

Changing Electronic Formats Is Associated With Changes in Number of Laboratory Tests Ordered

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The use of gamma glutamyl transferase (GGT) levels as a screening test for liver function is controversial.¹⁻³ Its main utility is in cases in which alkaline phosphatase is elevated, to differentiate between hepatobiliary or bone origin, but isoenzymes of alkaline phosphatase are more accurate in this case. It can also be used in patients with alcoholism to monitor alcohol intake and adherence to treatment regimens or to identify occult alcoholism. Many reasons exist for false-positive elevated GGT (it has very low specificity for liver disease), and in most cases, if the transaminases are not elevated, no serious liver problem is present. GGT is best used as a second-line laboratory test and not as a screening test. An isolated elevation of GGT does not need to be further evaluated unless the patient has additional clinical risk factors for liver disease.¹

Electronic health records (EHRs) can both help and harm the quality of healthcare. The ability to choose tests by marking them off on a computerized list has positive implications in saving time for the busy primary care physician. One does not need to search for the specific test or remember how it is spelled. On the other hand, making the decision too easy is likely to lead to the ordering of more tests than are actually needed. If tests are marked off without enough thought being given to the choices (eg, when they are presented in prespecified batches), physicians are very likely to order tests that are not especially useful. Overtesting can lead to overdiagnosis and down the line may cause overtreatment.

In Israel, EHRs have been used in health maintenance organizations (HMOs) for more than 20 years. Requests for laboratory tests are also computerized. In the Leumit HMO, which has 340 clinics distributed across Israel, there are 3 ways to find and mark laboratory tests to be ordered. The EHR has a first screen, which pops up when the laboratory function is accessed. This screen shows categories of commonly used laboratory tests (eg, blood chemistry, endocrinology, serology, urine analysis) that can be chosen one by one. To make the task easier for busy physicians, there are also several groups that can be marked as a batch, such as liver tests, lipid profile tests, kidney function tests, and tests used for following up the use of atypical antipsychotics. It is possible to choose only some of the included tests in the group, but it is easier to mark the whole

ABSTRACT

OBJECTIVES: To evaluate if changes in how laboratory test requests are presented in the electronic health record (EHR) would lead to less testing.

STUDY DESIGN: Computerized laboratory data were used to compare the numbers of tests ordered before and after each change was introduced.

METHODS: Leumit Health Services (a health maintenance organization [HMO] in Israel) has a central laboratory that serves HMO members in 340 clinics all over the country. We were able to compare the numbers of gamma glutamyl transferase (GGT) tests ordered during different periods of time during which the ways of presenting the parameters on the main laboratory screen of the EHR were changed.

RESULTS: A dramatic reduction in orders occurred when GGT tests could be ordered only by the search engine function, instead of being ordered from 2 other lists that appear on the main screen—from about 36,000 to about 1000 per month. When the GGT test option was added back to just 1 place on the main screen, the numbers jumped back to 18,000, and when GGT returned to its original place in all the lists, back to more than 35,000. Since then, the GGT test is available on the main screen only in the batch of liver tests.

CONCLUSIONS: A slight decrease in the convenience of ordering a laboratory test that is not indicated for routine screening led to a dramatic decrease in the number of test orders sent. Convenience is a positive thing when it saves precious time, but if it leads to overtesting, we shall not have gained much.

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TAKEAWAY POINTS

Preventing overdiagnosis is a major goal for healthcare providers. Although laboratory tests in the community are not necessarily expensive, they do add up and can cause overdiagnosis in the ambulatory setting. We found that a simple measure that reduced accessibility on the main screen of the electronic health record prevented physicians from routinely clicking to order gamma glutamyl transferase tests, and this led to a very significant reduction in the numbers of tests ordered. Such a measure is easily applicable to varied healthcare settings and can make a great difference in reducing related costs.

- ▶ Overtesting is prevalent in primary care.
- ▶ Avoiding this is feasible at the level of primary care.
- ▶ Workable solutions can be very simple.

group. At the bottom of the screen is a search function, which allows the physician to find any laboratory test done in the HMO by usual search methods. Although the groups and checklist are intended to make the physician's job easier (and they do), they also have the potential to lead to overtesting. When we analyze laboratory testing among groups of doctors, we find that too many physicians choose the whole group instead of clicking on each individual test as needed.

Some previous work has tackled this issue. In a study from Finland, blood tests considered to be of limited utility (erythrocyte sedimentation rate and aspartate transaminase) were made harder to find—by the researchers' estimates, an extra 4 to 8 seconds of work was needed to write the orders by hand—causing a decrease of 90% in the tests' ordering.⁴ In our HMO, a similar study was done when vitamin B₁₂, folic acid, and ferritin—which are considered second-line tests for the work-up of anemia—were removed from the main screen and available only via the search feature. Decreases of 31% to 41% were seen in the first month; they decreased further after the second month.⁵

In the largest HMO in Israel, a group of experienced, academically affiliated family practitioners and pediatricians took part in a pilot study.⁶ Liver tests were divided into 3 groups to be chosen as would fit a particular patient's situation: screening, further work-up, or full evaluation. Only the last included GGT. The pilot group showed a significant decrease in tests ordered—17%—versus an increase of 8.6% over the whole district.

This was a descriptive study in which we utilized a change in test presentation to observe the implications on numbers of tests. When some changes were made on the main laboratory screen that changed the accessibility of GGT testing over several months, we took the opportunity to analyze and describe what implications this would have on the numbers of tests ordered of this liver enzyme. We hypothesized that when physicians had access to the convenience of checking off GGT on the main screen, larger numbers would order the test, compared with decreased numbers when they would, less conveniently, have to search specifically for it.

