M.-A. (2020). Infection during the first year in patients treated with CD19 CAR t cells for diffuse large b cell lymphoma. *Blood Cancer Journal*, 10, Article 79. <https://doi.org/10.1038/s41408-020-00346-7>
43. Wudhikarn, K., & Perales, M.-A. (2022). Infectious complications, immune reconstitution, and infection prophylaxis after CD19 chimeric antigen receptor t-cell therapy. *Bone Marrow Transplantation*, 57(10), 1477–1488. <https://doi.org/10.1038/s41409-022-01756-w>
44. Yang, Y., Peng, H., Wang, J., & Li, F. (2024). New insights into CAR t-cell hematological toxicities: Manifestations, mechanisms, and effective management strategies. *Experimental Hematology & Oncology*, 13, Article 110. <https://doi.org/10.1186/s40164-024-00573-9>
45. Zadik, Y., Raber-Durlacher, J. E., Epstein, J. B., Majorana, A., Miranda-Silva, W., Yang, S., Blijlevens, N. M. A., & Elad, S. (2025). MASCC/ISOO clinical practice statement: Dental evaluation and management prior to treatment for hematologic malignancies and CAR t-cell therapy. *Supportive Care in Cancer*, 33, Article 853. <https://doi.org/10.1007/s00520-025-09845-4>