A Significant Reduction in Overtesting For Liver Disease with an Electronic Decision Support Tool That is Generalizable to Other Settings

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Problem:

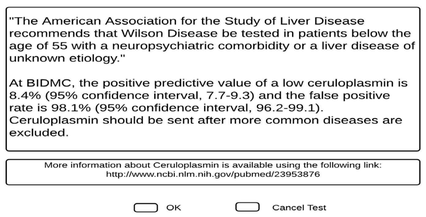
- Over testing is a source of significant healthcare costs, both in terms of dollars spent and the false-positives generated.
- An important source of over testing is the non-directed testing common to the evaluation of liver disease.
- We previously found that BIDMC clinicians were routinely testing for Wilson Disease (WD) using a serum protein level called ceruloplasmin at the same time as common liver disease like viral hepatitis. WD is very rare while viral hepatitis is common. We published these results in 2013.
- Society guidelines suggest testing for WD with a ceruloplasmin level after more common liver diseases have been excluded and, owing to the rarity of late-onset WD, rarely testing patients older than 55 years old

Aim/Goal:

- To reduce the rate of ceruloplasmin testing in patients who are also tested for viral hepatitis and those older than 55 years of age.

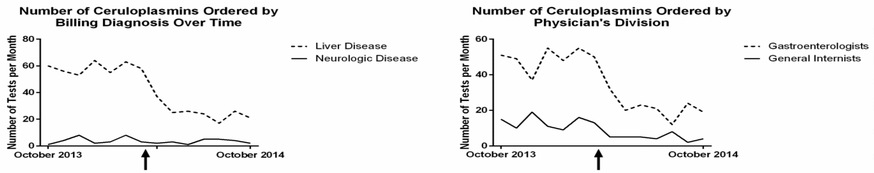
Description of the Intervention

- Decision support tool to provide local ceruloplasmin test characteristics as an interrupting screen for clinicians wishing to order a ceruloplasmin through OMR or POE. Launched May 2014
- Measurement: Assess rate of orders as well as orders simultaneous with viral hepatitis tests and in patients older than 55. Compare 7 months pre and post intervention. We also tracked the indications for the test as well as the division of the ordering clinician.

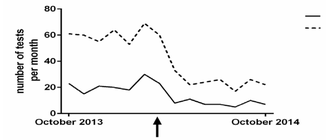


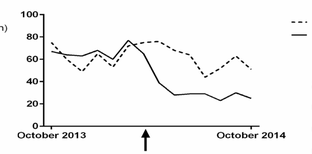
Clinic here to learn more about the development of this intervention

Results/Findings to date:



The number of tests ordered over time is depicted by billing diagnosis (left) and physician's division (right). The frequency of ceruloplasmin orders for liver disease indications and by gastroenterologists decreases substantially following the deployment of the intervention. The arrow indicates the start of the intervention.





LEFT: The clinician's response to the intervention is depicted according to the number tests ordered for patients > 55 years old and for patients simultaneously tested for viral hepatitis (B or C). These data show that the number of tests with both characteristics dropped substantially.
RIGHT: Alpha-1 Antitrypsin is a rare disease that is often ordered to evaluated at the same time as WD. While the number of ceruloplasmin tests decreased, the number of alpha-1 antitrypsin tests did not.

Click here for more results!

Key Lessons Learned

- A simple decision tool can reduce testing over-utilization for a common clinical scenario.
- Clinicians respond to interventions that educate that are associated with an interruption in their workflow
- This intervention reduced costs and by reducing over testing, minimized false positive

Next Steps

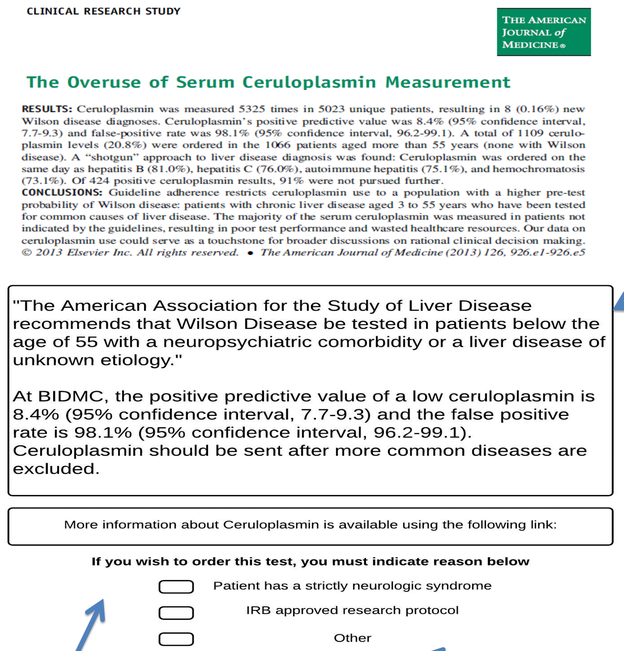
- Disseminate this knowledge as it has implications for other fields where non-directed testing is frequent (rheumatology) or over testing is routing (e.g. daily blood counts on inpatients)
- Liaise with other divisions to develop a similar strategy for other tests

