Characterization of the Clinical Impact of a Celiac Disease Algorithm on Diagnostic Workup of Patients at Beaumont Hospital Royal Oak

OAKLAND UNIVERSITY WILLIAM BEAUMONT

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Introduction

Advancements in medical technology and laboratory testing have changed the landscape of diagnostic medicine. These changes have prompted room for more accurate diagnostic procedures while also serving as opportunities for increases in errors, costs, and speed. One growing perspective towards improving medical efficiency is to shorten the time to diagnoses, as the costs may be less than expensive treatments for late-stage diseases down the line (2). A growing idea towards improving the efficiency in hospitals is by using a method called a Diagnostic Management Team (DMT). DMTs are essentially an assembly of cross-disciplinary physicians that can collectively approach patient diagnoses based on standard operating protocols (SOP). With DMTs in mind, algorithmic approaches towards diagnosis are necessary frameworks that should be further elucidated for different complex disorders. Algorithms have been available from different organizing bodies such as the American College of Gastroenterology, and specific hospitals have accepted algorithms as well such as Mayo Clinic.

Celiac Disease is an gastrointestinal autoimmune disorder that is clinically and diagnostically challenging. The differential diagnosis can be quite wide between different inflammatory disorders that impact the duodenum, leading to diarrhea, steatorrhea, and malnutrition. Currently, physicians use the following group of highly sensitive and specific serological assays, Endomysial Antibody (EMA), tissue transglutaminase (TTG), and Deamidated Gliadin peptide (DGP) (1). With these in mind, the gold standard is a duodenal biopsy via esophagogastroduodenoscopy (EGD), histologically confirming the disorder. Misinterpretations or negative results of the antibodies can elongate the time to diagnosis for patients, leading to potentially worse outcomes and poor quality of care for patients with Celiac Disease. Our goal with this pilot study is to understand how Beaumont Health approaches Celiac Disease serology testing, and whether they interpret these results efficiently and if they can be streamlined with the implementation of an algorithmic approach to serologic testing and biopsy.

Aims and Objectives

Aim I: Statistically compare the antibody ordering profile of patients suspected of celiac disease, stratified by a positive or negative screening test, and compare to the expected orders from an algorithmic based on an approach from Mayo Clinic.

Objective I: Perform a retrospective chart review, based on patients at Beaumont Hospital in Royal Oak, who were screened for celiac disease (by IgA tTG) and received a EGD duodenal biopsy.

Methods

A retrospective review of patients performed (approved by BH-IRB) on those who were seen in Beaumont Health-Royal Oak (BH) and were suspected of Celiac Disease and tested for by a biopsy.

1. Initial pool included over 12,000 total patients in 2020 who had ICD 10 codes for EGD duodenal biopsies and celiac disease screening, thus they were suspected of celiac disease and screened via IgA tTG antibody test. From this pool, 100 were randomly collected and analyzed, 94 used for analysis (6 lost to privacy), all age greater than or equal to 18.
2. The data collected includes: serological testing including Endomysial Antibody (EMA), tissue transglutaminase IgA (tTG IgA), and IgA antibody to Deamidated Gliadin peptide (DGP IgA). The dates for which they were ordered, lab values acquired, age, sex, will be collected.
3. Analysis consisted of comparing the ordering routes for these 94 patients, with what would have transpired with the use of the adopted algorithm based on Mayo Clinic.
4. Statistical analysis includes chi-square testing, comparing the qualitative effect that using an algorithm has on the number of orders placed for each individual test
    1. The following test groups are stratified in the graph and table below:
        1. EGD Duodenal Biopsy, IgG tissue transglutaminase antibody (IgG TTG), IgA/IgG Deamidated Gliadin Peptide antibody (DMD or DGP), IgA endomysial antibody (EMA). Male and Female subjects were also stratified for comparison.

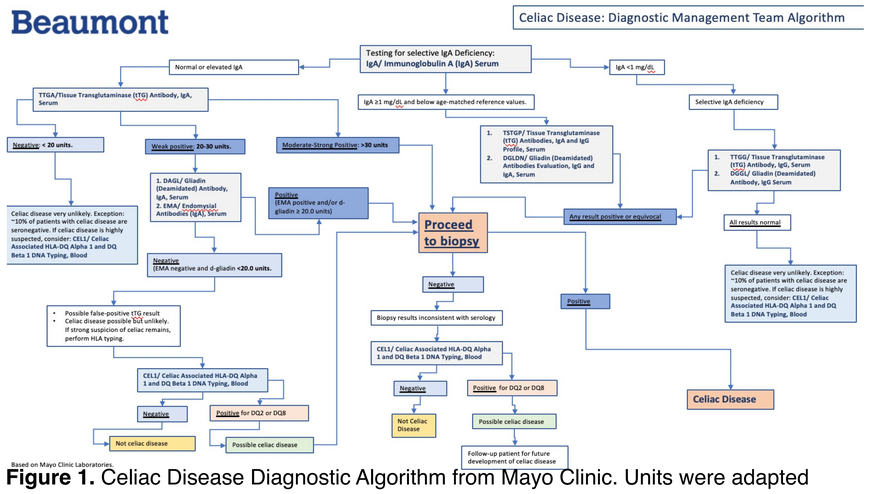

Figure 1. Celiac Disease Diagnostic Algorithm from Mayo Clinic. Units were adapted for Beaumont Laboratory values for each test.

