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IMPLEMENTATION OF TELEMEDICINE IN THE DIAGNOSIS AND MANAGEMENT OF MAXILLARY SINUS CYSTS

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Abstract.

Background: Telemedicine has become a durable adjunct in rhinology, otorhinolaryngology, and oral-maxillofacial care, yet its practical role in patients with maxillary sinus cysts remains insufficiently standardized.

Objective: To evaluate the effectiveness of a hybrid telemedicine pathway for the diagnosis, treatment planning, and follow-up of patients with maxillary sinus cysts.

Methods: A modeled comparative cohort of 120 patients was organized into a standard-care group (n=60) and a telemedicine-supported pathway group (n=60). The telemedicine model included remote triage, structured image review of CT/CBCT data, virtual multidisciplinary consultation, digital preoperative counselling, and remote postoperative surveillance.

Results: The telemedicine pathway shortened the time to specialist review from 11.8 ± 3.6 to 4.9 ± 1.8 days and reduced the time to final treatment decision from 16.2 ± 4.9 to 8.1 ± 2.7 days. The mean number of face-to-face visits before definitive management decreased from 2.3 ± 0.7 to 1.2 ± 0.5. Patient satisfaction increased from 78.6 ± 8.9 to 91.8 ± 5.7 points, while adherence to postoperative irrigation improved from 71.7% to 91.7%.

Conclusion: A hybrid telemedicine pathway can improve access, accelerate decision-making, reduce unnecessary hospital visits, and support postoperative monitoring in selected patients with maxillary sinus cysts.

Keywords

telemedicine, maxillary sinus cyst, rhinology, teleradiology, teledentistry, postoperative follow-up, hybrid care pathway, endoscopic sinus surgery

Introduction. Maxillary sinus cysts are frequently detected incidentally on CBCT, CT, or MRI, although a clinically relevant subgroup presents with facial pressure, nasal obstruction, recurrent inflammatory complaints, or the need for surgical clarification. In current practice, many patients enter the care pathway through dental imaging or outpatient radiology before being seen by a rhinology specialist. This creates delays, duplicate face-to-face visits, and fragmented decision-making, especially when ENT, dental, and maxillofacial services become involved sequentially rather than collaboratively.

Telemedicine has developed from a crisis-response tool into a durable model of specialist care delivery. Contemporary otorhinolaryngology evidence supports its use for triage, image-based decision support, follow-up, and selected low-risk consultations, while still recognizing that nasal endoscopy, surgery, and urgent examination cannot be replaced by remote care. For maxillary sinus cysts, telemedicine is best positioned not as a substitute for in-person assessment, but as a pathway-level intervention capable of accelerating review, improving coordination, and reducing low-value encounters.

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The present manuscript formats this concept as an original article and models publication-style results for a 120-patient cohort in order to demonstrate how a hybrid telemedicine service can be described in a journal-ready structure.

Aim. To assess the clinical effectiveness of introducing a hybrid telemedicine pathway into the diagnosis, treatment planning, and follow-up of patients with maxillary sinus cysts.

Materials and Methods. This modeled original study included 120 patients with radiologically confirmed maxillary sinus cysts. Patients were divided into two equal groups. Group 1 comprised 60 patients managed through a standard pathway consisting of conventional outpatient referral, in-person image review, routine specialist consultation, and face-to-face postoperative follow-up. Group 2 comprised 60 patients managed through a hybrid telemedicine pathway that incorporated remote triage, secure asynchronous transfer of CT/CBCT data, virtual specialist consultation, multidisciplinary ENT-dental case review when indicated, remote preoperative counselling, and protocolized tele-follow-up after treatment.

Baseline variables included age, sex, laterality of the cyst, maximal cyst diameter, mucosal thickening, and probable odontogenic association. The primary effectiveness outcomes were time to specialist review, time to final treatment decision, number of face-to-face visits before management, completion of preoperative imaging review before admission, triage efficiency, and patient satisfaction. Secondary outcomes included postoperative adherence to irrigation, missed follow-up, unplanned visits, and readmission.

Continuous data are presented as mean ± standard deviation and categorical data as number and percentage. Comparative p values were inserted to simulate a conventional publication layout.

Results. The baseline characteristics of the two groups were comparable, with no material differences in age, sex distribution, lesion size, or frequency of mucosal thickening. This allowed subsequent assessment of pathway performance without major baseline imbalance.

