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Altering a computerized laboratory test order form rationalizes ordering of laboratory tests in primary care physicians

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ABSTRACT

Background: To reduce physicians' inappropriate laboratory requests for their patients, administrators have used methods such as modifying a laboratory request order form with an agreed requesting protocol for the most common diagnoses in primary health care.
Objective: To study the effects of removing the erythrocyte sedimentation rate (ESR) and aspartate transaminase (AST) which are considered of limited clinical value for primary care clinical decision-making from a computerized laboratory test order form. These tests were removed to another new view from the electronic laboratory menu where the physicians, instead of just ticking the desired test from the list, had to do 4–8 s extra work by writing down the abbreviation to order the test.
Methods: An observational controlled prospective study based on a before-after design was performed by removing AST and ES from the laboratory test order form of the computerized laboratory system for all primary care in the city of Helsinki, Finland. The numbers of annual and monthly use of AST and ESR and their controls, alanine transaminase (ALT) and C-reactive protein (CRP) ordered by General practitioners (GPs) was recorded over an eight-year period: four years before and a four years after the removal of AST and ES.
Results: Removing AST and ESR from the computerized laboratory test order form decreased their use by up to 90%, whereas the use of the control tests increased throughout the follow-up period. The variation in use of these removed tests also decreased.
Conclusion: Removing a laboratory test from a computerized laboratory test order form may significantly reduce GPs' use of the laboratory test. Further studies are needed, however, to ensure the safety of this type of intervention.

1. Introduction

Ample resources have been invested in efforts to improve the quality of health care and its cost-effectiveness [1]. These actions also aim to improve care from the patients' perspective. Due to limited resources, decision makers have a *responsibility to decide how to use* these resources to maximize the benefits [1].

Inadequate use of laboratory tests in primary care has been a target of such interventions [2–6]. To reduce physicians' inappropriate laboratory requests for their patients, administrators have used methods such as involving a laboratory request menu with an agreed requesting protocol for the most common diagnoses in primary health care [2]. When incorporated into an *electronic* laboratory request menu, this system provides electronic reminders, which have proved effective in improving the quality of care [7–9]. These reminders have been reported to enhance better prescribing practices [10], better control over the treated disease [11] and further better recording in patient charts [12].

Former findings suggested that laboratory test form design influences test ordering by general practitioners (GPs) [13]. This led to some relatively short experiments in primary care system

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of Israel [14,15]. Plain manipulation of computerized laboratory test order forms of primary care practitioners by deleting certain tests was found to decrease use of these deleted laboratory tests by 31–41% relative to the pre-intervention month, with a further decrease by 36–53% the following month in a short two month experiment [14]. In a more extensive three year work, tests that were removed from a computerized laboratory order form showed an decrease of 27% in the first year and a further 19,2% decrease in the following year [15]. No educational programmes were reported to be included in these interventions [14,15].

In 2006, the laboratory menu in Helsinki primary care was a modification of a previously described laboratory menu [2] that was incorporated into an electronic laboratory system and patient medical records. The menu offered the most commonly used laboratory tests in primary care and reminded the GPs of the availability and usability of these tests. Less frequently used tests had to be ordered with abbreviations available from the computerized laboratory handbook, similar as described by Shalev [15]. So, this computerized laboratory test *order* form directed GPs' use of laboratory tests in primary care towards more appropriate use. The form contained 69 of the most commonly used laboratory tests, yet allowed clinicians to combine tests on the menu in any manner he or she desired, even if the combinations were inappropriate for clinical decision-making.

Despite continuous medical training on the appropriate use of lab tests GPs may continue to order such lab test combinations that have limited value in clinical decision-making [2]. Although several putative reasons for this behavior – often related to what is known as so-called "defensive medicine" performed by primary care doctors – have been suggested [4] the basic cause for this behavior remains unclear. However, we also hypothesized that easy access to laboratory tests in the computerized laboratory test order form and the public funding of medical care [16] with no sanctions, may also have contributed to the physicians' behavior.

