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CONSTIPATION-PREDOMINANT IRRITABLE BOWEL SYNDROME AND FUNCTIONAL CONSTIPATION ARE NOT DISCRETE DISORDERS: A MACHINE LEARNING APPROACH

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Introduction Chronic constipation is classified into two main syndromes, irritable bowel syndrome with constipation (IBS-C) and functional constipation (FC), on the assumption that they differ along multiple clinical characteristics and are plausibly of distinct pathophysiology. We tested this assumption by applying machine learning to a large prospective cohort of comprehensively phenotyped patients with constipation.

Methods Demographics, validated symptom and quality of life questionnaires, clinical examination findings, stool transit, and diagnosis were collected in 768 patients with chronic constipation from a tertiary centre. We used machine learning to compare the accuracy of diagnostic models for IBS-C and FC based on single differentiating features such as abdominal pain (a 'unisymptomatic' model) vs. multiple features encompassing a range of symptoms, examination findings and investigations (a 'syndromic' model), in order to assess the grounds for the syndromic segregation of IBS-C and FC in a statistically formalized way.

Results Unisymptomatic models of abdominal pain distinguished between IBS-C and FC cohorts near-perfectly (AUC 0.97) (figure 1). Syndromic models did not significantly increase diagnostic accuracy ($p > 0.15$). Furthermore, syndromic models from which abdominal pain was omitted performed at chance level (AUC 0.56). Statistical clustering of clinical characteristics showed no structure relatable to diagnosis, but a syndromic segregation of 16 features differentiating patients by impact of constipation on daily life.

Conclusions IBS-C and FC differ only with respect to the presence of abdominal pain, arguably a self-fulfilling difference given that abdominal pain inherently distinguishes the two in current diagnostic criteria. This suggests they are not distinct syndromes, rather a single syndrome varying along one clinical dimension. An alternative syndromic segregation is identified which needs evaluation in community-based cohorts. Our results have implications for patient recruitment into clinical trials, future disease classifications and management guidelines.
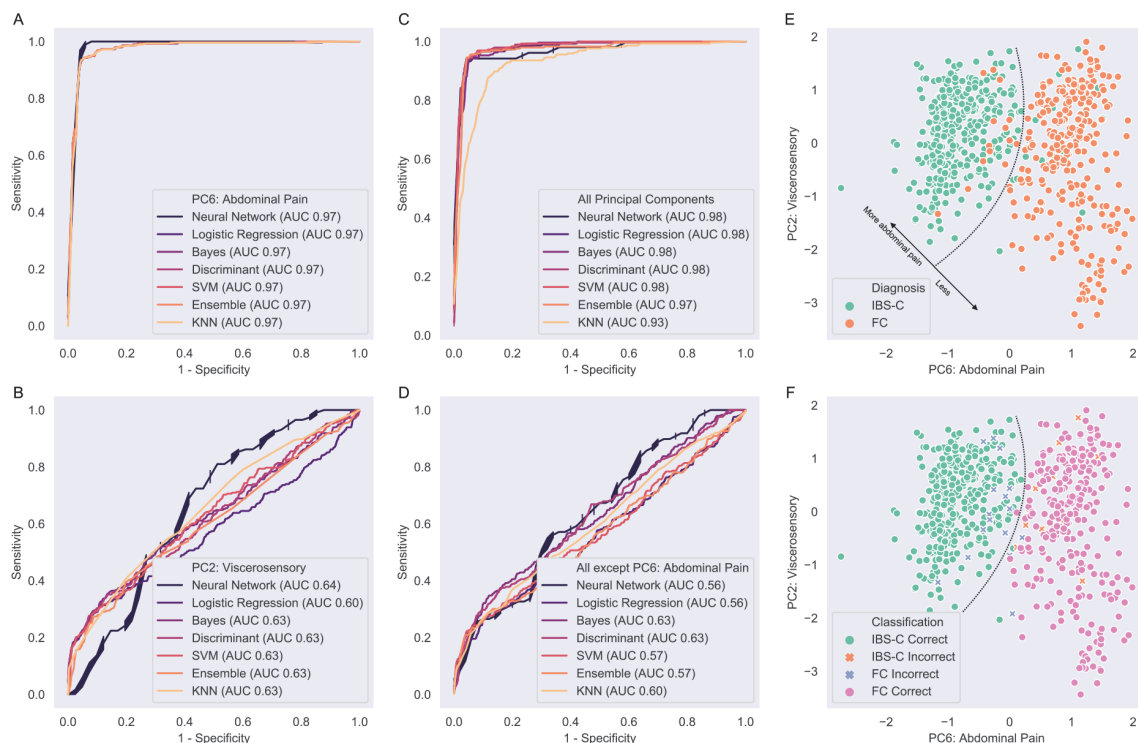
Abstract P342 Figure 1 Abdominal pain alone is necessary and sufficient for differentiating IBS-C and FC
A) Unisymptomatic models of abdominal pain (PC6) achieved near-perfect accuracy in distinguishing IBS-C and FC. B) Models of viscerosensory measures (PC2) perform poorly. C) There is no significant improvement in model accuracy when a syndromic feature set is used in place of a unisymptomatic pain feature. D) Syndromic feature set models, when excluding PC6: abdominal pain, shows chance level accuracy. E) Two-dimensional plot of the two components which significantly differed between IBS-C and FC patients, PC2: viscerosensory and PC6: abdominal pain, with IBS-C patients having both worse pain and other viscerosensory measures. The two diagnoses arguably appear distinct with this data alone, illustrated with dotted line approximately separating the groups. F) Two-dimensional plot of the two components, with the results of the best performing classifier plotted. Namely, patients wrongly classified as either diagnosis appear to fall on the 'wrong side' of the diagnostic line, not conforming to the stereotype of the diagnosis of FC or IBS-C (i.e. FC patients having abdominal pain features expected in IBS-C, and IBS-C patients having abdominal pain features expected in FC)