

Digital NAM: Reducing Treatment Burden in Cleft Care

Background and Challenge

Infants born with cleft lip and palate often require Nasoalveolar Molding (NAM) before surgical repair to improve treatment outcomes. Conventional NAM relies on acrylic appliances that require frequent hospital visits for appliance adjustments and monitoring. For families travelling from rural and underserved regions, these repeated visits create significant financial, logistical, and emotional burdens. Travel expenses, loss of workdays, accommodation costs, and difficulty accessing specialized cleft centres often contribute to treatment interruptions and reduced compliance.

The traditional NAM process is also highly dependent on repeated chairside modifications by specialized clinicians, limiting accessibility and increasing demands on healthcare resources. A digital solution was therefore required to reduce treatment burden while maintaining clinical effectiveness and specialist oversight.

Digital Innovation

To address this challenge, our centre developed a fully digital Nasoalveolar Molding (Digital NAM) workflow utilizing intraoral scanning, virtual treatment planning, CAD/CAM technology, and customized aligner-based molding appliances (OrthoAligner NAM). (Figure 1)



Figure 1. OrthoAligner Digital NAM appliance fabricated using CAD/CAM technology as part of the sequential digital molding protocol.

Instead of repeated chairside adjustments, a series of sequential appliances is digitally designed and fabricated in advance according to the planned treatment stages. Parents are provided with the appliances and can replace them at home according to a prescribed schedule. Clinical progress is monitored through a hybrid care model combining periodic in-person reviews with teleconsultation-based follow-up. This approach enables continuous specialist supervision while significantly reducing the need for frequent travel to the hospital.

Impact on Patient Care and Service Delivery

The Digital NAM program transformed a traditionally hospital-dependent treatment into a patient-centred, digitally enabled care pathway.

Key benefits achieved include:

- Reduced dependence on frequent hospital visits for appliance modification.
- Improved convenience and compliance for caregivers.

- Reduced travel burden, treatment interruptions, and associated costs.
- Enhanced access to specialized cleft care for families residing in remote and underserved regions.
- Improved continuity of care through telemedicine-enabled monitoring.
- Standardized treatment planning and appliance fabrication through digital workflows.
- Improved utilization of clinician time by reducing repetitive chairside procedures.
- Creation of a scalable and reproducible model that can be adopted across cleft care centres.

Quality and Relevance

The initiative directly supports:

- Patient-centred care.
- Accessibility and equity in healthcare delivery.
- Continuity of care.
- Timely intervention and follow-up.
- Effective communication between caregivers and healthcare providers.
- Digital documentation and technology-enabled healthcare services.
- Telemedicine and virtual care delivery.

The case demonstrates how digital transformation can improve healthcare delivery while maintaining clinical effectiveness and enhancing patient experience.(Figure 2)