To intervene in this problem, the *electronic* laboratory menu was modified. Certain tests which were scientifically [3–5] considered to be of limited clinical value for primary care clinical decision-making were removed from the computerized laboratory test *order form regardless of how often the clinicians used to prescribe these tests.* The medical education alone has not *always* been reported to be enough to produce significant changes in physicians' behavior in laboratory test prescribing [3]. This was also our experience before the present intervention because neither team teaching nor feed-back delivered in superior-subordinate or development *discussions altered clearly laboratory* test prescribing practices in the local public primary care before the present intervention. Therefore, we also wanted to study what happens to the use of those tests that were removed from our computerized laboratory test *order* form after the intervention. In this study we explored the effects of deleting erythrocyte sedimentation rate (ESR) and aspartate transaminase (AST) from this laboratory menu by comparing GPs' usage of them during the 4-year period before with 4-year period after the removal.

2. Methods

2.1. Design

The present experiment is a prospective study with a before- and after-design in the primary care of the capital of Finland.

2.2. Setting

The study was performed in the primary care center for the City of Helsinki and in the HUSLAB, a municipal commercial enterprise providing laboratory services for the City of Helsinki and 21 other communities. The Helsinki primary care center serves about 550,000 inhabitants of the city.

2.3. Participants

The subjects of our study are GPs ($n = 272$) who serve this population in primary care center. All the data was gathered and handled in such a way as to maintain patient *and doctor* anonymity. The registry keeper (health authorities of Helsinki and HUSLAB) accorded permission for the study (permission number HEL 2012-01029T 13 02 01).

2.4. Procedure and measurement

In February–March 2007 two widely used laboratory tests considered to have low clinical relevance, ESR and AST [3–5], which were relatively widely used in Helsinki primary care, were removed from the computerized laboratory test order forms. This intervention was implemented with a change in the computer system resulting in a new form excluding these two tests. This intervention was supported with short meetings for delivering information (maximum 1 h) in order to explain to GPs the reasons for removing these tests from the menu. Thus, the GPs were still able to order the removed tests but they had to find their abbreviations or code numbers from the *electronic* laboratory book attached to the system or to remember these codes to order them. To order the intervened laboratory tests, a GP had to do 4–8 s extra work because, similarly to Shalevs' work [15], he/she had to open an another new view from the *electronic* laboratory menu and write down the abbreviation of ESR or AST on an appropriate field of that view. Alanine transaminase-test (ALT) which served as a control to AST-test and C-reactive protein-test (CRP) which served as a control to ESR-test were not removed from the computerized laboratory test order form. To order these control tests, a GP just had to to select the required laboratory test on the menu.

The ESR test is a highly non-specific test for inflammation and tissue damage, and a pathological ESR test result alone leads to clinical actions only when it is highly abnormal (>50 mm/h), unlike the CRP test which is quick and clinically relevant to decision-making, especially in acute situations and severe clinical conditions [17]. The AST test does not increase the clinical information obtained with the ALT-test, yet GPs in Helsinki primary care generally used these two tests together.

The annual frequencies of the ordered tests (ALT, AST, ESR and CRP) served as the outcome measures. We were also able to compare monthly variations of the ALT and AST tests, which were often used simultaneously prior to the intervention. The follow-up prior to the intervention began in January 2003 and ended in December 2006, whereas the after intervention follow-up began in February 2007 and lasted through December 2010.

2.5. Statistical analysis

The numbers of annual laboratory test (per 1000 blood samplings) with 95% confidence intervals (CI) were calculated assuming a Poisson distribution. Rate ratios (RR) and statistical significance between observation years were calculated by using Poisson regression models or negative binomial regression models, as appropriate. The assumptions of overdispersion in the Poisson model were tested with the Lagrange multiplier test. The total number of laboratory samples prescribed in the health care of the City of Helsinki was used in analysis. The number of blood samples varied between 516,261 samples/year (minimum, in 2005) and 614,397 (maximum, in 2004) and the number of visits to GPs varied between 441,028 visits/year (minimum, in 2009) and 484,304 (maximum, in