

Point of Care Bowel Sound Analysis shows a 3-way correlation between IBS symptom severity and Lactulose Breath Testing.

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ABSTRACT

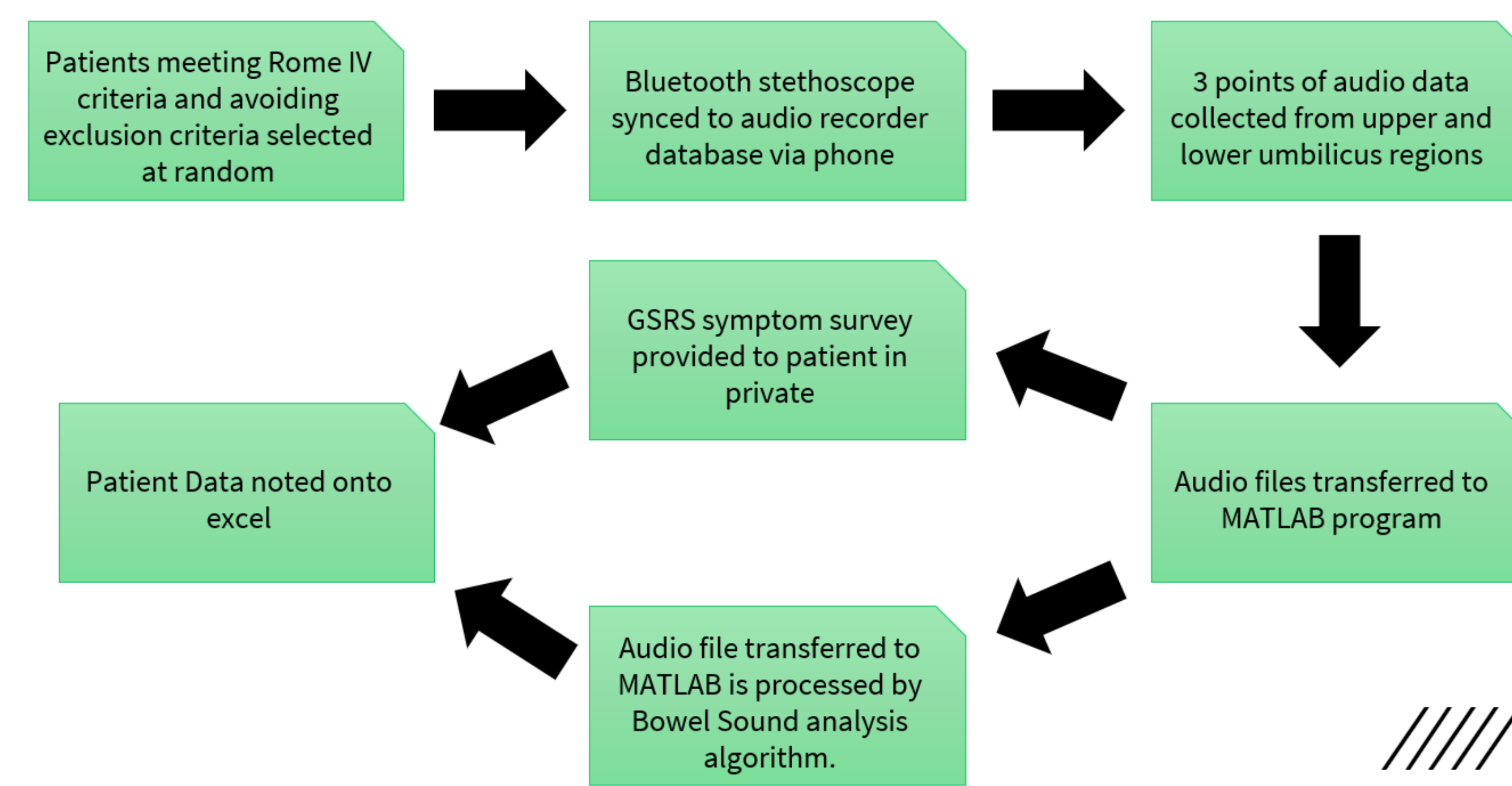
IBS is an enteric nervous system dysregulation that causes diarrhea, abdominal pain, bloating, and constipation. Prior investigation has suggested that a key contributory factor of IBS symptom severity is the overgrowth of bacteria in the small intestine, due to bacterial dysbiosis. For this reason, co-relations between Lactulose Breath Tests and IBS severity are hypothesized. Currently, in the setting of an IBS flare, diagnoses is solely symptom driven. Using auscultated bowel sound analysis, we've objectively compared Bowel Sound scores to symptom survey-based quantification in 63 patients. Our results show a linear positive correlation with linear regression p value <0.0001 and $R^2 = 0.597$. A 3-way association test between positive LBT, BSA, and GRSR scores also revealed association of p value <0.001. Overall, point of care Bowel Sound Analysis(BSA) can serve as a non-invasive, cost effective, and time efficient diagnostic method for assessment and screening of IBS severity, and its further development can lead to new clinical findings and stratification of IBS.