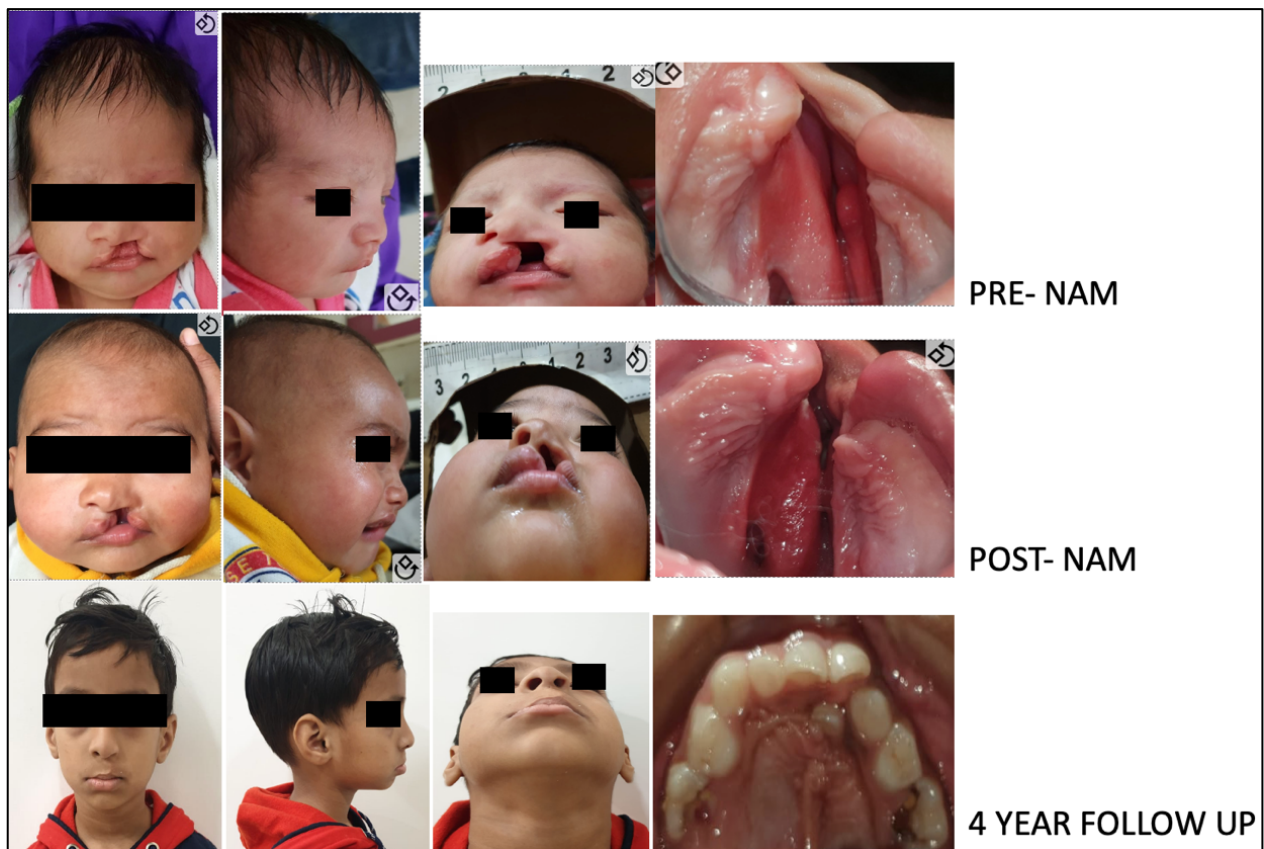


Figure 2. Infant with cleft lip and palate treated using the OrthoAligner digital nasoalveolar molding (NAM) system, with clinical follow-up demonstrating sustained outcomes through 4 years of age.

Innovation Highlights

A key innovation of this project is the replacement of repeated chairside appliance adjustments with digitally designed sequential molding appliances supported by virtual monitoring. By shifting a significant portion of care from the hospital to the home environment, the program successfully combines digital treatment planning, CAD/CAM manufacturing, and telemedicine into a single integrated care pathway.

Digital technology has enabled specialized cleft care to reach patients who may otherwise face barriers to accessing treatment because of distance, cost, or resource limitations.

Outcomes

The Digital NAM pathway has demonstrated the feasibility of delivering presurgical infant orthopedic treatment through a digitally enabled hybrid care model. Clinical outcomes have been shown to be comparable to conventional NAM protocols, while simultaneously improving accessibility, caregiver convenience, and treatment continuity.

Institutions adopting similar models may additionally monitor and report:

- Reduction in hospital visits.
- Number of teleconsultations conducted.
- Travel distance and cost savings.
- Treatment completion rates.
- Caregiver satisfaction scores.
- Clinical outcome measures.

Conclusion

Digital NAM transformed a traditionally hospital-dependent cleft care intervention into a patient-centred telemedicine-enabled care model. By integrating digital treatment planning, CAD/CAM technology, and remote clinical monitoring, the initiative reduced treatment burden, improved access to specialized care, enhanced caregiver experience, and established a scalable framework for future digital cleft care delivery.

References

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2. Batra P, Gribel BF, Abhinav BA, Raghavan S, Arora A. A comparative evaluation of presurgical infant orthopedics of modified Grayson's technique with clear aligners incorporating a nasal elevator in patients with unilateral cleft lip and palate. *Am J Orthod Dentofacial Orthop*. 2022;162(5):714-727. doi: 10.1016/j.ajodo.2021.06.027.