For More Information, Contact Elliot B. Tapper; etapper@bidmc.harvard.edu

The intervention

We originally studied the pronlem and found that ceruloplasmin was overused

We sought to created an intervention that would interrupt workflow with information about the guidelines and local data.



CLINICAL RESEARCH STUDY

THE AMERICAN JOURNAL of MEDICINE®

The Overuse of Serum Ceruloplasmin Measurement

RESULTS: Ceruloplasmin was measured 5325 times in 5023 unique patients, resulting in 8 (0.16%) new Wilson disease diagnoses. Ceruloplasmin's positive predictive value was 8.4% (95% confidence interval, 7.7-9.3) and false-positive rate was 98.1% (95% confidence interval, 96.2-99.1). A total of 1109 ceruloplasmin levels (20.8%) were ordered in the 1066 patients aged more than 55 years (none with Wilson disease). A "shotgun" approach to liver disease diagnosis was found: Ceruloplasmin was ordered on the same day as hepatitis B (81.0%), hepatitis C (76.0%), autoimmune hepatitis (75.1%), and hemochromatosis (73.1%). Of 424 positive ceruloplasmin results, 91% were not pursued further.
CONCLUSIONS: Guideline adherence restricts ceruloplasmin use to a population with a higher pre-test probability of Wilson disease: patients with chronic liver disease aged 3 to 55 years who have been tested for common causes of liver disease. The majority of the serum ceruloplasmin was measured in patients not indicated by the guidelines, resulting in poor test performance and wasted healthcare resources. Our data on ceruloplasmin use could serve as a touchstone for broader discussions on rational clinical decision making.
 • *The American Journal of Medicine (2013) 126, 926.e1-926.e5*

"The American Association for the Study of Liver Disease recommends that Wilson Disease be tested in patients below the age of 55 with a neuropsychiatric comorbidity or a liver disease of unknown etiology."

At BIDMC, the positive predictive value of a low ceruloplasmin is 8.4% (95% confidence interval, 7.7-9.3) and the false positive rate is 98.1% (95% confidence interval, 96.2-99.1). Ceruloplasmin should be sent after more common diseases are excluded.

More information about Ceruloplasmin is available using the following link:

If you wish to order this test, you must indicate reason below

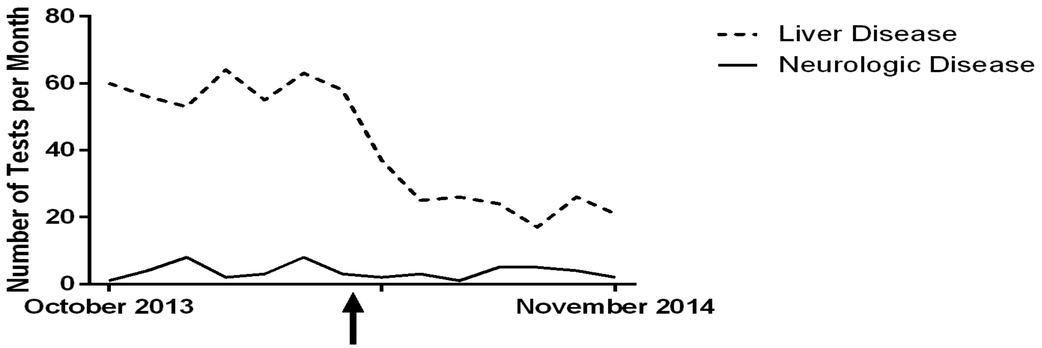
- ☐ Patient has a strictly neurologic syndrome
- ☐ IRB approved research protocol
- ☐ Other

