1 Title of the idea and proposing services

BARI-PREDICT

Multimodal biomarkers and artificial intelligence to predict response to metabolic surgery and guide the choice of technique

Proposing service: General Surgery, with Endocrinology, Nutrition, Psychology, Gastroenterology, Radiology, Clinical Pathology, Immunohaemotherapy, Family Medicine, Information Systems and the Research Department.

2 Team

Lead: Prof. Gil Faria. **Team:** Dr. Pedro Soares Moreira and Dr. Francisco Marrana (General Surgery); Joana Raposo, RN (follow-up and data management); liaison members from each service involved. **Partners (to be formalised):** FMUP, RISE-Health, Value4Health; European centres of the EAES and IFSO-EC networks.

3 2027 topics addressed

HORIZON-HLTH-2027-02-TOOL-01-two-stage: Predictive biomarkers of disease progression and treatment response using AI in chronic NCDs (RIA; EUR 6 to 8 M; stage 1 on 17/02/2027). The proposal responds to the expected outcomes of validated predictive biomarkers, trustworthy multimodal AI and biomarker-guided care.

4 Clinical problem or need

Obesity affects about one in five Portuguese adults, and surgery is the most effective treatment. Response is, however, heterogeneous: insufficient weight loss, weight regain, absence of type 2 diabetes (T2DM) remission, reflux after sleeve gastrectomy and deficiencies after malabsorptive procedures. The choice of technique currently rests on simple criteria and on the surgeon's experience. In the era of incretin-based drugs, each operation has to be indicated for the patients who benefit most.

5 Idea

Data: NLP curation of SClínico records, validated by manual review.

Multimodal predictive models, built with established AI methods, integrating clinical, laboratory (including C-peptide), endoscopic, body composition, psychological, sociodemographic and primary care data. Outcomes are weight loss, weight regain, T2DM remission, de novo reflux and complications; models are stratified by sex and by technique, with causal methods to address technique selection bias.

Longitudinal follow-up shared with ULS family medicine, using a minimum dataset and digital PROMs based on the ICHOM set, beyond 3 years.

Validation: prospective at ULSM (about 250 operations per year from 2027) and external in European centres (several hundred patients).

Value: cost per care cycle and cost-effectiveness of biomarker-guided technique choice, using the team's Markov model. Decision support prototype and regulatory plan.

What changes: the right technique for each patient, follow-up close to home, fewer failures and reoperations.

6 What already exists

Cohort: 816 patients operated on since 2018, with follow-up to 3 years in about 80%: sleeve gastrectomy 363, RYGB 296, OAGB 46, OATB 42, SADI-S 21, RYTB 6, band removal 20, other 22. T2DM in about 20%. Systematic preoperative C-peptide and upper gastrointestinal endoscopy.

Publications: Faria G et al., Ann Surg 2014;260:279-86 (PMID 24743628), predictive score after RYGB; Faria GR, Preto JR, Costa-Maia J, Obes Surg 2013;23:460-6 (PMID 23341033), Markov model.

Gaps: PROMs are not yet systematic, and the less frequent techniques depend on partner data.