



Commentary

The future of iron deficiency diagnostics – Rapid home-use point-of-care test kits



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Iron is essential to an optimal erythropoiesis. Insufficiency in turn results in iron deficient erythropoiesis, which, if persistent, causes iron deficiency anemia. Anemia is the most common medical disease in the world and affects more than 2.36 billion (32.1%) inhabitants [1]. In patients scheduled for surgery, approximately one third suffers from preoperative anemia that is mostly associated with a shortage of erythropoietic iron supply [2]. In this population, anemia is an independent risk factor for a prolonged hospitalization, a higher need for allogenic blood transfusions as well as for an increased morbidity and mortality [3]. Both anemia and iron deficiency are also associated with fatigue and muscular weakness which can affect patient's recovery. Boosting erythropoiesis in iron deficient patients by (intravenous) iron supplementation is a potent strategy to increase the body's hemoglobin mass and to reduce transfusion requirements. Managing preoperative anemia in surgical patients is an essential part of patient blood management, a multimodal clinical concept aiming to improve patient safety [4,5]. As part of the concept, patients are screened preoperatively with the objective to provide, if possible, a pragmatic treatment within the time available ensuring optimal surgical preparation (eg, iron supplementation in iron deficiency anemia), while detailed identification of causes is postponed to the postoperative period.

Diagnosing anemia based on hemoglobin levels is straightforward, yet only allows identification of patients already compromised by a reduced hemoglobin mass. Despite a plethora of iron status parameters, detection of iron deficient erythropoiesis to provide treatment to both, patients already or not yet anemic due to iron deficiency, is much more challenging [6]. This is especially true, when comorbidities are present. For instance, results of the most frequently ordered iron status parameters, ferritin and transferrin saturation, are likely flawed during concomitant inflammation due to acute phase properties [7,8]. Additionally, ferritin reflects body iron stores and is thus not sensitive for the erythroids' iron demand. A more valid proxy for the iron availability during erythropoiesis might be the soluble transferrin receptor [9], that is supposed to track the iron demand during erythropoiesis independent from inflammation.

In most settings, assessment of iron status, particular of soluble transferrin receptor, requires access to centralized sophisticated laboratories. However, there is an urgent need for sensitive and affordable

diagnostics for soluble transferrin receptor at the bedside to allow rapid diagnostic and treatment.

In an article in *EBioMedicine*, Srinivasan and colleagues now developed an immunochromatographic assay-based point-of-care diagnostic that allows a rapid, user-friendly test strip on a mobile platform for quantification of soluble transferrin receptor levels from a drop of human serum within a few minutes [10]. The analytical performance of the point-of-care soluble transferrin receptor diagnostics indicates the potential for application in home-use test kits and field settings, especially in low- and middle-income settings.

In general, point-of-care devices has successfully been integrated into the healthcare system to provide laboratory testing outside of the main laboratory. One of the most important advantages of point-of-care, particularly with the use of mobile devices and medical software applications (apps), is fast diagnosis for clinicians.

Using the rapid diagnostics for point-of-care quantification of soluble transferrin receptor has the huge potential to improve bedside diagnostics of iron deficiency and thereby enabling faster identification of patients and treatment with iron.

In future studies, the performance of the point-of-care soluble transferrin receptor diagnostics will need to use serum or whole blood in human validation studies among greater number of participants with a wider range of iron status including iron deficient individuals. Future studies should also evaluate a duplex assay for measurement of soluble transferrin receptor and ferritin on a single test strip, facilitating a broader iron status assessment at the bedside.

Disclosure

PM received research grants from the German Research Foundation (ME 3559/1–1, ME 3559/3–1), International Anesthesia Research Society, German Society of Anaesthesiology and Intensive Care Medicine, European Society of Anaesthesiology. PM and KZ received grants by B. Braun Melsungen, CSL Behring, Fresenius Kabi and Vifor Pharma for the implementation of Frankfurt's Patient Blood Management Program; by Pfizer for investigator-initiated trial; honoraria for scientific lectures from B. Braun Melsungen, Vifor Pharma, Ferring, CSL Behring, Pharmacosmos, Heinen&Löwenstein, and Aesculap Academy.

DOI of original article: <https://doi.org/10.1016/j.ebiom.2019.03.017>.E-mail address: patrick.meybohm@kgu.de.<https://doi.org/10.1016/j.ebiom.2019.03.044>2352-3964/© 2019 The Author. Published by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

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