INTRODUCTION

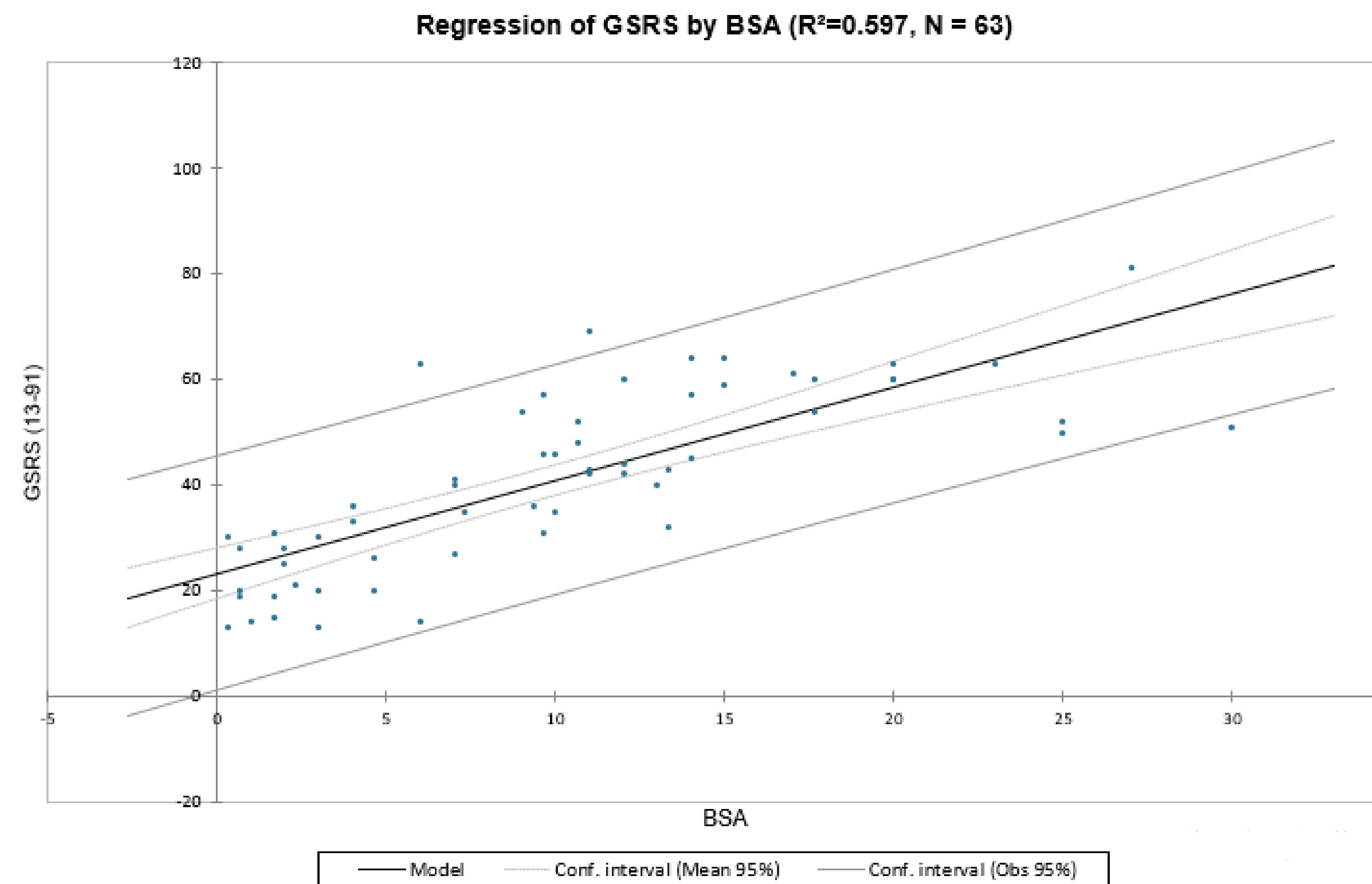
- Modern day algorithms for IBS diagnoses is primarily driven by patient testimony and symptom-based criteria. Given the functional nature of IBS and the subjective methods of its diagnoses, excess testing is often ordered.
- IBS is primarily a peristaltic dysfunction that greatly effects the patient's quality of life. The most accepted mechanism of pathology states that multifactorial environmental triggers can dysregulate normal enteric nervous system function.
- Prior studies have postulated the onset and severity of IBS is contributed by bacterial dysbiosis leading Small Intestinal Bacterial Overgrowth (SIBO), which is hypothesized to lead to changes in the bowel sound pattern.
- The Lactulose Breath Test is a well documented procedure that has been shown to significantly overlap with IBS diagnoses due to the disease's concurrence rate with SIBO. Our pilot investigation revealed a correlation between the intensity of bowel sounds to the symptom severity of IBS patients.
- Given the hypothesized mechanism of the BSA, investigating the concurrence between the Lactulose Breath Test and IBS symptom severity along with the intensity of the BSA would further elucidate the nature of the BSA as well as serve to expand the conclusions of the previous study.

