

Case Report

Trends in Follow-Up Liver Chemistry Testing: A Retrospective Cohort Study

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ABSTRACT

Bili, AST, ALT, ALP commonly appears in primary care. This retrospective cohort study evaluated repeat testing for patients with abnormal liver tests seen in an academic, internal medicine clinic between 2007 and 2016. Data come from the the Clinical Data Warehouse (CDW) at the Medical University of South Carolina (MUSC)Primary care clinicians frequently encounter abnormal liver test results, but fewer patients appear to obtain repeat testing.

Keywords: Health services research; Primary care; Medical decision making

Introduction

Abnormal liver chemistry tests, including total bilirubin (Bili), aspartate aminotransferase (AST), alanine aminotransferase (ALT) and alkaline phosphatase (ALP), commonly appear in primary care. Responses to abnormalities vary, though many guidelines recommend repeating the tests as a first step [1-3]. Previous work with abnormal liver tests identified the year of the initial abnormality as a key variable associated with patients obtaining repeat testing [4]. To examine if proportions of patients receiving follow-up liver tests in response to abnormalities have changed over time, we performed a cross-sectional study in a primary care practice. Based on our prior observations, we hypothesized that over the past 10 years, more patients with abnormal liver tests do not receive a repeat assessment.

Methods

This retrospective cohort study evaluated repeat testing for patients with abnormal liver tests seen in an academic, internal medicine clinic between 2007 and 2016. Data come from the Clinical Data Warehouse (CDW) at the Medical University of South Carolina (MUSC). All liver test results during this study period were collected and analyzed. All laboratory results from the study period were originally viewed by clinicians via electronic platform, and data from 2012 to 2016 comes from the fully integrated electronic health record (EHR, Epic © Systems Corporation, WI), which allowed clinicians to also communicate electronically and order follow-up testing. The MUSC inpatient, outpatient and emergency room (ER) settings shared these systems. Neither system interfaced with records external to

MUSC. Liver tests were deemed abnormal if values exceeded the upper limit of normal (ULN) reference range: Bili>1.2 mg/dL, AST>34 IU/L, ALT>45 IU/L and ALP>150 IU/L. Patients met cohort inclusion by possessing at least 1 abnormal liver test and visiting the clinic on at least 2 occasions during the study period. Patients were followed from cohort entry (first abnormal liver test) until 2016. Patients with initial abnormalities after the year 2014 were censored to allow for 24 months of follow-up. The outcome of interest was the presence of a repeat liver test following the first abnormal. Other variables include the degree of liver test elevation (compared to the ULN) and the year of the index abnormality. The degree of elevation was based upon the single liver test most elevated relative to the reference range and categorized into mild (1-2 X ULN), moderate (2-4 X ULN) and severe (>4 X ULN) abnormalities. Proportions of patients receiving repeat testing were calculated by year of index abnormality. Follow-up was calculated at 3, 6, 12 and 24 months and by the end of the study period.

Results

A total of 30,518 unique patients received care in the outpatient clinic between 2007 and 2016 and 11,790 (39%) of these patients had at least one abnormal liver chemistry test. Of those, 9,545 patients met inclusion criteria. The majority of patients (82.6%, n=7,881) possessed mild abnormalities (1-2 X ULN), while 11.9% (n=1,137) and 5.5% (n=527) possessed moderate (2-4 X ULN) and severe (>4 X ULN) abnormalities, respectively. Overall, 1,130 (12%) did not have follow-up LFTs by the conclusion of the study period. Figure 1 depicts the proportion of patients receiving repeat testing for different time periods. These trends persisted for all degrees of abnormality (except for 3 month follow-up for severe abnormalities on account of limited sample size).

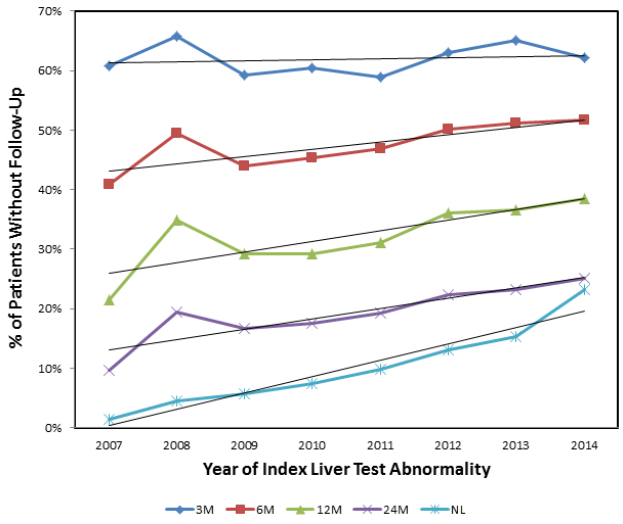

Figure 1: Proportion of patients without repeat liver chemistry testing, by year of initial abnormality.

Follow-up is defined as having a set of repeat liver tests by the end of a given time period, including 3 months (3M), 6 months (6M), 12 months (12M), 24 months (24M) and the entire study duration (NL)

ULN: Upper Limit of Normal

Discussion

The proportion of patients without repeat liver chemistries in response to initial abnormalities increased over the course of the past decade and multiple factors may play a role in this observed trend. From the physicians perspective, influences such as EHR-related alert fatigue, changes in practice patterns (i.e., liver test monitoring with statin prescribing) and increased emphasis on cost conscious care (not testing further or opting for directed testing in lieu of confirmation) may contribute to reductions in repeat liver testing. Patient factors also warrant investigation, as patient issues with cost and access affect lab testing. Health system challenges including EHR interoperability and care fragmentation may also contribute.

From the perspectives of diagnosis and quality, this trend in repeat testing merits attention. With the burden of non-alcoholic fatty liver disease (NAFLD) rising in step with the escalating incidence of obesity, diabetes and hypertension in the United States, abnormal liver chemistries can often provide an important signal indicating the presence of disease [5]. Also, the advent of curative therapies for Hepatitis C virus (HCV) heightens the need to diagnose those patients falling outside general screening recommendations, as abnormal liver tests can suggest the presence of chronic viral hepatitis [2]. Further investigation into abnormal liver test follow-up strategies for these two clinical entities merits study to ensure patients do not endure missed or delayed liver disease diagnoses.

Conclusion

Primary care clinicians frequently encounter abnormal liver test results, but fewer patients appear to obtain repeat testing. Whether or not this finding correlates with less follow-up or the employment of other, more focused, diagnostic strategies warrants further study.

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PRIOR PRESENTATIONS

This data, in this form, has not been presented previously.

CONFLICTS OF INTEREST

There are no conflicts of interest to report.

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