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Forecast models to predict the demand for endoscopic procedures in a tertiary unit: a prospective validation

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Dear Editor,

Over the past few decades, there has been an exponential increase in the utilization of endoscopic procedures[1]. Accurately predicting the demand is crucial for effective capacity planning and resource allocation in the endoscopic unit. However, predictive

models are not integrated into current endoscopy software. To overcome this limitation, our group used data on the demand in our tertiary unit from 2015 to 2021 (83 months) to develop forecast models using exponential smoothing techniques adjusted for trend and seasonality (derivation phase). These models were recently published at the Revista Española de Enfermedades Digestivas[2]. The present study aimed to validate those models, using prospectively collected data (validation phase). For such, the demands for esophagogastroscopy (EGD), colonoscopy, percutaneous endoscopic gastrostomy (PEG), capsule enteroscopy (CE), device-assisted enteroscopy (DAE), endoscopic ultrasonography (EUS) and endoscopic retrograde cholangiopancreatography (ERCP) from January to December 2022 were retrieved. Throughout 2022, 9028 endoscopic procedures were requested (42.3% EGD, 40.9% colonoscopy, 5.3% EUS, 4.5% ERCP, 4.2% CE, and 0.7% DAE). The actual demand (AD) and the predicted 95% confidence intervals (p-95%CI) for each procedure and for each trimester of the year are presented in Figure 1.

The AD for EGD was within the forecasted range (AD=3819, p-95%CI 3208-4368), as was the case of colonoscopy (AD=3688, p-95%CI 3079-4225), PEG (AD=193, p-95%CI 141-283), EUS (AD=477, p-95%CI 260-553), and ERCP (AD=402, p-95%CI 252-462), for all year quarters. On the other hand, the number of CE requested in the first quarter (AD=136) was above the p-95%CI (58-95) as was the number of DAE in the first and fourth trimesters (AD=19 and 20, respectively), while p-95%CI were 0-15 and 1-17, respectively. The slight mismatch in results for CE and DAE was expected, as the mean absolute percentage error (MAPE, a measure of forecast accuracy based on the residues) calculated at the derivation phase was higher (35.5% for DAE). It could also be explained by the impact of the COVID-19 pandemic on these procedures, which, in the case of CE, may have reduced the upward trend considered on the forecast model. Overall, the models developed in our unit effectively predicted the demands for most endoscopic procedures. The integration of data from 2022 will enhance the robustness of the models, especially for CE and DAE. Combining business analytics capabilities with recent artificial intelligence technologies[3] will hopefully support real-world planning and decision-making, improving the quality of gastrointestinal endoscopy services.

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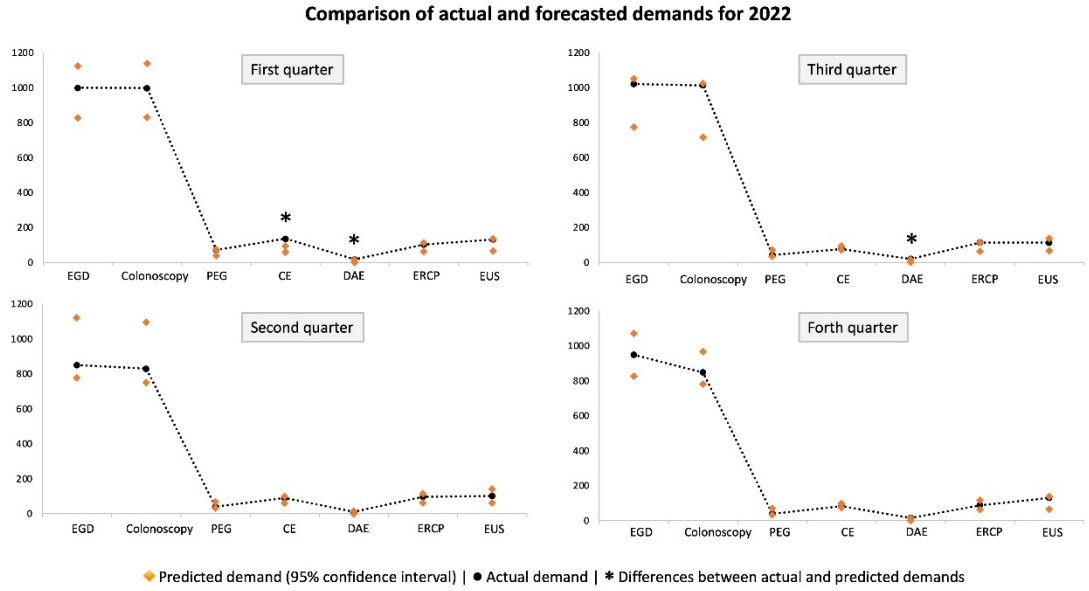

Fig. 1.