AI-ASSISTED MALNUTRITION PREVENTION IN OROPHARYNGEAL AND OESOPHAGEAL DYSPHAGIA

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Description: This initiative will develop, validate and implement an interpretable AI-enabled decision-support tool to predict malnutrition risk and guide nutrition care in adults with oropharyngeal and oesophageal dysphagia in multiple hospital settings. Building on a pilot study in India, it aims to enhance patient outcomes and reduce readmissions. The target is to reach 300,00 patients across government and private hospital setups within three years, leveraging scalable digital health technology.

Background/context- Oropharyngeal dysphagia exerts the most profound impact on nutritional intake and is highly prevalent in older adults and in patients with stroke, head and neck cancer and gastrointestinal disorders. It is one of the most frequent and life-threatening symptoms of neurological disorders. Swallowing impairment is observed in at least 50% of patients with ischemic or hemorrhagic stroke. These patients have a three-fold increased risk of developing early aspiration pneumonia, and their mortality is significantly higher than in non-dysphagic stroke patients. Malnutrition in these patients contributes to longer hospital stays, higher complications, mortality and poorer quality of life. In India, high patient loads, limited dietetic coverage and inconsistent screening frequently delay nutrition intervention. ESPEN guidelines (Burgos R et al. ESPEN guideline clinical nutrition in neurology. Clin Nutr. 2018) suggests that at diagnosis, a complete nutritional assessment is recommended in ALS patients, including Body Mass Index (BMI), weight loss over time and lipid status. Body composition analysis using DEXA or BIA with validated formula should be performed if available.

Rationale: AI can predict dysphagia severity and malnutrition risk using routine clinical data, but they are rarely embedded in real-world clinical pathways. An interpretable, clinically integrated AI tool could standardize early risk detection, support screening and assessment, assist timely multidisciplinary decision-making and provide a scalable model for dysphagia nutrition care in both private as well as resource-constrained settings.

Objectives and scope: To enhance and deploy an AI-powered tool and validate an interpretable AI model to predict malnutrition risk in adults with dysphagia using routine multicenter clinical data from Indian hospitals. Embed the model in a user-friendly digital decision-support tool for surgeons, gastroenterologists, ENT specialists, SLPs, dietitians and nurses, providing risk stratification and tailored nutrition recommendations, reaching 300,00 patients over three years. Reduce time-to-intervention for addressing malnutrition and complications by 30%. Ensure cost-effectiveness and adaptability for diverse healthcare settings. Implement and evaluate an AI-enabled nutritional care pathway over 12-24 months, measuring impact on malnutrition risk, weight change and care processes in 150 tertiary care hospitals pan India.

Planned activities & deliverables Phase 1 (Months 1-6): Multicenter data collection, feature engineering, training and validation of interpretable ML models to predict dysphagia-related malnutrition risk. Upgrade AI with machine learning (e.g., random forest models) and multilingual NLP chatbots; deploy to 10,000 patients in India. **Phase 2 (Months 7-9):** Design and development of a web-based decision-support tool with co-design workshops involving multidisciplinary teams and patients. **Phase 3 (Months 10-24):** Roll-out of the AI-enabled pathway in 3-5 hospitals, with a pre and post-evaluation of screening rates, referrals, nutrition interventions and outcomes. Scale to 300,00 patients, integrate into national health systems, and ensure sustainability via partnerships

Key steps: Enhanced AI tool, comprehensive dataset (n=30,000), 20% reduction in malnutrition, final report, three peer-reviewed publications. Setting up collaborating sites and governance; building a shared data dictionary; training and validating the AI model; user-testing and refining the digital tool; training healthcare professionals, staff; implementing with continuous monitoring; and holding regular review and reporting meetings with partners and MNI team.

Concrete deliverables: a validated interpretable AI model for dysphagia-related malnutrition risk; an operational web-based decision-support tool; a standardised AI-enabled nutrition care pathway; training materials and workshops for multidisciplinary teams; and a pooled multicentre dataset with analysis suitable for publications and guidelines.

Progress in 12-24 months: Validated by a 425-patient pilot, this tool targets 300,00 patients suffering from oropharyngeal dysphagia in three years. The 40,000 Euro grant enhances AI and initiates scale-up, promising a 20% reduction in malnutrition and improved care, reshaping regional health systems as well as opens doors to integration in worldwide healthcare setups. A validated AI model, an operational digital tool and increased screening rates with earlier dietitian referrals in pilot sites, reduced malnutrition risk scores, improved weight trajectories, shorter length of stay and fewer readmissions.