Results

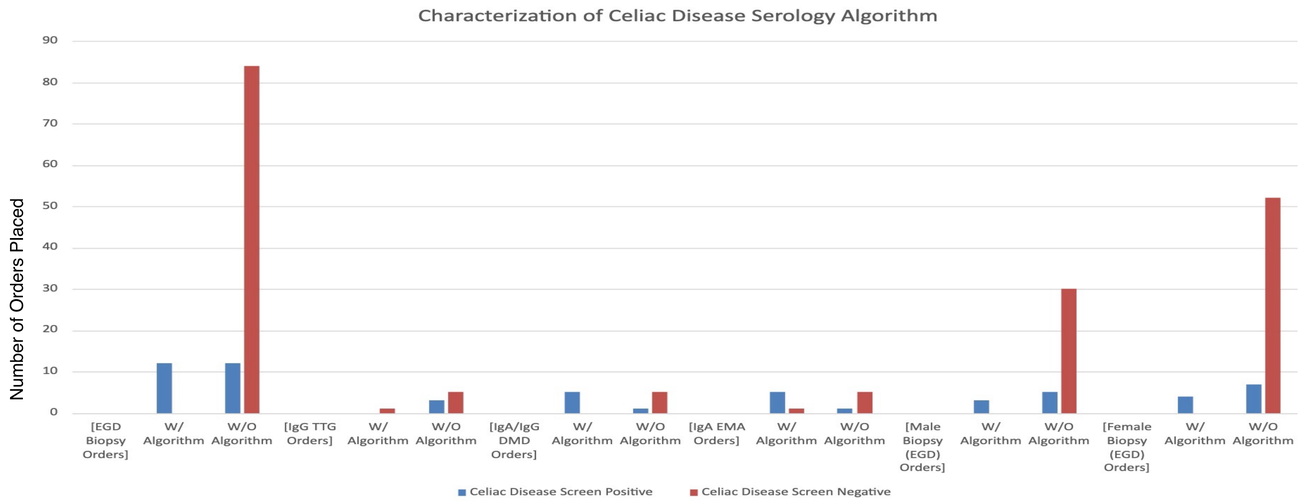

Figure 2A. Graph comparison of each order for patients positive and negative for celiac disease screen.

Table Demonstrating Statistically Qualitative Effect of Algorithmic Serologic Ordering

Labels:	Celiac Disease Screen Positive	Celiac Disease Screen Negative	P-Values
[EGD Biopsy Orders]			7.36E-34
W/ Algorithm	12	0	
W/O Algorithm	12	84	
[IgG TTG Orders]			0.45325
W/ Algorithm	0	1	
W/O Algorithm	3	5	
[IgA/IgG DMD Orders]			0.005712
W/ Algorithm	5	0	
W/O Algorithm	1	5	
[IgA EMA Orders]			0.0209
W/ Algorithm	5	1	
W/O Algorithm	1	5	
[Male Biopsy (EGD) Orders]			0.0004742
W/ Algorithm	3	0	
W/O Algorithm	5	30	
[Female Biopsy (EGD) Orders]			7.01E-06
W/ Algorithm	4	0	
W/O Algorithm	7	52	

Figure 2B. Numerical representation and statistics demonstrating impact of algorithm on each order placed for patients suspected of celiac disease, separated by result of screen. Of note, screen sensitivity was 67% for this patient pool of 94, and specificity of 100%

Conclusions

Based on the findings in this pilot study, it is clear that an algorithmic approach can have statistical differences with regards to serology ordering and biopsy via EGD. However, it is important to note, that many of the patients who incorrectly received EGD biopsies based on the algorithm, did in fact not have celiac disease, however, other disorders were uncovered that necessitated an eventual EGD. Of note, an algorithm would prove more useful to reduce unnecessary ordering of serologies in patients that have low suspicion of celiac disease, given a negative initial screening test. Furthermore, this study suggests that an algorithm may not be sufficient to safely reduce all biopsy procedures, however, can be an useful aid in the clinical decision making for providers to avoid unnecessary antibody orders and biopsies.

References

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