

Enhancing the blood safety program in Myanmar: Report on projects of global extension of medical technologies of Japan

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Abstract: The National Center for Global Health and Medicine has long collaborated with the blood program in Myanmar, and the Center started a new project in 2015 to enhance blood transfusion safety as part of a new set of projects of global extension of medical technologies that aims to improve public health and medicine in developing countries under public-private partnerships. The project resulted in remarkable achievements, including maintaining a high proportion of voluntary blood donations despite a rapidly growing demand for blood, ensuring blood safety from the donor to the recipient, and creating public-private partnerships. The project supported the introduction of blood grouping using the tube method at hospital blood banks, safety measures during blood transfusions, and effective use of blood products including component blood. The project identified the need for medical devices such as leukocyte filters, serofuges, and refrigerators to store blood products. The success of the project may depend on mutual understanding and trust based on the duration of collaboration, improvement of the requirement for medical safety (including blood safety) in the country, and shifting the mindset of partner companies in public-private partnerships to create new demand by encouraging improvement of the quality of care and requiring the safety of medical care. In this era of sustainable development goals, the hopes are that these experiences will help other countries seeking to improve their public health through public-private partnerships.

Keywords: medical technologies, blood transfusion, sustainable business, medical safety

Introduction

Blood transfusions are widely used to manage various medical conditions such as acute and chronic blood loss and are an essential and lifesaving form of medical care even in resource-limited countries. The demand for blood products has been increasing due to improvement in the levels of medical care and the introduction of advanced medical treatment, all of which are attributable to economic growth, aging of society, and a population increase. However, adverse events, including transfusion-transmissible infections and acute hemolytic transfusion reactions, are possible and can cause life-threatening complications requiring immediate supportive care. Transfusion-related risks can be reduced by taking necessary actions, however, they cannot be entirely avoided. Therefore, the World Health Organization and all its member states have agreed on the importance of enhancing blood establishments and ensuring the quality, safety, and efficacy of blood products (1).

The National Center for Global Health and Medicine (NCGM) supported blood transfusion services in

Myanmar through JICA's Major Infectious Disease Control Project from 2005 to 2015 (2). Thus, blood transfusion services in Myanmar have improved remarkably, particularly in terms of blood product safety (3,4).

Several advanced therapies including transplantation, which requires quality blood transfusion as supportive therapy, have concurrently been introduced. The demand for blood has also increased after a free blood policy was introduced by the government. Therefore, the clinical use of blood products needs to be promptly improved. Given the increasing need for technical assistance, the NCGM decided to institute a new project in 2015 to enhance blood transfusion safety under a new program of the Japanese Ministry of Health, Labour, and Welfare, *i.e.*, projects of global extension of medical technologies, which aims to improve public health and medicine in developing countries under public-private partnerships.

Approach

Since 2015, the National Blood Center (NBC) has

collaborated with the project to enhance blood safety in Myanmar to tackle remaining challenges and further improve safety; approximately 30 policymakers and high-ranking officials, including members of Parliament, the President of the Myanmar Medical Association, the President of the Myanmar Medical Academy, the Director General of the Department of Medical Services of the Ministry Health and Sports, and directors of medical care in the public and private sectors, were invited on a 7-day tour to observe the institution of a nationwide blood program in Japan, including hemovigilance, supply management, blood collection and blood product manufacturing, and blood transfusion management in hospitals, to further improve safety. During this 7-day trip, the person in charge of the blood program and decision-makers talked extensively and reached a consensus on the future direction of improved blood safety.

Moreover, Japanese experts were sent to Myanmar to hold annual meetings with blood banks in Myanmar and the Educational Symposium on Blood Safety, in collaboration with the International Society of Blood Transfusion. The heads of the blood banks were invited to the annual meetings, and hospital administrators and clinicians were invited to the symposium to discuss further improvements in blood safety. In addition, hands-on training in blood grouping for laboratory technicians in hospital blood banks was also conducted by experts from Japan. In addition, training on bedside safety measures and infection control during blood

transfusions was provided to nurses and nursing students. Figure 1 shows the number of the participants in the tour of Japan and the educational symposium and training in Myanmar each year.

Several Japanese medical device manufactures supported the project, namely Daido Industry providing refrigerators and blood storage; Kubota Corporation providing laboratory centrifuges; and Terumo Corporation providing blood bags, leukocyte filters, blood donation beds, and other consumables.

