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Adding value in the postanalytical phase

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ABSTRACT

Apart from maintaining the highest quality of analytical test results, laboratories are now getting more focused on how to achieve the greatest impact of laboratory results on their patient's outcome. Laboratory professionals are now in the learning phase of implementing new practices at different steps of the extra-analytical phases of the testing process where laboratories used to contribute seldom, only sporadically. Recently, the achievable levels of harmonization and responsible contributors at various steps of the testing process have also been proposed. Based on this proposal some tasks of the extra-analytical phase should become primarily the responsibility of laboratories with the involvement of clinicians, like additive testing, individualized interpretative commenting and reporting results with clinical urgency in postanalytical (PA) phase. These tasks can be good targets to start with or to increase patient outcome-oriented extra-analytical activities of laboratories.

The status of the present practice of the PA activities for which laboratories proposed to be primarily responsible in the testing process - laboratory-driven PA tasks - will be reviewed below. In addition, approaches of quality assessment (QA) with quality specifications of these laboratory-driven PA tasks and

the available best practice recommendations in the light of the achievable level of harmonization will be discussed.

Laboratory professionals are encouraged to improve their methodological, theoretical and communicational skills and take the lead and participate in the discussed PA activities that can assist in translating laboratory test results into clinical meaning and thereby lead to better clinical utilization of laboratory test results.

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INTRODUCTION

In the era of changing healthcare environment, fast technological development and increased patient consciousness about their health, clinical laboratories face major challenges to look outside the laboratory and pay more attention to activities which optimize the clinical outcomes of laboratory testing. These new challenges require identification of all the activities and benefits of laboratory medicine that can provide the best utilization of laboratory tests in the interest of the patient. This leads to the renewal of the total testing process concept (TTP) (1) and, besides maintaining the highest quality of analytical test results, laboratories are now getting more focused on how to achieve the greatest impact of laboratory results on their patient's outcome. Recently, the need for harmonization with the likely achievable levels of harmonization has been proposed for all the different phases and steps of the TTP where laboratory profession can have a significant impact (2). In addition, responsible contributors at the various steps of the testing process have also been proposed for activities. Now laboratory profession has started to explore areas where they can successfully participate in extra-analytical phases where laboratories used to contribute seldom, only sporadically to better patient outcome. Based on the proposed levels of harmonization, some of these areas will remain mainly the task of clinicians and laboratory should only provide more assistance, while others should become primarily the responsibility of laboratories with the involvement of clinicians. (2) The activities for which laboratories should be primarily responsible in the PA phase can be good targets to start with or to increase patient outcome-oriented extra-analytical activities of laboratories. Regarding harmonization efforts within the TTP, the present use of these PA activities in laboratories as well as the status of their quality assessment (QA) readiness need to be reviewed first.

UPDATED CONCEPT OF TTP

TTP or brain-to-brain laboratory test loop is a concept which describes the journey of laboratory testing from requesting laboratory tests to the clinical actions taken based on reported results. The TTP therefore includes test requesting, identification (at several stages), collection, transportation, preparation and analysis of samples, interpretation and reporting of analytical results, and finally actions based on the results and their communication (3). The many intermediary steps are further classified in their relation to laboratory analysis as pre-preanalytical, preanalytical, analytical, PA and post-PA phases. (3,4) By definition the PA phase includes those laboratory actions that are induced by a certain laboratory result and taken before the result is communicated to the clinician, e.g. reflex testing, validation of results done by medical technologists or interpretation by laboratory specialists. The post-PA phase means the interpretation of laboratory results by clinicians, which results in clinical decision-making. Although laboratory profession can have significant impact in all the different phases and steps of the TTP (2), extraanalytical phases were due to historical reasons less

in the focus of laboratory attention. Thus, some parts of PA phase, such as analytical and medical validations (with evolving information technology and also the autovalidation) as well as selection of units and correct reference range of the measured analytes became typical routine tasks of laboratories. However, activities related to test interpretation are less practiced and test interpretation remained mainly clinical activity with little, sporadic input from laboratories. In addition, the post-PA phase – the clinical consequences of the laboratory result for the patient- is not in any way under the laboratory's control. (3)

The relatively new concept of „added value" in Laboratory Medicine focuses on the range of opportunities that ensure that the laboratory medicine service achieves optimal clinical relevance for users and that it takes advantage of rapid advances in technology and our understanding of the disease process and treatment opportunities. (5,6) Added value in laboratory medicine is represented by the effectiveness (usefulness/utility) of laboratory tests in influencing the management of patients and related clinical outcomes (7). The use of a diagnostic test, besides having clinical impact, may also involve operational and economic benefits which should be considered by laboratories. (9) The analysis of the outcome of laboratory testing, whether the performance of the test was useful for the patient or for public health, has been integrated as the 10th step in the brain-to-brain laboratory test loop concept (1).

