Clinical Biochemistry 50 (2017) 555–561

Contents lists available at ScienceDirect

Clinical Biochemistry

journal homepage: www.elsevier.com/locate/clinbiochem

Review

The role of laboratory in ensuring appropriate test requests

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ARTICLE INFO

Article history:
Received 16 January 2017
Received in revised form 3 March 2017
Accepted 4 March 2017
Available online 9 March 2017

ABSTRACT

This review highlights the role of laboratory professionals and the strategies to be promoted in strict cooperation with clinicians for auditing, monitoring and improving the appropriateness of test request. The introduction of local pathways and care maps in agreement with international and national guidelines as well as the implementation of reflex testing and algorithms have a central role in guiding test request and in correcting the overuse/misuse of tests. Furthermore, removing obsolete tests from laboratory menu and vetting of restricted tests is recommended to increase cost-effectiveness. This saves costs and permits to introduce new biomarkers with increased diagnostic accuracy with a better impact on patient outcome. An additional issue is concerning the periodicity of (re)testing, accounting that only a minority of tests may be ordered as often as necessary. In the majority of cases, a minimum retesting interval should be introduced. The availability of effective computerised order entry systems is relevant in ensuring appropriate test requests and in providing an aid by automated rules that may stop inappropriate requests before they reach the laboratory.

Contents

1. Introduction . . . 555
2. Definition of an inappropriate test . . . 556
3. Prevalence of inappropriateness . . . 556
4. Interventions to improve appropriateness in test request . . . 556
   4.1. Developing and disseminating practice care maps and clinical pathways . . . 557
   4.2. Using the Health Technology Assessment (HTA) approach . . . 557
   4.3. Removing obsolete tests . . . 557
   4.4. Avoiding pathophysiologic duplications and implementing reflex testing . . . 557
   4.5. Vetting of restricted tests . . . 558
   4.6. Restricting retesting by applying minimum retesting intervals . . . 559
5. Underutilization in laboratory testing: an underappreciated problem . . . 559
6. The way forward: stopping inappropriate requests before they reach the laboratory . . . 559
7. Conclusions . . . 560
References . . . 561

1. Introduction

Advising on the optimal use of laboratory tests to improve the clinical effectiveness and patient outcome is one of the main tasks of laboratory professionals [1]. According to Smellie [2], to improve the appropriate use of tests, we should first answer a number of relevant questions concerning: a) the definition of an inappropriate test, b) the estimation of the prevalence of inappropriate testing, and c) which

Abbreviations: GPs, General Practitioners; PSA, prostate specific antigen; BNP, B-type natriuretic peptide; ED, Emergency Department; HTA, Health Technology Assessment; CK, creatine kinase; AMI, acute myocardial infarction; AST, aspartate aminotransferase; ALT, alanine aminotransferase; PCT, procalcitonin; ICU, Intensive Care Unit; HbA_{1c}, haemoglobin A_{1c}; TSH, thyroid-stimulating hormone; CPOE, computerised physician order entry.

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http://dx.doi.org/10.1016/j.clinbiochem.2017.03.002
0009-9120/

types of intervention are valuable to reduce the rate of inappropriate test requests.

2. Definition of an inappropriate test

Current literature largely defines inappropriate laboratory utilization as "any test order in violation of a guideline produced by a government or professional society" [3]. In a broader sense, according to Lundberg, who compared the laboratory test to any other diagnostic or therapeutic intervention, the appropriateness entails that the delivered benefit to the patient exceeds the delivered harm (i.e., undesirable effects of testing), and this can be done at a reasonable cost and with reasonable risk [4]. Indeed, the right test choice is part of the triad of main elements of value in laboratory information, together with the right interpretation and the right advice as to what to do next with the result (Fig. 1). The appropriate request starts the loop of laboratory testing, in which a laboratory result should enable a decision to be made, which leads to an action being taken, yielding an improved clinical and economic outcome for the patient [5]. The majority of laboratory-related causes of diagnostic mistakes have been ascribed to overuse, underuse and misuse of laboratory tests [1,6,7] and updated evidence has recently identified test ordering on the top of the pre-analytical steps recognized as the most critical and in need of immediate harmonization [8]. Interestingly, a net prevalence of underutilization vs overutilization (error rate, 44.8% vs 20.6%) has been suggested [9].

All effective strategies documented to drive the appropriate test demand imply the establishment of a close relationship between clinicians and laboratory professionals. Working on the clinical-laboratory interface is central to increase the clinical efficacy of laboratory testing and to promote subsequent appropriate actions [1]. By the way, this may actively involve laboratory professionals both in managing upstream test demand and in down-stream interpretation of laboratory results [10]. Plebani and Panteghini have prioritized harmonization initiatives at the clinical-laboratory interface [5]. In particular, the harmonization of test demand, covering the so-called pre-pre-analytical phase, implies cooperation between clinicians and laboratory professionals to achieve: a) local implementation of practice guidelines, b) design and use of common laboratory test profiles, if any, c) agreed periodicity of (re)testing, d) use of reflex testing and algorithms, and e) a policy of introducing new tests and discontinuing or replacing obsolete tests [5]. Appropriate quality assessment programs should be implemented together with a regular auditing of this activity, in order to share the results of quality indicators with clinicians and to demonstrate their effectiveness [11].