Outcomes

As advanced medical care has been introduced in the country, the requirement for blood safety as supportive therapy has also increased both quantitatively and qualitatively. Therefore, when the project started, maintaining a high proportion of voluntary blood donation was critical due to the growing demand for blood. The NBC has maintained the high proportion of voluntary donations and also increased the number of hospitals with access to a direct supply of quality blood from the NBC, even though hospital-based blood banking is common in Myanmar. Policymakers and high-ranking officials, including the President of the Myanmar Medical Association, were invited to Japan and were major supporters of capacity development in the NBC. They helped the NBC to establish the National Blood Transfusion Committee as members of the advisory group for the Ministry of Health. That committee endorsed the revision of the National Guidelines on Blood Transfusion.

Demand for safe and quality blood has spawned a need for medical devices that were not required previously. For instance, leukocytes remaining in blood products might cause adverse effects such as infection (5,6). A leukoreduction filter (Terumo) should be utilized in specific wards requiring special care, such as Hematology. To improve donor safety and comfort, blood collection beds (Terumo and others) were also procured by blood centers. Since the advantages of component therapy (7) are widely acknowledged, the usage of component blood products has gradually increased. Assessment of the quality of component blood products has indicated that a higher platelet concentration is achieved when using Kubota's blood product centrifuge. Because storage conditions differ for each blood component (8,9), the demand for storage devices increases when component transfusions become common. Hence, a platelet agitator and cooling table (Daido) were introduced to maintain products.

Earlier, blood was grouped only *via* cell typing using the conventional tile method. The tube method has been introduced for both cell and serum typing to improve the accuracy of testing and to avoid a group transfusion. Introduction of the tube method requires necessary equipment such as a serofuge

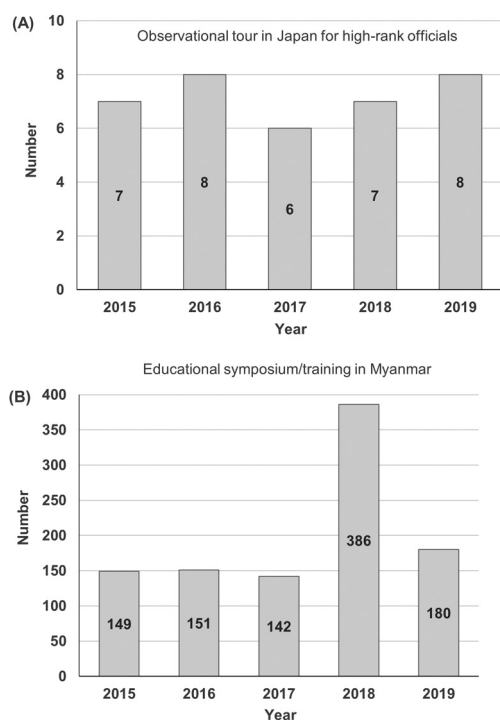


Figure 1. The number of participants of the observational tours in Japan (A) and the educational symposium and training in Myanmar (B).

Table 1. Medical technologies/systems and medical devices introduced during this project

Items	Contents
Medical technology/system	<ul style="list-style-type: none"> ● Blood grouping using the tube method at hospital blood banks ● Safety measures for blood transfusion including monitoring of adverse reactions (Draft standard operational procedure) ● Safe, proper, and effective use of blood products, including component blood
Japanese medical devices that were newly procured by the Ministry of Health and Sports	<ul style="list-style-type: none"> ● Leukocyte filter (Terumo) ● Serofuge for blood grouping using the tube method (Kubota) ● Centrifuge for component blood preparation (Kubota) ● Refrigerator for blood packs (Daido) ● Platelet agitator (Daido) ● Blood collecting bed for donors (Terumo)

and consumables. Some hospitals that started blood grouping using the tube method procured a serofuge from Japan (Kubota) because of its ease of use. Based on National Guidelines, standard operating procedures for a safe blood transfusion have been drafted by medical professionals who perform transfusions at hospitals.

Table 1 presents a summary of the medical technologies/systems and medical devices introduced during this project.

Discussion

Mutual understanding and trust based on long-standing collaboration between the Myanmar Ministry of Health and Sports and the NCGM has played a key role in the successful implementation of this project. Since 2000, experts have been dispatched to JICA technical cooperation projects for blood safety (2). The current project has taken over from the JICA project since 2015. Over the past 5 years, remarkable outcomes have been achieved. The National Blood Transfusion Committee was created in 2018, and it has played an important role in blood safety. The centralized blood supply system has been improved by increasing the number of hospitals receiving blood from the NBC. Blood grouping has gradually shifted from the conventional tile method to the more accurate tube method.

