Integrating Artificial Intelligence with Clinical Dashboards to Measure Screening Colonoscopy Quality Indicators for Large Health Systems

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Introduction: High quality colonoscopy is the hallmark of effective colorectal cancer (CRC) screening. Despite a national focus on colonoscopy quality, measuring quality indicators (QIs) is labor-intensive and often done inconsistently. We previously developed and validated a natural language processing (NLP) algorithm that automates the extraction and reporting of colonoscopy QIs in our health system. In this quality initiative, we used these NLP-derived QI measures to build a clinical dashboard that tracks real-time colonoscopy QI data.

Methods: The setting for this study is a large academic health center with a defined primary care population, robust referral-based care, and 6 outpatient endoscopy facilities that perform over 17,000 screening colonoscopies annually. In prior work we developed, validated, and integrated into our health system an NLP algorithm that utilizes machine learning to identify, extract and structure data from free-text electronic health record colonoscopy and pathology reports. These data enable real-time measurement of colonoscopy QIs, based on the 2015 ASGE/ACG colonoscopy quality indicator recommendations. For this quality improvement initiative, we held interdisciplinary meetings to discuss dashboard content and formatting for optimal QI information dispersion. The dashboard currently consists of five QIs measured across all screening/surveillance colonoscopies performed at our institution: documentation of colonoscopy indication (IND), cecal intubation (CI), documentation of bowel preparation (BP), adequate bowel preparation (ABP), and adenoma detection rate (ADR; by institution, provider, and patient sex). ASGE/ACG performance goals for each QI are indicated as benchmarks. The dashboard excludes colonoscopists who performed <20 colonoscopies per year.

Result: The figure shows a snapshot of the colonoscopy QI clinical dashboard for the period between 1/1/2022 and 09/30/2022. In that period, there were 12,903 colonoscopies performed for 12,792 patients. Patients were 52.2% female and 48.2% non-White, and mean age was 56.4 ± 8.51 (**Table**). Mean health system performance was: 100% for IND, 100% for CI, 100% for BP, 97.9% for ABP, 30.5% for female ADR, and 43.0% for male ADR. All five measured institutional QIs exceeded ASGE/ACG performance goals. In all, 94.1% of providers met the ASGE/ACG male ADR, and 84.3% of providers met the ASGE/ACG female ADR goal. (**Figure**)

Conclusion: We successfully developed a real-time clinical dashboard that allows for accessible visualization and regular feedback of screening colonoscopy quality. The dashboard will be used to identify underperforming colonoscopists, help assess whether future interventions are needed, and allow for convenient evaluation of those interventions. Future development will include indexing pre-procedural and post-procedural QIs in the dashboard.

Figure: Snapshot of the UCLA Health Colonoscopy Quality Indicators Clinical Dashboard

Table: Snapshot population: patients aged 45-75 years with at least one screening/surveillance colonoscopy performed at UCLA Health between 1/1/2022 to 9/30/2022; n=12792 patients (12,903 colonoscopies)

Demographics	**n (%) or mean (SD)**
Mean Age	56.4 (8.51)
Gender	
Male	6,111 (47.8)
Female	6,681 (52.2)
Race/Ethnicity	
Non-Hispanic White	6,630 (51.8)
Non-Hispanic Black	789 (6.2)
Hispanic	1,418 (11.1)
Non-Hispanic Asian	1,840 (14.4)
Non-Hispanic Other*	754 (5.9)
Unknown or Declined to Answer	1,361 (10.6)
*Non-Hispanic Other includes American Indian or Alaskan Native, Native Hawaiian or Pacific Islander, null, and other race categories.