

Curtailing Laboratory Test Ordering in a Managed Care Setting Through Redesign of a Computerized Order Form

Natan R. Kahan, RPh, MHA; Dan-Andrei Waitman, MD, MPH;
and Daniel A. Vardy, MD, MSc

Rising costs from the growing and often inefficient utilization of laboratory resources have become an issue of major concern among healthcare providers.¹ Accordingly, in view of the fact that physicians control laboratory test ordering, analysis of physician laboratory utilization behavior has become routine practice in hospital and primary care settings.² Of particular concern has been the excessive use of laboratory resources emanating from inappropriate physician ordering of tests often devoid of any utility to diagnosis or disease management routines. An additional concern among payers is redundant use of laboratory tests incapable of providing valuable information for patient care in scenarios where clinically significant changes in biochemical outcomes do not appear during short periods.^{3,4} Reasons identified for excessive ordering of tests by physicians include the following: defensive behavior, fear of uncertainty, lack of experience, use of protocols and guidelines, “routine” clinical practice, inadequate educational feedback, clinician’s unawareness of the cost of tests, belief that test results are considered more significant than physical examination or history taking, desire to be complete, and collective ordering.⁵⁻⁷

This study was conducted in the Leumit Health Fund (LHF), a managed care organization that provides medical coverage to approximately 700,000 members nationally in Israel (about 10% of the population). The LHF operates a central laboratory that services all health maintenance organization (HMO) salaried and independent physicians treating LHF members. The LHF physicians order laboratory tests electronically via the HMO’s electronic patient record program, and the laboratory’s documentation process is computerized and linked to this electronic patient record network. Accordingly, LHF managers have at their disposal comprehensive databases of all laboratory tests ordered and performed for LHF patients in the community setting.

On analysis of laboratory test utilization patterns during fiscal year 2007, medical managers at the LHF suspected that there may be overutilization of blood tests for vitamin B₁₂ and folic acid by HMO physicians. This perceived overuse of laboratory tests was exacerbating the current overload on limited laboratory resources and causing significant unnecessary expenditures to the HMO. Therefore, a reduction in the ordering of these tests was targeted as a goal for fiscal year 2008.

Objective: To increase appropriate use of blood tests for folic acid and vitamin B₁₂ ordered by primary care physicians in a managed care organization in Israel through redesign of a computerized order form.

Study Design: Pre–post intervention.

Methods: A new version of the computerized order form was launched. Utilization patterns were calculated for tests of vitamin B₁₂, folic acid, and ferritin, which were previously grouped together. Concomitant utilization patterns for tests of hemoglobin and iron were evaluated as controls.

Results: Tests ordered for the 3 targets decreased by 31% to 41% relative to the preintervention month, with a further decrease to 36% to 53% the following month. Negligible changes in utilization patterns were observed for the controls (–2% to 3%) during the postintervention period.

Conclusions: Simple restructuring of a computerized order form significantly reduced the number of laboratory tests suspected of being unnecessary or redundant. When overutilization of laboratory resources is suspected, managers should evaluate the efficiency of the organization’s current ordering procedures before implementing resource-intensive interventions.

(*Am J Manag Care.* 2009;15(3):173-176)

In this issue
Take-Away Points / p175
www.ajmc.com
Full text and PDF

For author information and disclosures,
see end of text.

At that time, these tests were bundled together (along with ferritin) on the electronic order form under a collective diagnostic classification category labeled “anemia.” Because a completely comprehensive computerized requisition may promote overuse,⁸ we postulated that this format was inducing physicians to order these tests unnecessarily. In addition, because restructuring of paper order forms has been successful in reducing unnecessary laboratory tests,⁹ we hypothesized that reformatting the electronic order form so that these 3 tests would no longer be grouped together would reduce the number of tests ordered. The objectives of this study were to design and launch a new version of the electronic order form with these 3 tests appearing individually within the general list of tests, as well as to evaluate if this new configuration curtails the number of tests ordered.

METHODS

The new version of the computerized order form was launched on January 1, 2008. Four months later, the number of blood tests performed monthly for vitamin B₁₂, folic acid, and ferritin was calculated for July 1, 2007, through April 30, 2008. To identify any concomitant changes in laboratory utilization patterns not related to the intervention, we evaluated as controls the utilization patterns of laboratory tests for hemoglobin and iron during this period, as their presentation to physicians on the form was not affected by the new format.

This analysis was conducted using Excel 2003 software (Microsoft, Redmond, WA). The corrected number of tests ordered per day each month was calculated by dividing the number of each of these 5 tests ordered monthly by the number of days that LHF clinics operated each month. This was necessary to avoid miscalculations caused by days when the clinics did not operate because of the Jewish High Holidays, which were celebrated during the study period. The preintervention month of December 2007 was chosen as the reference period for the analysis. The relative change in the number of tests ordered longitudinally throughout the study period was calculated by dividing the number of tests per workday for each month by the values observed during the reference month.