The telemedicine pathway substantially improved early access metrics. The mean time to specialist review fell from 11.8 ± 3.6 days in the standard-care group to 4.9 ± 1.8 days in the telemedicine group. Time to final treatment decision decreased from 16.2 ± 4.9 to 8.1 ± 2.7 days. The mean number of in-person visits before definitive management also fell by almost half, indicating that remote image review and virtual preoperative consultation meaningfully reduced logistical burden.

Operationally, the telemedicine pathway increased the proportion of patients whose imaging had been fully reviewed before hospital attendance, increased multidisciplinary case discussion when a dental component was suspected, and improved triage to observation in cases that did not require immediate procedural escalation.

In follow-up, the telemedicine pathway was associated with higher treatment satisfaction, improved adherence to postoperative irrigation and medication instructions, fewer missed scheduled follow-up appointments, and fewer unplanned early postoperative visits.

Table 1. Baseline characteristics of the study groups.

Variable	Standard care (n=60)	Telemedicine pathway (n=60)	p
Age, years (mean ± SD)	41.8 ± 10.9	42.3 ± 11.2	0.81
Male, n (%)	28 (46.7)	27 (45.0)	0.85
Female, n (%)	32 (53.3)	33 (55.0)	0.85

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Unilateral cyst, n (%)	49 (81.7)	50 (83.3)	0.82
Bilateral cyst, n (%)	11 (18.3)	10 (16.7)	0.82
Mean cyst diameter, mm	18.6 ± 5.7	19.1 ± 5.4	0.63
Associated mucosal thickening, n (%)	24 (40.0)	26 (43.3)	0.71
Probable odontogenic association, n (%)	14 (23.3)	15 (25.0)	0.83

Table 2. Telemedicine-related efficiency indicators.

Efficiency measure	Standard care (n=60)	Telemedicine pathway (n=60)	p
Time to specialist review, days	11.8 ± 3.6	4.9 ± 1.8	<0.001
Time to final treatment decision, days	16.2 ± 4.9	8.1 ± 2.7	<0.001
Face-to-face visits before treatment, n	2.3 ± 0.7	1.2 ± 0.5	<0.001
Preoperative imaging review completed before admission, n (%)	49 (81.7)	58 (96.7)	0.008
Multidisciplinary ENT-dental case discussion, n (%)	19 (31.7)	41 (68.3)	<0.001
Patients triaged to observation without unnecessary admission, n (%)	18 (30.0)	29 (48.3)	0.039

Table 3. Clinical and patient-reported outcomes.

Clinical outcome	Standard care (n=60)	Telemedicine pathway (n=60)	p
Postoperative unplanned visits within 30 days, n (%)	11 (18.3)	5 (8.3)	0.11
Readmission, n (%)	3 (5.0)	1 (1.7)	0.31
Patient satisfaction score /100	78.6 ± 8.9	91.8 ± 5.7	<0.001
Diagnostic concordance with final in-person assessment, n (%)	50 (83.3)	56 (93.3)	0.09
Adherence to postoperative irrigation protocol, n (%)	43 (71.7)	55 (91.7)	0.004
Missed scheduled	10 (16.7)	3 (5.0)	0.038

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follow-up, n (%)			

Discussion. The modeled data suggest that telemedicine provides its greatest value in maxillary sinus cyst care when implemented as a structured pathway rather than as an isolated virtual consultation. Remote triage and store-and-forward review of CT or CBCT images can remove unnecessary early visits, while virtual counselling and tele-follow-up appear to improve continuity, patient satisfaction, and adherence.

The most important conceptual point is that telemedicine should complement, not replace, endoscopy, surgery, or urgent examination. Patients with unilateral red-flag symptoms, suspected complicated sinusitis, persistent bleeding, fever, orbital complaints, or diagnostic uncertainty still require rapid in-person review. However, in stable patients with image-defined cystic lesions, remote review can shorten time to decision, facilitate multidisciplinary alignment, and reduce travel and service congestion.

These modeled findings align with current tele-ENT and teledentistry literature, which consistently shows that remote care performs best in triage, planning, and follow-up. The present article translates that evidence into a disease-specific pathway for maxillary sinus cysts.

Conclusion

A hybrid telemedicine pathway for maxillary sinus cysts can improve service efficiency and patient-centered outcomes by accelerating specialist review, reducing unnecessary face-to-face visits, supporting multidisciplinary decision-making, and strengthening postoperative monitoring. The most effective implementation strategy combines structured remote intake, standardized teleradiology review, selective escalation to in-person rhinologic examination, and protocol-based tele-follow-up.

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