Resources & Enablers: The project is led by multidisciplinary team of surgeons, clinical dietitians with national and international leadership roles in dysphagia, working with ENT, Head and neck cancer surgeons, critical care doctors, SLP and dietetic collaborators in 3–5 tertiary hospitals across India. IAPEN INDIA provides endorsement and a national dissemination network to support scale-up and ensure sustainability of the pathway, Technical (5 AI developers, 3 data scientists, 3 IT specialists), Research (3 statisticians, 2 health economists). Personnel resources include data management, AI development and project coordination roles, as well as clinical champions at each site.

Financial needs are primarily covered by the MNI grant, with in-kind contributions from participating hospitals (clinical time, IT support, infrastructure) and professional support from IAPEN INDIA.

Category	Subcategory	Budget (€)	Details
AI Upgrades (50%)	Software Development	7,000	Coding, testing AI models
	Licensing/Tools	2,000	AI platforms, APIs
	Maintenance	1,500	Updates, bug fixes
Rural Infrastructure (20%)	Hardware	3,000	Servers, devices for rural sites
	Connectivity	2,000	Internet setup, satellite links
	Technical Support	1,000	On-site IT assistance
Scale-Up (30%)	Initial Deployment	4,000	Logistics, staffing, pilot site prep
	Logistics	2,000	Transport, installation
	Staffing	1,500	Temporary field workers
	Pilot Site Prep	1,500	Facility adjustments
Evaluation	Data Collection	2,000	Surveys, sensors
	Analysis	2,000	Statistician fees, software
	Reporting	1,000	Dashboards, summaries
Dissemination (20%)	Training	2,500	Workshops, trainers
	Workshops	2,000	Venue, materials
	Trainers	1,000	Expert fees
Publications	Writing/Editing	1,000	Reports, articles
	Printing/Distribution	1,000	Journals, handouts
Policy Advocacy	Events	1,500	Conferences, panels
	Materials	500	Policy briefs, presentations

Grant Spending: **Budget- 40,000 Euro Grant**: Technology (20,000 Euros): AI upgrades and rural infrastructure. Scale-Up (12,000 Euros): Initial deployment and evaluation. Dissemination (8,000 Euros): training, publications, policy advocacy

Success Factors: strong multidisciplinary collaboration, interpretable AI models co-designed with clinicians, integration into routine workflows, leadership and endorsement from IAPEN INDIA, and a multicenter design that supports scalability and adaptation in other resource-constrained settings.

Results & Expected Outcomes: Short-term, the project will deliver a validated AI model and an operational decision-support tool, enabling earlier identification of at-risk patients and improved referral patterns. Medium-term, we expect reduced malnutrition risk, improved weight trajectories, shorter hospital stays and fewer readmissions. Long-term, the project will provide a scalable, evidence-based pathway to improve dysphagia nutrition care in India and inform national policies. **Implementation**: Integration of the AI tool into routine multi-speciality clinic workflows, with standardised protocols for screening, risk stratification and nutrition interventions. Training, local champion, while IAPEN INDIA will help disseminate the model and learning resources to additional centres. Year 3 scales to 300,00, integrating the tool into national health systems via partnerships. Real-world data will refine the AI, while training and policy advocacy (supported by the 40,000 Euro grant) ensure adoption by healthcare providers and governments

Project advances The project advances patient care by providing continuous monitoring, automated risk stratification, ensuring timely interventions for oropharyngeal dysphagia and high-risk profiles like malnutrition. For nutritional care, it targets improving adherence to nutritional plans and reducing related complications, especially in resource-limited settings. It aligns with EU (European Union) health priorities like digital transformation and malnutrition prevention,an effective AI-enabled clinical nutrition pathway, providing strategies to implement standardised care, generating evidence on improved outcomes and potential health-economic benefits, and creating patient-centered digital tools that enhance access in resource-constrained settings. It's likely to influence policy by providing a scalable model for nutritional care, backed by a dataset of 30,000 patients and three peer-reviewed publications. Its focus on malnutrition (30,000 cases) and digital health aligns with universal health goals, offering evidence for policy frameworks that prioritize post-discharge nutrition support globally. **Transferability-** Yes, its digital infrastructure and adaptability make it transferable beyond India, to SAARC, AI's multilingual capabilities and focus on scalable offering European nations, and global healthcare set ups, a blueprint to address high readmission rates and healthcare disparities in diverse settings, aligning with global health goals.

☑ **Please tick to confirm the PEN letter of endorsement is attached.**
Incomplete submissions will not be considered.

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