RESULTS

The number of tests performed and the corrected rate per day are shown in the **Figure**. Similar to general utilization patterns observed in the HMO, a decrease in orders was observed during September, when patients tend to put off routine physician visits until after the Jewish High Holidays. This also explains the subsequent rise in services provided

afterward during October. During the first postintervention month of January 2008, the rate of tests ordered for the 3 targets decreased by 31% to 41% relative to the preintervention month, with a further decrease to 36% to 53% the following month. Negligible changes in utilization patterns were observed for the controls (–2% to 3%) during the postintervention period.

DISCUSSION

We demonstrated in this study a large reduction in laboratory test utilization by reformatting a computerized order form. The implementation of this administrative intervention resulted in a substantial reduction in the number of target laboratory tests ordered, while concomitant utilization of other clinically related laboratory resources remained constant. Although this analysis is limited by a lack of information concerning case mix such as identification of incident cases of anemia, the magnitude of the fall-off in utilization observed indicates that significant portions of the tests performed in the preintervention period were probably unnecessary or redundant. However, we cannot rule out that some patients with folate deficiency may not have been identified after unbundling the tests as a result of the additional inconvenience caused to physicians who now had to order tests separately. These results may suggest that, in community settings where laboratory test overutilization is suspected, managers should evaluate the efficiency of the organization’s current ordering procedures before implementing costly educational or time-consuming feedback interventions. In addition, these results are significant because they were obtained in a study that included the entire national population of more than 3000 HMO salaried physicians practicing in a managed care environment without being reinforced by an educational intervention. Therefore, we believe that this study may be more applicable to similar environments than other investigations previously reported in the literature.¹⁰

This analysis necessitated the formulation of a design to overcome a number of methodological barriers that otherwise would have significantly limited this study. In this analysis, we needed to compensate for the lack of relevant data to account for case mix, as well as for the inability of the HMO’s computer network to isolate a control group of physicians not exposed to the new version of the form versus an experimental group that was. We compensated for these limitations by comparing the utilization patterns of similar laboratory tests that were not bundled into a profile, in parallel to the target tests before and after the implementation during the study period. Because these constraints are common in other managed care settings, we believe that these methods may

be applicable to other settings where similar deficiencies in resources may impede performance of scientifically robust evaluations of administrative interventions.

Such a reduction in laboratory orders, when not initiated by the physician clinical process but rather by an interface change, raises the question of possible underuse. A valid answer to this question necessitates a different methodological approach that is not readily available in most active service systems. Vitamin B₁₂ and folic acid laboratory orders were still readily available in the computerized record but were not grouped within the laboratory order set for anemia. Therefore, we can reasonably assume that the reduction observed was a reduction in previous overuse.

CONCLUSIONS

Restructuring of a computerized order form significantly reduced the number of laboratory tests suspected of being unnecessary or redundant. When overutilization of laboratory

Take-Away Points

This study demonstrates a large reduction in laboratory test utilization by reformatting a computerized order form.

- Efficiency of ordering procedures should be evaluated before implementing resource-intensive interventions to reduce laboratory test utilization.
- A simple study design can be implemented to evaluate changes in physician laboratory test-ordering behavior when using a control group is not feasible.

resources is suspected, managers should evaluate the efficiency of the organization's current ordering procedures before implementing resource-intensive interventions. This study demonstrates a simple design to evaluate changes in physician laboratory test-ordering behavior when using a control group is not feasible.

