

Editorial

External quality assessment in immunohematology: a key component of patient safety

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When blood or blood components are given to a patient, the treating physician aims not only for the patient to receive the greatest possible benefit with the least possible harm or risk, but this is also what is required of the blood bank, whose role is to source and prepare blood and blood components for patients. To achieve this, the blood bank laboratory, led by the medical director and chief technologist, must manage both the organization of its work, knowledge and skills of the staff, so that laboratory results are accurate and free of error. Furthermore, the system in place can detect near-miss events before blood is issued or transfused to a patient. When a blood bank laboratory can operate this way effectively, patients gain not only benefit and safety; treating physicians and patients alike also gain greater confidence and trust that the patient has received the intended therapeutic benefit.

For this reason, the operation of blood bank laboratories must operate with established international standards, or national standards, and should not independently modify or adapt testing procedures. Equally important is accreditation which confirms that testing is performed according to established quality standards. ISO/IEC 17043:2023¹ specifies the requirements for proficiency testing providers across various laboratory disciplines. The organization responsible for this function in Thailand is the Bureau of Laboratory Quality Standards, Department of Medical Sciences, Ministry of Public Health²; organizations from other countries include the Association for the Advancement of Blood and Biotherapies (AABB)³, and the College of American Pathologists (CAP)⁴, among

others. Each proficiency testing program distributes unknown test samples to participating laboratories for analysis. Participants are required to submit their results within a specified period, after which the results are evaluated, summarized, and reported to all participants.

Blood bank testing for patients who require blood comprises ABO grouping and RhD typing, red cell antibody screening, identifying the specificity of antibodies present, and performing the compatibility testing between the patient and donor blood. Additional tests include antigen typing, the direct antiglobulin test, and antibody titration to determine the strength of patient's antibodies, such as anti-A, anti-B and anti-D.⁵

With respect to blood bank personnel, being prepared to detect the range of problems that can arise in routine blood preparation for patients requires confirming that every staff member has genuine, hands-on knowledge, skill, and experience in detecting and resolving problems in ABO grouping and RhD typing, or problems arising from a patient's antibodies. The antibodies found may be either single or multiple, and may include commonly encountered in the Thai population⁶, or less frequently, associated with rare phenotypes. These antibodies cause difficulty in reporting the correct blood group conclusion or sourcing safe compatible blood for the patient. Participating in the program will allow the staff to examine blood samples that present wide range of immunohematological problems; therefore, builds the skill and experience needed for them so that staff can apply appropriate problem-solving strategies when similar challenges arise in actual patients requiring transfusion.

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External Quality Assessment (EOA) is a program that many countries have established in recognition of its importance in maintaining laboratory quality and promoting patient safety. The first EOA program was established in the United States in 1945⁷. In Thailand, external quality assessment began in 1973, run by the Public Health Laboratory Standards, Division of the Department of Medical Sciences, Ministry of Public Health⁸. For the blood banking field specifically, External Quality Assessment in Immunohematology began in 1988⁹ and has continued without interruption to the present day, with the range and complexity of test samples developed and expanded progressively over time. Participating blood bank laboratories may choose their own test panels, to suit the differing workloads of hospital blood banks.

The blood bank tests offered to members for analysis under the program comprise: ABO grouping, RhD typing, antibody screening, antibody identification, compatibility testing, the direct antiglobulin test, and antibody titration². Because the range of tests the program requires member hospital blood banks to perform is so varied, and because the program has a large number of members including different levels and responsibilities of hospital blood banks, the preparation of test samples is of great importance: the number prepared must be sufficient for all members and must be accurate and error-free, encompassing a range of samples that are both straightforward and difficult, which requires the knowledge, skill, and experience of the staff to resolve. Most importantly, members of the program must receive test samples of equal quality at close to the same time, wherever in the country they are located, so the preparation, verification and distribution of samples matters a great deal, giving program members confidence when comparing their own results with those of blood banks at other hospitals¹⁰.

Test samples for the blood banking component of the program are of two kinds: those prepared domestically and those sourced from abroad. The in-house prepared

samples reflect problems genuinely encountered in the Thai population, which blood bank staff have a real opportunity to meet in practice; samples from abroad, however, tend to reflect problems arising in the population of the country of origin, which may differ from the Thai population. For instance, being found only rarely, or not at all, among Thai people⁶, giving program members a valuable opportunity to examine samples that would otherwise be difficult to obtain. This is beneficial in its own right, since patients from an increasing range of countries are now coming to Thailand for treatment, resulting in difficulty to provide compatible blood for them and may take longer time than usual. Preparing test samples also requires planning, so that samples appropriate to each round sent out for analysis are selected, for example, always including both positive and negative results, so that it can be confirmed whether a tester has truly performed the test correctly. The most important part of the unknown sample preparation is that every test sample must without exception be verified for accuracy by highly experienced blood bank personnel.

At the end of each round, the program organizers issue the correct results together with a summary of each member's performance. This performance reflects the underlying capability of each blood bank, in terms of both its personnel and its laboratory systems, and the medical director must be aware of it and must inform every staff member of the correct results, the laboratory's own results, and how these compare with similar categories of hospital blood banks elsewhere, without blaming or penalizing the individual concerned. Beyond this, the root cause analysis of any error, a corrective action plan, and improvements to prevent recurrence must also be identified. Importantly, staff must receive ongoing education, laboratory systems must be continually improved, and participation in the program must continue to be tracked over time, to monitor how the blood bank personnel are developing.

For the program organizers, who have a large number of member hospital blood banks, the results reflect the

state of blood bank services nationwide, showing where practice is already sound and where further improvement is needed, or where gaps remain that must be addressed if every hospital blood bank is to reach the standard of a genuinely high-quality service. Applying the results of the blood banking EQA program to drive such improvement, therefore, benefits both the organizers and the member hospital blood banks, and, ultimately, delivers the greatest benefit to the patients who receive blood through the service, most importantly, ensuring that patients receive a safe blood transfusion¹¹, which is what everyone wants. Every hospital or institution whose blood bank is involved in supplying blood to patients should therefore join the program as a member, to be confident that its own test results are accurate; in this way, when blood is given to a patient, the patient gains the greatest possible benefit with the least possible risk and no harm, precisely the objective of every blood bank.

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