Method to Derive a Modified Mayo Score from Electronic Health Records Data

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Background

The modified Mayo Score (MMS), which consists of stool frequency, rectal bleeding, and endoscopic subscores, is the most commonly used method for measuring disease activity in Ulcerative Colitis (UC) patients. It is a standard outcome measure in clinical trials and is recommended as a clinical trial endpoint by the US Food and Drug Administration. Each component has a score from 0-3; the total MMS ranges from 0 to 9. MMS is infrequently recorded in routine care, in part because it requires an endoscopic assessment. Real world data, including electronic health record (EHR) databases, are useful for studying longitudinal disease and treatment outcomes, but most EHR databases do not include Mayo scores. Building off the methods described by Rudrapatna et al., 2021[1], we calculated a derived MMS using data elements available in EHRs.

Objective

To derive longitudinal modified Mayo scores using data elements routinely reported in EHRs.

Methods

Data Source
Data were derived from the OM1 PremiOM™ UC Dataset (OM1, Boston, MA), a multisource real-world database with linked healthcare claims and EHR data on US patients with UC (2013-present).

Score Derivation
Each of the three subscores were extracted from clinical notes and endoscopy reports, either by automated natural language processing methods or by abstraction by a trained medical abstractor. Rectal bleeding and stool frequency scores occurring within 4 months before or up to 1 month after the endoscopic score were combined to calculate a MMS. Multiple MMSs could be calculated for each patient, but each component score could contribute to only one MMS.

Results

Among 14,105 UC patients, only 31 had a full Mayo score recorded in their notes, and 1 had a MMS recorded. After applying the above algorithm, we were able to calculate 1,006 derived MMSs for 639 patients. 198 patients had > 1 score available. **Figure 1** shows the distribution of derived MMSs. Patients with a MMS were younger and more likely to be Asian, less likely to be Black, and more likely to be treated with biologic compared with those who could not have a MMS calculated **(Table 1).** Mean MMS was lower after a biologic treatment was initiated **(Table 2).**

Conclusions

- A derived MMS can be calculated from data that may be recorded in the patient's medical record.
- Further work to validate these measures against a gold standard should be considered but was not feasible in the OM1data set due to the paucity of observed Mayo scores in EHR data.
- Increased emphasis on standardized collection of relevant information in EHR systems would further improve the availability of derived MMSs.
- The population for which a MMS can be derived may have more severe disease and more frequent interactions with the healthcare system as evidenced by higher proportion of patients prescribed biologic therapies.
- MMSs can be derived and used to describe UC patients and could potentially be used to study longitudinal changes in patient disease status and treatment effectiveness in settings where observed scores are not available.

Figure 1. Distribution of Derived Modified Mayo Scores (N=1,006).

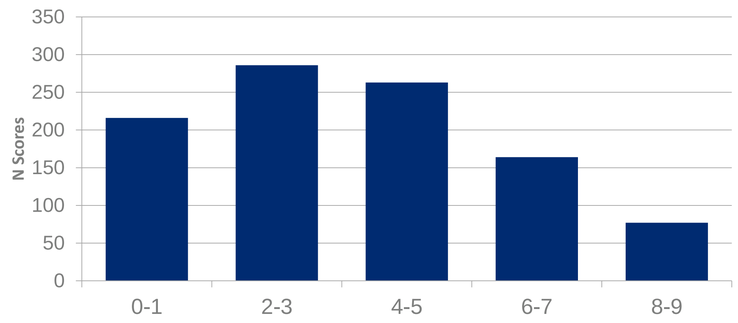

Table 1. Characteristics of Patients With and Without a Derived MMS.

	Derived MMS (N = 693)	No MMS (N = 13,407)
Age, years (mean, SD)	42 (17)	48 (17)
Sex (% female)	369 (53.2%)	7,629 (56.9%)
Race		
White	436 (62.9%)	9173 (68.4%)
Black	22 (3.2%)	809 (6.0%)
Asian	52 (7.5%)	300 (2.2%)
Other	101 (14.6%)	874 (6.5%)
Unknown	82 (11.8%)	2251 (16.8%)
Treated with biologic (ever)	393 (56.7%)	3,625 (27.0%)
Treated with corticosteroids (ever)	547 (78.9%)	10,051 (75.0%)
Treated with mesalamine (ever)	377 (54.4%)	6,458 (48.2%)

Table 2. Characteristics of Patients with a Derived MMS.

	Derived MMS (mean, SD)
Fecal calprotectin*	
<250 (n=73)	4.1 (1.8)
≥250 (n=96)	5.1 (1.5)
UC Extent	
Proctitis, only (n=78)	3.1 (2.3)
Left-sided colitis (n=48)	3.6 (2.4)
Pancolitis (n=96)	3.4 (2.5)
MMS within 30 days before first biologic record (n=60)	5.6 (1.7)
MMS in the 0-360 days after first biologic record (n=134)	4.3 (2.4)

*within 30 days of MMS

Conference
Presented at Crohn's and Colitis Congress. January 19, 2023. Denver, CO, USA

References
1.Rudrapatna, V.A., B.S. Glicksberg, and A.J. Butte, *Utility of routinely collected electronic health records data to support effectiveness evaluations in inflammatory bowel disease: a pilot study of tofacitinib.* BMJ Health Care Inform, 2021. **28**(1).

Disclosures
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