Blood tubes should be labeled before drawing blood

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Received: 13 November 2017; Accepted: 18 November 2017; Published: 25 November 2017.
doi: 10.21037/aob.2017.11.02
View this article at: http://dx.doi.org/10.21037/aob.2017.11.02

Blood tubes labeling is an almost unavoidable procedure in clinical and laboratory practice. This preanalytical activity typically entails attaching to the primary blood tube an adhesive paper label, which contains demographic data, specific information about the tests that will be performed on that sample along with other potentially useful data. This information is typically conveyed within a printed barcode, which is then read by preanalytical or analytical workstations interfaced with the laboratory information system (LIS) (1). Along with the type of information that can be stored within the barcode, one of the most debated issues in laboratory medicine is whether blood tubes should be labeled before or after drawing blood. This is an import issue, since a survey from the College of American Pathologists (CAP) showed that the aggregate frequency of identification errors can be as high as 379 per 1 million billable tests, half of which caused by primary specimen labeling errors and approximately 6% of which may generate adverse events (2). Although there is little doubt that blood tubes labeling should always be performed in front of the patient, we are in support of labeling blood tubes before drawing blood, for a variety of reasons that will be discussed in the following parts of this article.

As a rule of thumb, the incidence of critical phlebotomy errors (especially those related to specimens mislabeling) can be considerably decreased by replacing human activities with automated specimen processors (3,4), i.e., devices capable to labeling blood test-tubes and other biological containers for clinical laboratory use. Regardless of this firm evidence, the available guidelines about blood tubes labeling provide rather controversial suggestions. The Italian Society of Clinical Biochemistry and Clinical Molecular Biology (SIBioC) strongly advises that blood tubes should be labeled before drawing blood (5), the Clinical and Laboratory Standards Institute (CLSI) document H3-A provides an opposite indication (6), whist the European Federation of Clinical Chemistry and Laboratory Medicine (EFLM) (7) and the World Health Organization (WHO) (8) actually acknowledge that both practices may be suitable provided that they are performed in front of the patient. Therefore, the lack of standardization in this important preanalytical step should be regarded as an important source of uncertainty and leaves space for an open debate on the best approach that shall be followed.

In our perspective, there are some pragmatic reasons supporting the practice of labeling blood tubes before drawing blood, and not afterwards. First, automatic tube labeling devices, which are effective for consistently abating identification errors, can only be used with empty tubes. Therefore, precluding the employment of this cutting-edge technology, which also carries many other practical advantages (i.e., reducing the overall time necessary for blood sampling, increasing the number of patients managed per hour, improving phlebotomy center organization and saving money due to less healthcare personnel needed in phlebotomy centers) (4), seems now unreasonable, especially in those centers that have already implemented these efficient systems. The use of a wrong container is also possible, when the type of different blood tubes that should be collected is not clearly indicated in the attached label. It can hence happen that phlebotomists will only realize that they have collected a wrong container once blood has been completely drawn and the needle has been removed from the vein. This will dramatically increase the risk of receiving specimens in the wrong container or cross-contaminated with blood from another tube (i.e., EDTA

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Table 1 Potential issues in labeling tubes after blood collection

Preclusion of using automatic tube labeling devices
Higher risk of collecting unsuitable samples
Delayed labeling of tubes and application of labels on the wrong tubes
Mislabeling blood tubes from multiple patients in the same room

blood transferred into citrate blood tubes). The latter aspect is even worse than the former, because this inappropriate practice cannot be easily recognized by the laboratory. Sample management immediately after blood drawing is another useful information that can be conveyed by pre-labeled blood collection tubes. For example, the type of information written on the blood tube label may include the need for accurate mixing after collection (e.g., for all samples containing additives and anticoagulants), the order of draw to be followed by the phlebotomist, the minimal draw volume, along with the temperature of transportation (i.e., immediate refrigeration for measuring blood lactate or sample warming to 37 ℃ for cryoglobulinemia screening, respectively). The risk of receiving unsuitable samples can hence be enormously reduced when precise instructions about the type of container and its immediate management are reported in pre-labeled blood tubes. Then, the risks for patient care when blood tubes are labeled before drawing blood are much lower than afterwards, especially when labels only contain hand-written information on patient identity, as well as limited information on the tests requested.

The same criticism that can be raised for labeling blood tubes before drawing blood (i.e., the risk of using empty labeled tubes on the wrong patient) also applies to post-collection labeling, since the tubes may remain unlabeled for long after being collected, and then another healthcare operator may put wrong labels on them. This circumstance is not implausible, as demonstrated by Wallin *et al.* (9), who showed that the vast majority of phlebotomists (up to 78%) tend to label test tubes only after having left the patient. In another study, Söderberg *et al.* also showed that not every person working in primary healthcare centres personally labels test tubes, whilst this practice is frequently left to other colleagues, who do not even see the patient (10). Blood collections from multiple patients in the same room is another potential source of errors, since all blood tubes may be first collected, and patients' labels may then be mismatched among tubes. It is an improbable occurrence, but one may argue that it is as unlikely as the risk of using empty pre-labeled tubes for collecting blood from the wrong patient.

Although there is no unquestionable evidence to support a recommendation that blood tubes should be labeled before or after venipuncture, we believe that labeling blood tubes before drawing blood should be considered a safer procedure than post-collection labeling, at least until active tubes (e.g., equipped with active chips or RFID tags) will become available (11), and will hence completely eliminate the need of labeling blood tubes (*Table 1*). In the meanwhile, there is a compelling need of well-designed randomized studies, aimed to clarify the real patient safety risk associated with pre- or post-labeling blood tubes, which should also be designed to consider technological advancements and related improvements in preanalytical procedures and workflows.

Acknowledgements

None.

Footnote

Conflicts of Interest: The authors have no conflicts of interest to declare.

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doi: 10.21037/aob.2017.11.02
Cite this article as: Lippi G, Plebani M. Blood tubes should be labeled before drawing blood. Ann Blood 2017;2:18.

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