METHODS AND MATERIALS

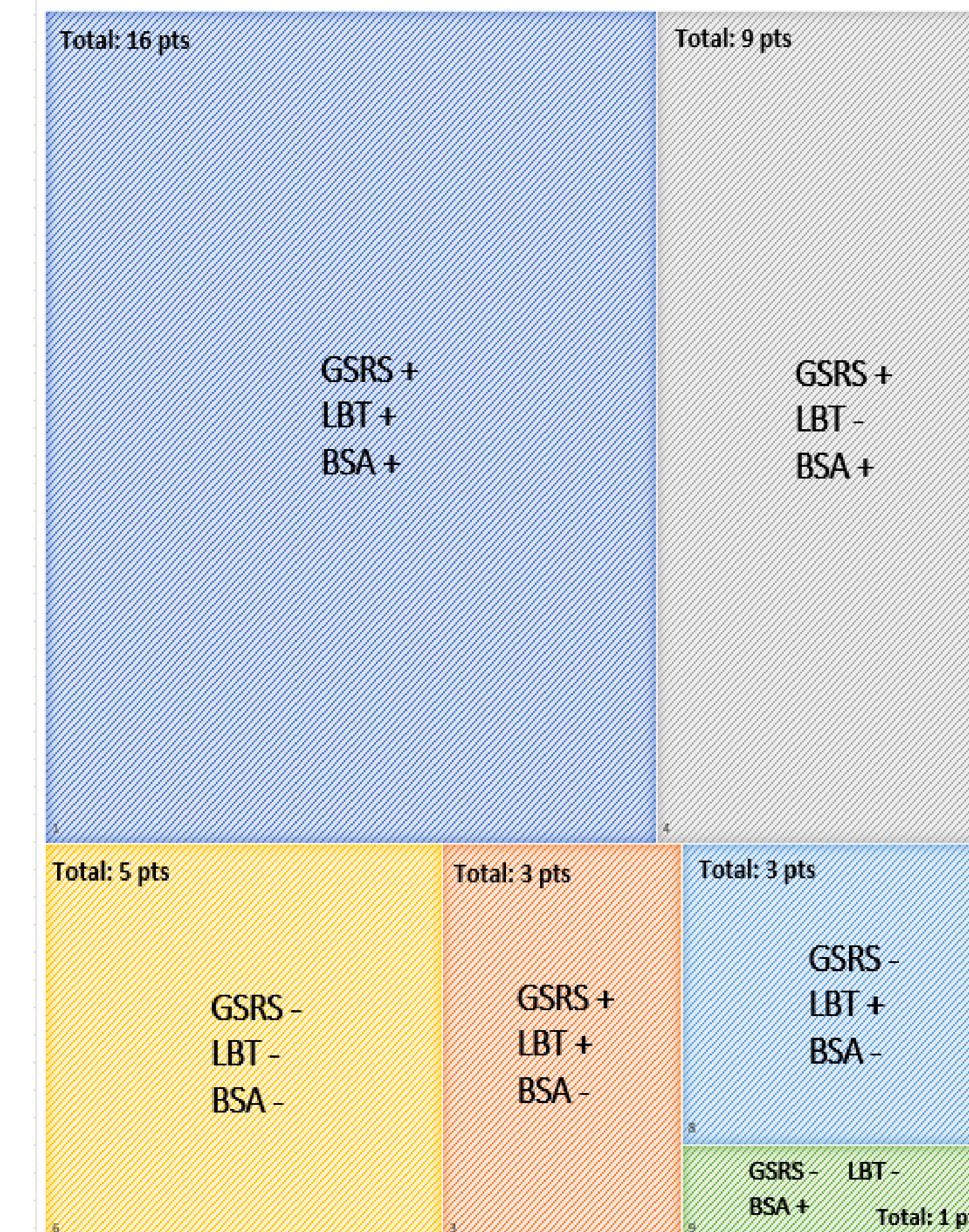
This study was a retrospective case control study. BSA data was collected using an electronic stethoscope and analyzed using a proprietary computer program. LBT data was collected using the Trio Smart™ Breath test. The Gastrointestinal Symptom Rating Scale collected patient reported IBS severity. For categorical binning, GRSR <35 and BSA<10 was considered positive for IBS flare up based on literature.