Public-private partnerships in health care have gained considerable attention over the last two decades, and especially after setting of the Sustainable Development Goals in 2015 (10,11). However, public-private partnerships are also associated with several risks, including conflicting visions and scopes of activity for corporations and public health agencies (12). The mindset of both the private and public sectors should be changed so that public-private partnerships are successful. A member of a company that cooperated with the project remarked, “Japanese medical device manufacturers have trouble beating prices in developing countries. We need to shift to selling value-added products, and the market should be aware of this value. Therefore, we have decided to invest in future markets

by helping to improve levels of medical standards in those countries.” Collaboration with companies that have such a mindset seems effective. In fact, they improved medical standards by introducing medical devices such as leukoreduction filters and serofuges in this project.

Commitment by policymakers is always the key to successful implementation of a public health program. Fortunately, the Ministry of Health and Sports has prioritized medical safety, including blood safety. This has had a positive impact on improving blood safety, *i.e.*, an increased national budget for the program and staff assignment. However, a challenge was that policymakers were not fully aware of the risks of transfusion. They were satisfied since blood donors did not need to be recruited as the NBC increased voluntary blood donations, and they were unaware of remaining risks regarding the clinical use of the blood, the quality of blood grouping and other testing, and hemovigilance (13,14). This project could help those policymakers to better understand the Japanese blood program and the supporting healthcare system, which is considered one of the world's safest.

In conclusion, the project helped to improve blood safety and create a public-private partnership as a sustainable business. As the lessons from this project, we believed that the success of the project may depend on: *i*) Mutual understanding and trust based on the duration of collaboration, *ii*) Improvement of the requirement for medical safety (including blood safety) in the country, and *iii*) Shifting the mindset of partner companies in public-private partnerships to create new demand by encouraging improvement of the quality of care and requiring the safety of medical care. The hope is that this experience will help other countries seeking to improve public health through public-private partnerships.

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References

1. World Health Organization. Availability, safety and quality of blood products, A63/VR/8. http://apps.who.int/gb/ebwha/pdf_files/WHA63/A63_R12-en.pdf (accessed February 10, 2020).
 2. Japan International Cooperation Agency. Activities in Myanmar, Major Infectious Diseases Control Project. <https://www.jica.go.jp/myanmar/english/activities/activity02.html> (accessed February 12, 2020).
 3. Aung T, Nozaki I, Oo NN, Swe KK, Wada K, Yoshihara N. Reducing the risk of HIV transmission through blood transfusion in the National Blood Center, Myanmar. *ISBT Sci Ser.* 2015; 10:27-30.
 4. Aung T. Overcoming the resource limitation in Myanmar. *ISBT Sci Ser.* 2016; 11:7-12.
 5. Bilgin YM, van de Watering LM, Brand A. Clinical effects of leucoreduction of blood transfusions. *Neth J Med.* 2011; 69:441-450.
 6. Singh S, Kumar A. Leukocyte depletion for safe blood transfusion. *Biotechnol J.* 2009; 4:1140-1151.
 7. World Health Organization. Processing of donated blood, Advantage of component therapy. https://www.who.int/bloodsafety/testing_processing/components/en/ (accessed February 11, 2020).
 8. WHO Expert Committee on Biological Standardization. Guidelines on management of blood and blood components as essential medicines, WHO Technical Report Series No. 1004. <http://apps.who.int/medicinedocs/en/m/abstract/Js23322en/> (accessed February 10, 2020).
 9. Edelstein SB. Blood product storage: does age really matter? *Semin Cardiothorac Vasc Anesth.* 2012; 16:160-165.
 10. De Pinho Campos K, Cohen JE, Gastaldo D, Jadad AR. Public-private partnership (PPP) development: Toward building a PPP framework for healthy eating. *Int J Health Plann Manage.* 2019; 34:e142-e156.
 11. Parker LA, Zaragoza GA, Hernandez-Aguado I. Promoting population health with public-private partnerships: Where's the evidence? *BMC Public Health.* 2019; 19:1438.
 12. Silva V, Turci SRB, Oliveira APN, Richter AP. Can the risk in public-private partnerships be classified? *Cad Saude Publica.* 2017; 33Suppl 3:e00086316.
 13. WHO Expert Committee on Biological Standardization. WHO Guidelines on Good Manufacturing Practices for Blood Establishments. <http://apps.who.int/medicinedocs/en/m/abstract/Js18672en/> (accessed February 11, 2020).
 14. Aung T. Filling the gap in safe blood transfusion service of Myanmar. <http://mohs.gov.mm/Main/content/publication/blood-transfusion-filling-the-gap-in-safe-blood-transfusion-service-of-myanmar> (accessed February 11, 2020).
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