OPPORTUNITIES TO ASSURE THE EFFECTIVENESS OF LABORATORY TESTS IN THE PA PHASE

The main focus of the everyday operation of laboratories used to be to achieve and maintain the highest analytical quality of test results. Recently this task has broadened to encompass activities for optimizing patient outcomes in all steps of the TTP. (6) Achievable harmonization goals for all the different phases and steps of the TTP have recently been proposed with indication of the responsibility for each step. (2) Based on this harmonization proposal, some of the steps where responsibility should be shared between clinicians and laboratory will remain mainly the task of clinicians, and laboratory should only provide more assistance (e.g. test requesting and laboratory result-based clinical actions in the pre-pre- and post-postanalytical phases). Some other steps should become primarily laboratory responsibility with the involvement of clinicians, like additive testing in PA phase, individualized interpretative commenting and also reporting results with clinical urgency. These latter PA activities, where laboratories are designated as being primarily responsible for the task in TTP, can be good targets to start with or to increase extra-analytical activities of laboratories.

PA ACTIVITIES WHERE LABORATORIES ARE PRIMARILY RESPONSIBLE FOR THE TASK IN TTP

Additive testing

Laboratory specialists are expected to assist their clinicians in requesting appropriate tests to help them answer their clinical questions. This includes assisted test requesting techniques in the pre-preanalytical phase as well as additive test requesting techniques applied in the PA phase. Failure to order appropriate tests in diagnostic work can cause harm to the patient either because the clinician misses key information to form the correct diagnosis or because unnecessarily ordered tests can lengthen the patients' investigations. (15) Known interventions to optimize test requesting such as educational strategies, feedback and changing test order forms were found to improve the

efficient use of laboratory tests in primary care very differently, with effect sizes ranging from 1.2% to 60%. (14) However, the impact of inappropriate testing on patient outcomes is rarely reported. (16) There are far more data available on the heterogeneity of test requesting practices where the extent of variation in the requesting patterns cannot be explained by differences in the local prevalence of the disease. (2) Many approaches exist for rationalized test requesting starting from implementing minimum retesting intervals in electronic request systems (11) through harmonized test profiles (12) to implementing artificial intelligence methods to predict the benefit of proposed future laboratory tests. (13) Problem-based test requesting (2,17) and additive testing (18,19) are both approaches when laboratory tests are selected by laboratory specialists in order to respond to a clinical question. During additive testing laboratory investigations are added to existing test results either automatically on the basis of algorithms (reflex testing) or by laboratory professionals who – apart from results – also consider the clinical context of the patient (reflective testing). Typical examples of reflex testing are the addition of free thyroxin when thyroid stimulating hormone is abnormal or free prostate specific antigen in case of an increased level of total PSA. In cases with multiple abnormal test results, addition of appropriate tests –reflective testing- requires professional medical experience combined with the knowledge of patient characteristics and cannot be done by automated protocols. In problem-based test-requesting, the sequence and variety of laboratory tests necessary to answer the laboratory test-based clinical question are selected by the laboratory specialist during investigations. Although reflective testing is considered to be a useful way to improve the process of diagnosing (and treating) patients by different general practitioners or other clinicians and patient populations (18), there is no consensus yet on the point when additive testing should be indicated, for which tests, and for what type of results. (2) So far no quality indicators (QIs) or performance criteria in added testing have been set. (28) There is no strong evidence either on the positive outcome of reflective testing on patient management. (18)

Interpretative commenting

Interpretive comments are narrative interpretations of laboratory results in the context of the clinical situation of the patient. Those comments that are only result-specific and do not generally refer to the patient context do not represent interpretative commenting, e.g. cautionary or explanatory notes on quality or adequacy of the primary sample appended automatically by the laboratory information system such as “sample is haemolysed”. An increasing number of studies has been published reporting that some physicians have either found laboratory assistance useful, or required such laboratory assistance in the interpretation of common laboratory test results. (17,18,20,21) It has also been shown that clinicians found interpretative comments time-saving and improving the accuracy of their diagnoses. (20,22,23) Several studies show that although most of the interpretative comments given by laboratory specialists are appropriate, inconsistencies in comments are observed and some comments may be directly misleading when laboratory specialists are presented with the same case histories. (24,25,26) It is generally advisable that only professionals with clear expertise in the particular laboratory field should be charged with interpreting laboratory results. (24, 25) Recommendations on TTP harmonization suggest that mainly interpretative commenting for complex testing or for laboratory tests should be an integrated and central part of laboratory specialists’ daily activities. (2) However, some studies maintain

that laboratory professionals should even be trained in the interpretation of ordinary laboratory tests because when laboratory specialists were asked to add interpretative comments to non-esoteric laboratory test results, more than half of the interpretations were inappropriate and/or misleading. (24, 27) Therefore, it is absolutely essential that the quality of interpretative commenting should be improved. Improved quality can be achieved by education, availability of best-practice and evidence-based guidelines and by establishing or expanding EQA programs to assess this PA activity. (2) Some EQA schemes already include or focus on interpretative commenting. (2) It is noticeable that the only QI which has been proposed to measure the performance of interpretive commenting, interpretative comments with a positive impact on patient outcome (28), was found not to have been used by a survey looking to provide preliminary results on QIs and related performance criteria in the PA phase. (29) This finding can reflect that it is difficult to collaborate with clinicians in order to evaluate an outcome following the introduction of a specific interpretative comment in the patient's report.