METHODS

This was a descriptive study done in the Leumit HMO. Leumit has a central laboratory that serves the entire HMO all over Israel,

serving 340 branches in varied populations. We were able to compare the numbers of GGT tests ordered at different times during which the parameters were changed on the main laboratory screen of the EHR. Historically, GGT appeared in the "liver tests" on the main screen and also in the "general chemistry tests" as one of a long list, as well as via the search engine for laboratory test requests.

In April 2014, the laboratory decided to remove GGT from the main laboratory screen so that it could only be ordered if searched for specifically. When we realized this, we

undertook this study to see if behaviors would change as a result and gathered data. After 2 months, GGT was returned, at first partially, then completely to the original status, which enabled us to see the greater picture. At that point (June 2015), the laboratory decided to leave GGT as part of the liver tests batch but to remove it from the list under general chemistry tests. This is the situation today.

RESULTS

A dramatic decrease in orders occurred when GGT tests could be ordered only via the search engine function. The number of orders fell from about 36,000 to just over 1000 per month (a 97.3% reduction). When, a few months later, GGT was returned to 1 place on the main screen, the numbers jumped back to 18,000; they then increased to more than 35,000 when GGT returned to both places on the main screen. Since July 2015, GGT has been available only in the group of liver tests (and the search function). To see if changes in patient population had caused the changes in GGT, we compared the number of tests at each period with the population of the HMO during the same period (Figure).

Since July 2015, the numbers of test orders have slowly increased but are still (as of 2018) about 25 to 34 per 1000 HMO members and not the 51 per 1000 seen prior to the intervention.

DISCUSSION

A slight decrease in the convenience of ordering a laboratory test that is not indicated for routine screening led to a dramatic decrease in the number of tests sent. A decrease from 3 options to 2 showed a decrease in orders of about 50%, and a decrease to 1 option further decreased orders to 3% of the original levels. Although it was not studied in parallel, no reports were made of diagnoses being missed or delayed due to these changes in the ordering of laboratory tests. It is indeed more likely that costs of imaging tests and second-line laboratory tests were much higher when the test was easier to order. It seems clear that the patients—who will not have to undergo protracted work-ups and increased anxiety due to a false-positive GGT test—will benefit, as well as the doctors who will be able to use their own medical acumen in choosing tests. Because the doctors are

still able to choose the test should they feel it is necessary by actively searching for it, it follows that the increased convenience was the most likely cause of the overordering, facilitated by the use of shortcuts.

The other side of the coin is also important: Does making the choice of laboratory tests more difficult increase the risk of missing an important finding? To see if we had inadvertently caused under-testing, we looked at the tests of alkaline phosphatase during the study period. We found that the number of alkaline phosphatase tests were steady whereas the numbers of GGT tests changed in accordance with presentation on the laboratory page. This does not allow us to ascertain what the optimal level of GGT testing is but shows the difference between 2 tests usually given in the same clinical circumstances.

We also looked at the total numbers of HMO members over the study period to see if the changes in GGT testing could be connected to changes in total population served. We found that the total number of insured patients in the HMO ranged from 716,000 to 732,000 over the study period and since. Contrary to a possible connection, the times of higher total populations were those when lower numbers of GGT tests were ordered. By comparing the total population with the numbers of orders for a similar test, such as alkaline phosphatase, we can conclude that the main influence on the number of GGT tests ordered was the changes in presentation on the laboratory page.

In another HMO in Israel, senior doctors reduced a checklist of 51 commonly ordered tests by removing 27 tests and adding 2. Orders of those that were deleted were reduced by 27%, the unchanged ones were reduced by 18%, and the added tests increased by 60%.⁷ These findings show that making tests easier to order increased the numbers of orders in a more significant fashion than deleting tests decreased the numbers of orders. This would be an interesting topic for a further study.

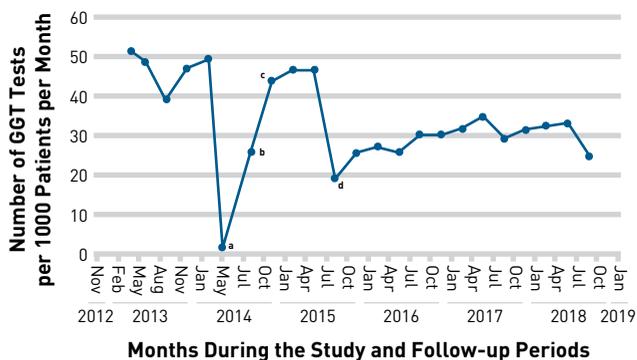
Limitations

This study has some limitations. For one, we looked only at the numbers of tests ordered by the various ways of presentation but were not able to ascertain whether the decrease in testing caused a decrease in detection of disease. Such a study would require more resources in order to read so many medical records. That is a challenge we would like to take on in the future. We were also not able to ascertain what the “ideal” level of GGT tests should be. Another limitation is that the attitudes of the physicians toward these changes were not elicited. Because it is important that the physician’s work not be made more difficult, this would be a good topic for a further study. In the future, we would like to see if the trend continues over longer periods of time.

CONCLUSIONS

Utilizing a change to the EHR, we demonstrated that a slight decrease in the convenience of ordering a laboratory test that is not indicated

FIGURE. GGT Tests Ordered During Study and Follow-up Period



GGT indicates gamma glutamyl transferase.

*GGT was removed from the main screen.

*GGT was back to 1 place on the main screen.

*GGT was back as before the intervention.

*GGT is available as a grouped test on the main screen.

for routine screening—the measurement of GGT level—led to a dramatic decrease in the number of test orders sent by physicians. We were able to demonstrate that the computer rather than the physician had an influence on GGT laboratory test utilization patterns. Convenience is a positive thing when it saves precious time, but if it leads to overtesting, we shall not have gained much. ■

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