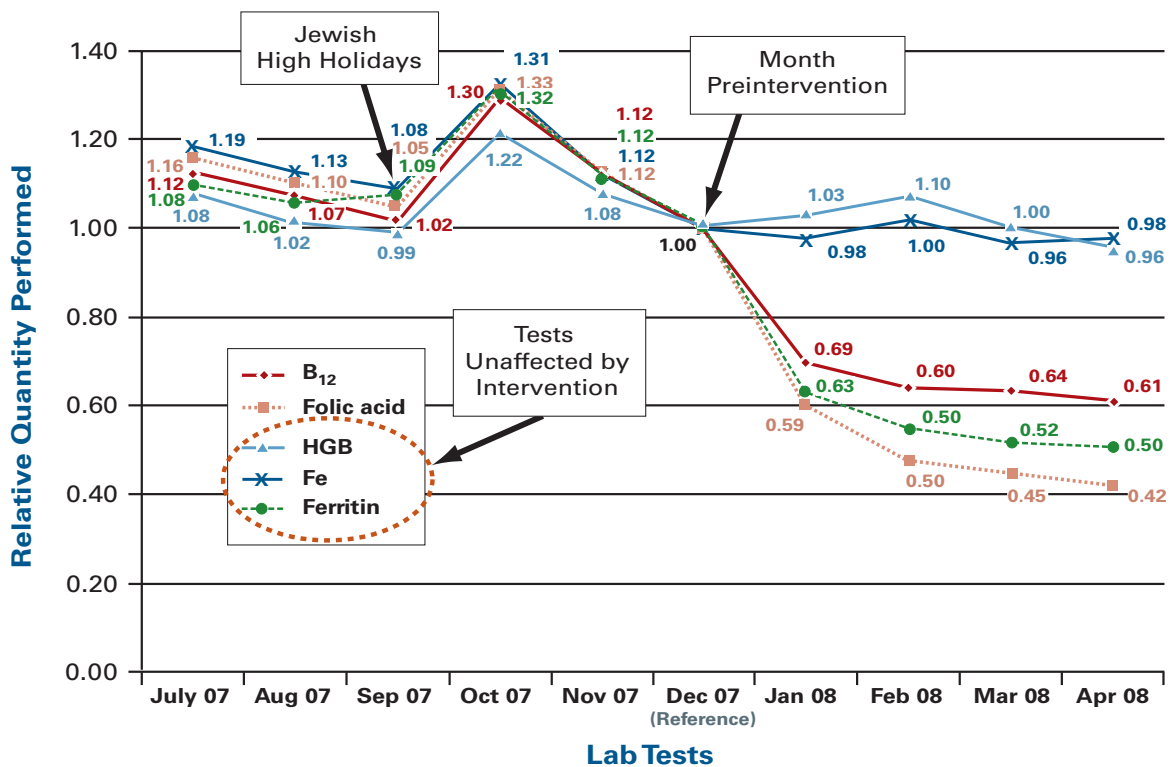
Author Affiliations: From the Leumit Health Fund (NRK, D-AW, DAV), Tel Aviv, Israel; the Hebrew University of Jerusalem (NRK), Jerusalem, Israel; and the Ben-Gurion University of the Negev (DAV), Beer-Sheva, Israel.

Funding Source: None disclosed.

Author Disclosure: The authors (NRK, D-AW, DAV) report no relationship or financial interest with any entity that would pose a conflict of interest with the subject matter of this article.

Authorship Information: Concept and design (NRK, D-AW, DAV); acquisition of data (NRK, D-AW); analysis and interpretation of data (NRK,

■ **Figure.** Utilization Rate of Laboratory Tests Relative to the Month Before the Intervention



B₁₂ indicates vitamin B₁₂; Fe, iron; and HGB, hemoglobin.

D-AW, DAV); drafting of the manuscript (D-AW, DAV); and critical revision of the manuscript for important intellectual content (D-AW).

Address correspondence to: Natan R. Kahan, RPh, MHA, Leumit Health Fund, PO Box 20083, Tel Aviv, 64738 Israel. E-mail: natan.kahan@mail.huji.ac.il.

REFERENCES

1. **Vardy DA, Simon T, Limoni Y, et al.** The impact of structured laboratory routines in computerized medical records in a primary care service setting. *J Med Syst.* 2005;29(6):619-626.
2. **van Walraven C, Naylor D.** Do we know what inappropriate laboratory utilization is? A systematic review of laboratory clinical audits. *JAMA.* 1998;280(6):550-558.
3. **Bates DW, Boyle DL, Rittenberg E, et al.** What proportions of common diagnostic tests appear redundant? *Am J Med.* 1998;104(4):361-368.
4. **van Walraven C, Raymond M.** Population-based study of repeat laboratory testing. *Clin Chem.* 2003;49(12):1997-2005.
5. **Miyakis S, Karamanof G, Lontos M, Mountokalakis TD.** Factors contributing to inappropriate ordering of tests in an academic medical department and the effect of an educational feedback strategy. *Postgrad Med J.* 2006;82(974):23-29.
6. **Barefird D, Hayling A.** Inappropriate use of laboratory services: long term combined approach to modify request patterns. *BMJ.* 1990;301(6764):1305-1307.
7. **Axt-Adams P, Van der Wouden JC, van der Does E.** Influencing behavior of physicians ordering laboratory tests: a literature study. *Med Care.* 1993;31(9):784-794.
8. **Hindmarsh JT, Lyon AW.** Strategies to promote rational clinical chemistry test utilization. *Clin Biochem.* 1996;29(4):291-299.
9. **Zaat JO, van Eijk JT, Bonte HA.** Laboratory test form design influences test ordering by general practitioners in the Netherlands. *Med Care.* 1992;30(3):189-198.
10. **Attali M, Barel Y, Somin M, et al.** A cost-effective method for reducing the volume of laboratory tests in a university-associated teaching hospital. *Mt Sinai J Med.* 2006;73(5):787-794. ■