Reporting results that need urgent clinical review for patient safety

Medical laboratories often produce clinically unexpected results that require timely clinical evaluation. The recently proposed risk-based definition of these results differentiates between two risk categories. (30) Critical-risk result (CRR) is defined as results requiring immediate medical attention and action because they indicate a high risk of imminent death or major patient harm. The other risk category, significant-risk results (SRR), labels test results that are less urgent but need to be reported within a shorter timeframe than that for routine results. SRRs are defined as results that are not imminently life-threatening, but signify significant risk to patient well-being and therefore require medical attention and follow-up action within a clinically justified time limit. Examples of common CRRs include very abnormal potassium or glucose concentrations in serum/plasma, whilst examples of SRR might be elevated leukocytes commonly seen in chronic leukemia or early-stage adenocarcinoma in a routine appendectomy specimen.

High-risk results (HRR) as an appropriate umbrella term for critical and significant risk results has also been introduced. (30) Laboratories need to have systems and mechanisms for rapid identification and timely reporting of these HRRs that need urgent clinical review for patient safety. Many studies all over the world, including the one which was organized by the joint working group of EFLM and AACB in European laboratories (31), demonstrated that the reporting of CRRs is very heterogeneous when it comes to procedures on how and what results to report. (32,33) Reporting of CRRs is a field where efforts must be made to improve the quality at many levels. Principally, HRR procedures should be organized in agreement with clinical users considering the local institutional needs and resources. In addition, both HRR practices and alert lists should be designed to serve patient safety. CLSI guidelines on management of CRRs and SRRs have recently been published to provide guidance for laboratories in the field. (34) The QIs proposed for critical values aim to determine the level of successful reporting of CRRs in the laboratory, and turn-around-times (TAT) in CRR notification both for inpatients and outpatients. (28) Reports on preliminary results on QIs and performance criteria in the PA phase showed improvement of laboratories in recent years in successful reporting, and records of time taken to communicate results indicate that procedures are carried out rapidly and effectively. (29)

CONCLUSIONS

The addition of value to laboratory medicine services involves working with users of the service (clinicians). Based on the proposed achievable harmonization goals for all the different phases and steps of the TTP, laboratories should take the lead in several PA activities where laboratories and clinicians should work together for the sake of patient safety. These steps of TTP are good targets to start with or to increase extra-analytical activities of laboratories. All these activities are a new challenge to the laboratory profession since they require communication and cooperation with other professions and most recently they have also become targets of harmonization efforts in laboratory medicine. (2, 7, 10)

Despite lot of communication about extra-analytical activities of laboratories, little is known (mostly sporadic data available only (2,27)) about the practices that laboratories apply in PA phase (neither about those that are proposed to be led by laboratories nor those where clinicians should lead the activities). The forthcoming survey of the Joint Working Group on Postanalytical phase of the European Federation of Clinical Chemistry and Laboratory Medicine. (EFLM) and European Organisation for External Quality Assurance Providers in Laboratory Medicine (EQALM) in 2016 intends to collect the applied PA practices in European laboratories. (35)

Exteral QA programs for the discussed PA activities for which laboratories proposed to be primarily responsible in the testing process and their quality specifications are developing areas of quality assessment. (2) Although performance criteria of the TTP have been set, only very few of the proposed QIs focus on the PA phase. Thus QIs on additive testing and outcome of CRR reporting are not specified at all. In addition, the only QI which has been proposed to measure the performance of interpretive commenting - interpretative comments with a positive impact on the patient outcome (28) - was found not to have been used by a survey looking to provide preliminary results on QIs and related performance criteria in the PA phase. (29) This finding emphasizes that the work at clinical interface is rather challenging. In order to characterize performance criteria and outcome-based QIs in the extra-analytical phases, EFLM established a new task force group, the Task Force group on Performance specifications for the extra-analytical phases (TFG-PSEP). (36) A survey of TFG-PSEP to collect existing QIs in PA phase and ideas of laboratories about quality and performance specifications of extra-analytical phases in European countries has been launched just recently.

Despite the fact that work at clinical interface is rather challenging, laboratory professionals should be encouraged to improve their methodological, theoretical and communicational skills and take the lead and participate in the discussed PA activities that can assist in translating laboratory test results into clinical meaning, improve laboratory test interpretation and thus lead to better clinical utilization of laboratory test results.

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