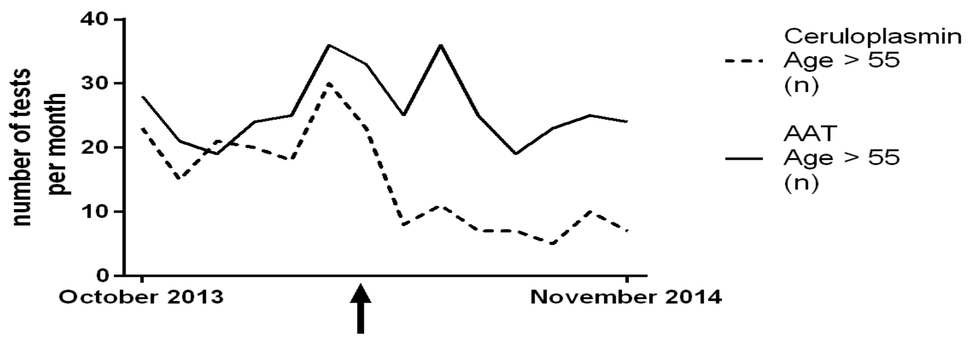
The AASLD guidelines suggest ceruloplasmin for patients with liver disease of unknown etiology for patients > 55 years old

We also wanted to know why clinicians were ordering the test

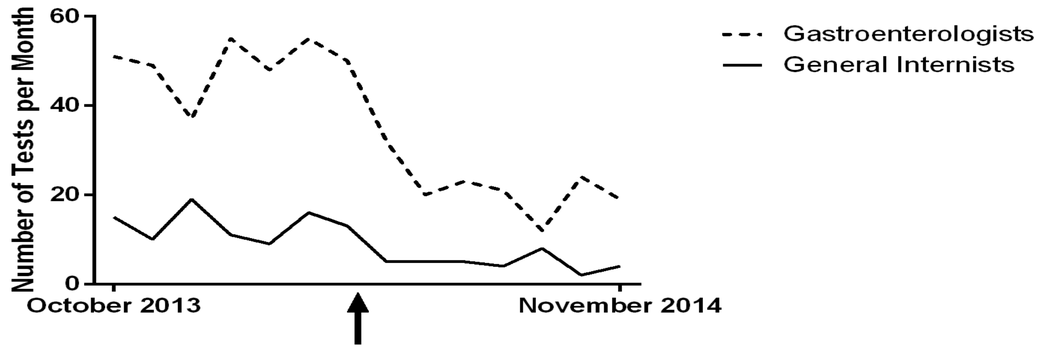
Unfortunately, our IS support lacks the capacity to store the indications provided for the test orders

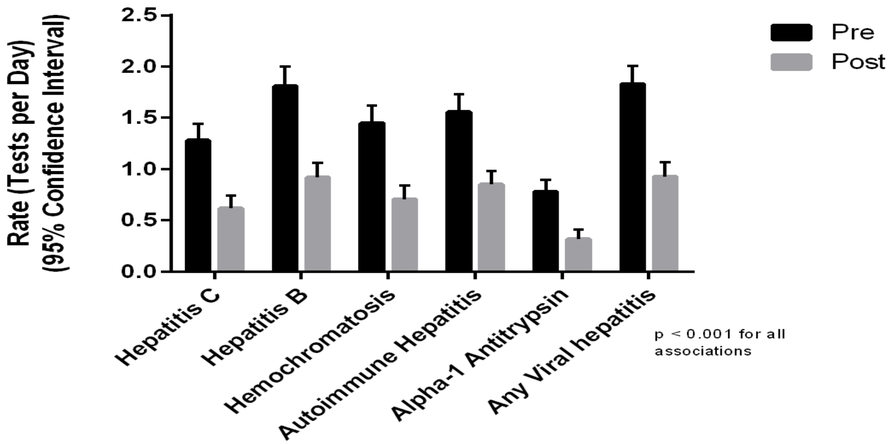
Number of Ceruloplasmins Ordered by Billing Diagnosis Over Time





Number of Ceruloplasmins Ordered by Physician's Division





The trends for decreased orders in patients > 55 years old are specific to ceruloplasmin (AAT = Alpha-1 Antitrypsin)

Non-directed testing was less frequent in the post-intervention period with much fewer simultaneous tests for other diseases with the ceruloplasmin order