TITLE: STOOL CHARACTERISTICS MEASURED BY SMARTPHONE APPLICATION ARTIFICIAL INTELLIGENCE AND BY PHYSICIAN SCORES CORRELATE WITH C-REACTIVE PROTEIN AMONG INPATIENTS WITH ACUTE SEVERE ULCERATIVE COLITIS: A PILOT STUDY

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ABSTRACT BODY:

Background: Patients with ulcerative colitis (UC) are often asked to visually assess stool characteristics as a measure of disease activity. However, stool characteristics have not been validated against objective inflammation. A previous study found that trained artificial intelligence (AI) via smartphone application can measure certain stool characteristics in patients with irritable bowel syndrome. We aimed to determine whether stool characteristics measured by AI and physicians correlate with inflammation in UC.

Methods: Patients hospitalized with acute severe ulcerative colitis (ASUC) were asked to capture images of all bowel movements (BMs) using a smartphone application (Dieta®). Validated AI was used to measure stool characteristics, including Bristol stool scale, consistency, edge fuzziness, fragmentation, and volume. Additionally, four physicians, including an inflammatory bowel disease specialist, scored each image for blood amount, mucus amount and whether stool was in a toilet or commode. Serum CRP was measured daily, and each BM was associated with a CRP value obtained within 12 hours of the BM. AI measurements and mean physician scores were rank normalized and correlated with rank normalized CRP values using mixed linear regression models. We also used Mann-Whitney tests to compare median CRP values of images with and without mucus.

Results: We analyzed 151 stool images collected from five patients admitted with ASUC (mean age 42 years, 40% male). 53 images were capture in a toilet, 52 images were in a bedside commode, and 46 were in a commode but were somewhat obscured by urine. Overall, Bristol stool scale and fragmentation positively correlated with CRP ($p=0.026$ and 0.049), while consistency negatively correlated with CRP ($p=0.047$). Volume, edge fuzziness, mucus amount and blood amount did not correlate with CRP. When analyzing toilet images alone, Bristol and consistency correlations remained significant ($p= 0.024$ and 0.038), but these correlations were not seen when analyzing unobscured commode images alone. The median CRP of images with mucus was higher than that of images without mucus ($p= 0.011$).

Conclusions: Smartphone application AI measurements of Bristol stool scale, stool consistency, and stool fragmentation significantly correlate with CRP values in hospitalized patients with ASUC. Additionally, median CRPs are higher when mucus is seen. Further training of smartphone-based AI algorithms to validate the association of stool characteristics with objective inflammation may yield a novel, non-invasive tool for UC disease monitoring. Future studies in larger populations are warranted.

Table 1) P-Values Obtained by Mixed Linear Regression Models of CRP versus Stool Characteristics

	P-Value						
	Bristol	Consistency	Fragmentation	Edge Fuzziness	Volume	Mucus Amount	Blood Amount
All Images (n = 151)	0.0257*	0.047*	0.0497*	0.116	0.983	0.195	0.540
Toilet (n = 53)	0.0241*	0.0375*	0.0865	0.221	0.673	0.731	0.471
Commode (n=52)	0.913	0.898	0.721	0.675	0.391	0.569	0.551

*Represents statistically significant p-value

Figure 1)