RESULTS



CATEGORIZING PATINETS RESPECTIVE TO THIER TEST RESULTS (N=37)



Bowel Sound analysis scores co-relate with IBS symptom severity

Based of the procedure followed, matching GRSR IBS symptom severity scores with the obtained BSA scores from the algorithm yields this scatterplot. Bi-variate ANOVA for regression showed a p value of <0.0001. Follow up Chi square analysis showed similar significance of association.

BSA, LBT, and IBS symptom severity show 3-way significance in association

With the cutoffs to determine flare up status in an IBS patient, BSA and GRSR scores can be segmented into categorical variables with each patient having tested either positive or negative for each procedure.

A Chi Square test of association between the 3 variables yielded significant results with a P value <0.001 only studying the 3-way interaction of BSA-LBT-GRSR. A log linear regression showed similar results. Amongst patients that reported higher GRSR scores, it was shown that around 67% of patients tested positive for the LBT.

DISCUSSION

- In this study, we ascertain the validity of the correlation of IBS symptom severity to the magnitude of the BSA score, as well as show a 3-way correlation described by the BSA, LBT, and symptom severity.
- While the link between IBS and SIBO is still being investigated, there is evidence to show significant overlap in disease progression. Based on previous literature, around 50-70% of IBS patients develop SIBO. These observations could suggest an association of pathology.
- Correlation scores between the GRSR/BSA to GRSR/LBT also suggest that other intestinal noises may contribute to the BSA other than bacterial metabolism. This claim, however, needs further investigation.
- The significance of overlap between all 3 criteria does further support the notion that the BSA can detect dysbiosis of bacterial microbiome into the jejunum and ileum.
- A cohort study of the BSA between pre and post treatment group patients would need to be done to provide evidence for causality.
- If validated, the BSA could provide clinicians with objective markers to ascertain the diagnoses of IBS and response to therapy.

CONCLUSIONS

With further research, The point of care application of BSA, and its non-invasive, cost-effective, and time-efficient nature may allow it to serve as an adequate screening procedure to help evaluate and begin diagnostic workup for undiagnosed IBS patients.

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