3. Prevalence of inappropriateness

A large variation in clinicians' requesting behaviour has been demonstrated by auditing data on test ordering for inpatients and outpatients in primary and secondary care settings. Data published in UK in November 2013 in the National Health System Atlas of Variation in Diagnostic Services showed large variations in General Practitioners' (GPs) requesting, which affected both common and specialized tests [12]. Marked difference were reported between most and least requesting groups of GPs for, e.g., prostate specific antigen (PSA) (72-fold difference in annual rate of requesting), B-type natriuretic peptide (BNP) (89-fold difference), serum creatinine (106-fold difference), and fecal calprotectin (446-fold difference) [12]. Even when outliers were removed, a 4 to 5-fold difference in average persisted. Notably, it was difficult to explain such a large variability in requesting rate by differences in disease prevalence in different regions and, consequently, to establish the correct requesting rate. Similar audits performed in Spain in primary care has further confirmed the wide test request variability involving both relatively common analytes, such as calcium and iron, and specialized tests, such as ferritin and vitamin D [13,14]. Another survey involving more specifically tumour marker ordering in general surgery has pointed out that ~40–50% of all requests were for panels of ≥4 markers and one-third of requests for carbohydrate antigen 125, the reference marker for ovarian cancer, were for male patients [15].

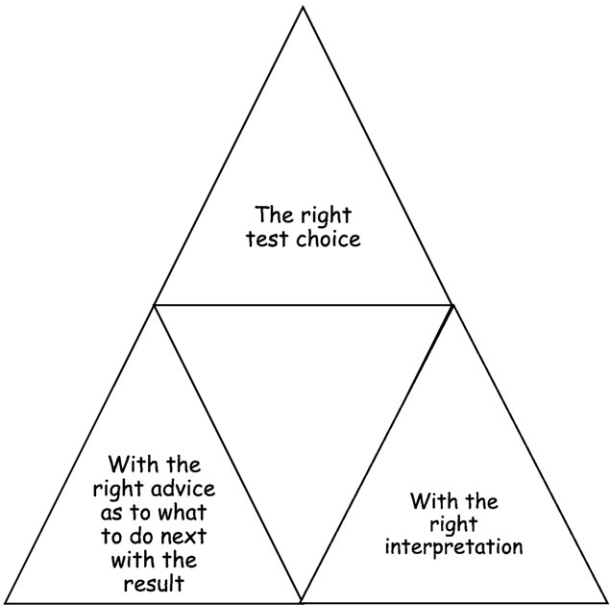

Fig. 1. The triad of elements of value in laboratory information.

Surveys have also clearly documented underuse of appropriate tests. Since 2005, the European Society of Cardiology recommends excluding suspected heart failure in symptomatic patients through electrocardiogram and measurement of natriuretic peptides [16]. However, a recent international survey has revealed that in 2013–20% of surveyed laboratories did not offer this test in their menu, showing that this type of service is not yet universal [17].

The documented situation calls for efforts in reduction of variation in test requests addressing the urgent need for harmonization efforts. Indeed, the existence of persistent unwarranted variations in providing healthcare may directly affects the equity of access to services, the health outcomes of populations and the efficient use of resources [18].

An additional source of inappropriateness proven by auditing concerns the failure to follow-up test results, which also represents a critical safety issue. A meta-analysis of 12 studies reported that the proportion of test results not followed up for hospitalized patients ranged from 20% to 61.6% and for patients treated in the Emergency Department (ED) ranged from 1% to 75% [19]. Notably, the main problems concerned the follow-up of critical test results, which can result life threatening if an action is not taken promptly. In many cases, urgent results were never accessed electronically, missing in the medical records or there was no documentation showing that the physician was aware of the critical laboratory value and/or had taken a consequent corrective action [19]. A comparable missing follow-up of laboratory results was reported in patients moving across different healthcare settings (e.g., from hospital to outpatient services or for patients first treated in the ED and then moved to a clinical ward). In this case, late-arriving results, flawed management systems, and practices preventing the appropriate sharing and transferring of information across healthcare settings increased the risk of missing certain test results, causing problems with the continuity of care [19].

4. Interventions to improve appropriateness in test request

A wide body of literature describes actions and strategies that can be employed to improve test ordering [20]. Here, we describe some options, summarized in Table 1, related to practical approaches we applied in our professional experience that proved to be effective.