## Urinary Volatile Organic Compound Testing in Fast-Track Patients with Suspected Colorectal Cancer

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**Abstract**: Background: Colorectal symptoms are common but only infrequently represent serious pathology, including colorectal cancer (CRC). A large number of invasive tests are presently performed for reassurance. We investigated the feasibility of urinary volatile organic compound (VOC) testing as a potential triage tool in patients fast-tracked for assessment for possible CRC. Methods: A prospective, multi-centre, observational feasibility study was performed across three sites. Patients referred on NHS fast-track pathways for potential CRC provided a urine sample which underwent Gas Chromatography Mass Spectrometry (GC-MS), Field Asymmetric Ion Mobility Spectrometry (FAIMS) and Selected Ion Flow Tube Mass Spectrometry (SIFT-MS) analysis. Patients underwent colonoscopy and/or CT colonography and were grouped as either CRC, adenomatous polyp(s), or controls to explore the diagnostic accuracy of VOC output data supported by an artificial neural network (ANN) model. Results: 558 patients participated with 23 (4.1%) CRC diagnosed. 59% of colonoscopies and 86% of CT colonographies showed no abnormalities. Urinary VOC testing was feasible, acceptable to patients, and applicable within the clinical fast track pathway. GC-MS showed the highest clinical utility for CRC and polyp detection vs. controls (sensitivity=0.878, specificity=0.882, AUROC=0.884). Conclusion: Urinary VOC testing and analysis are feasible within NHS fast-track CRC pathways. Clinically meaningful differences between patients with cancer, polyps, or no pathology were identified therefore suggesting VOC analysis may have future utility as a triage tool. Acknowledgment: Funding: NIHR Research for Patient Benefit grant (ref: PB-PG-0416-20022).

**Keywords :** colorectal cancer, volatile organic compound, gas chromatography mass spectrometry, field asymmetric ion mobility spectrometry, selected ion flow tube mass spectrometry

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