2019 ANNUAL REPORT

醫療財團法人
台灣血液基金會
捐血救人 Taiwan Blood Services Foundation

CONTENTS

OVERVIEW

OUR PERFORMANCE

STATISTICS

APPENDIX

Message from the president

Taiwan's medical standards are well known to all. We at the Taiwan Blood Services Foundation (TBSF) have been working hard to collect and supply blood for clinical use throughout the country. We continue to provide stable and safe blood transfusion for our citizens and actively invest in the development of blood technology to further improve blood safety and quality.

Last year, with the joint efforts of every colleague of us, we also have remarkable achievements, including the continuous promotion of the use of leukocytes reduced blood products in hospitals. Currently, 102 hospitals in Taiwan have fully used leukocytes reduced RBCs, reaching a 54.1% utilization rate. To improve the service of blood transfusion, we have also tested on red blood cell antigens, such as C, c, E, e, Jka, Jkb, and Mia, making it more convenient for the hospital blood banks to obtain antigen-negative blood products for cross-matching in a hope to reduce the patient's waiting time. Medical services is optimized.

We are planning and constructing the nation's first blood component manufacturing center in southern Taiwan. The initial plan is to incorporate the blood component processing and testing laboratory in Tainan and Kaohsiung Blood Centers. We have already followed the PIC/S GMP standards and fully automated the operations, thus greatly upgrading its safety and quality. This center will be developed into the world-class blood center in Taiwan.

To promote the concept of Patient Blood Management (PBM), we held in April 2019 a patient blood management promotion meeting, to which representatives from hospitals in northern Taiwan were invited to share their experience in clinical practice and to listened to the valuable suggestions from various physicians. In addition, the physicians from the TBSF and its Blood Centers have continued to hold medical lectures on blood transfusion at a number of hospitals, to advocate the concept of "appropriate and effective blood transfusion", "blood component therapy —

the advantages and clinical application of leukocyte-reduced blood products" and other patient blood management concepts. It is hoped that all the hospitals will be able to review and control their blood use patterns of various diseases and various surgical methods and take the initiative to decrease the need for inappropriate and unnecessary blood transfusions. Meanwhile, we have also revised the "Essentials of Blood Components" in order to assist physicians in establishing correct blood transfusion concepts, so that they can more accurately use all the blood components to the recipients.

Following the theme of " The Pioneer of Safe and Sufficient Blood Supply " in 2017 and the theme of "The comprehensive and highly efficient laboratory testing of donor blood to ensure transfusion safety in Taiwan" in 2018, both of which were certified with the SNQ (Symbol of National Quality) and conferred with Silver and Bronze Awards respectively in the National Biotechnology Clinical Quality Award, we once again won the certification of SNQ and Bronze Award in the National Biotechnology Clinical Quality Award in 2019 by presenting the theme of " Guardian angel for patients in southern Taiwan, remote areas and offshore islands --Kaohsiung Blood Center ". It is evident that the TBSF has been highly affirmed at the national level for all aspects of its performance.

In terms of blood donor services, we

have since October 18, 2019 promoted the policy for every blood donor to wear a barcode wristband which is connected with the Blood Management System, so that a donor can, in the blood donation process, be identified right away by scanning his or her bar code, making the process even smoother. In terms of research paper publication, we have not only engaged in multiple researches, but published many papers in domestic and international journals, two of which have even won the second and third places in the annual Best Paper Award from the Journal of Taiwan Hospital Association (THA).

Faced with the social trends of declining birth rate and population aging, the TBSF will try its best to further educate our young people, and narrow the gap in between by combining various popular elements to gain their attention and eliminate their fear of blood donation. It is hoped that we can pass on the mission value of blood donation and the importance of health, allowing more young people to participate blood donation.

Since its establishment on January 1, 1990, the TBSF has played an indispensable role in Taiwan's medical and health system for 30 years. In the future, we will continue to promote the development of Taiwan's blood industry and we will further enable the general public to better understand the blood donation and supply situations in our country. It is hoped that everyone of us will support the national blood sufficiency policy and help maintain the stable blood services.

About us

Our Aim

Upholding the concept of "happy blood donation and safe blood use," the TBSF practices a voluntary non-remunerated blood donation system, insists on strict blood quality control and provides the most complete services for blood donors and blood recipients so as to ensure a sufficient blood supply for clinical uses.

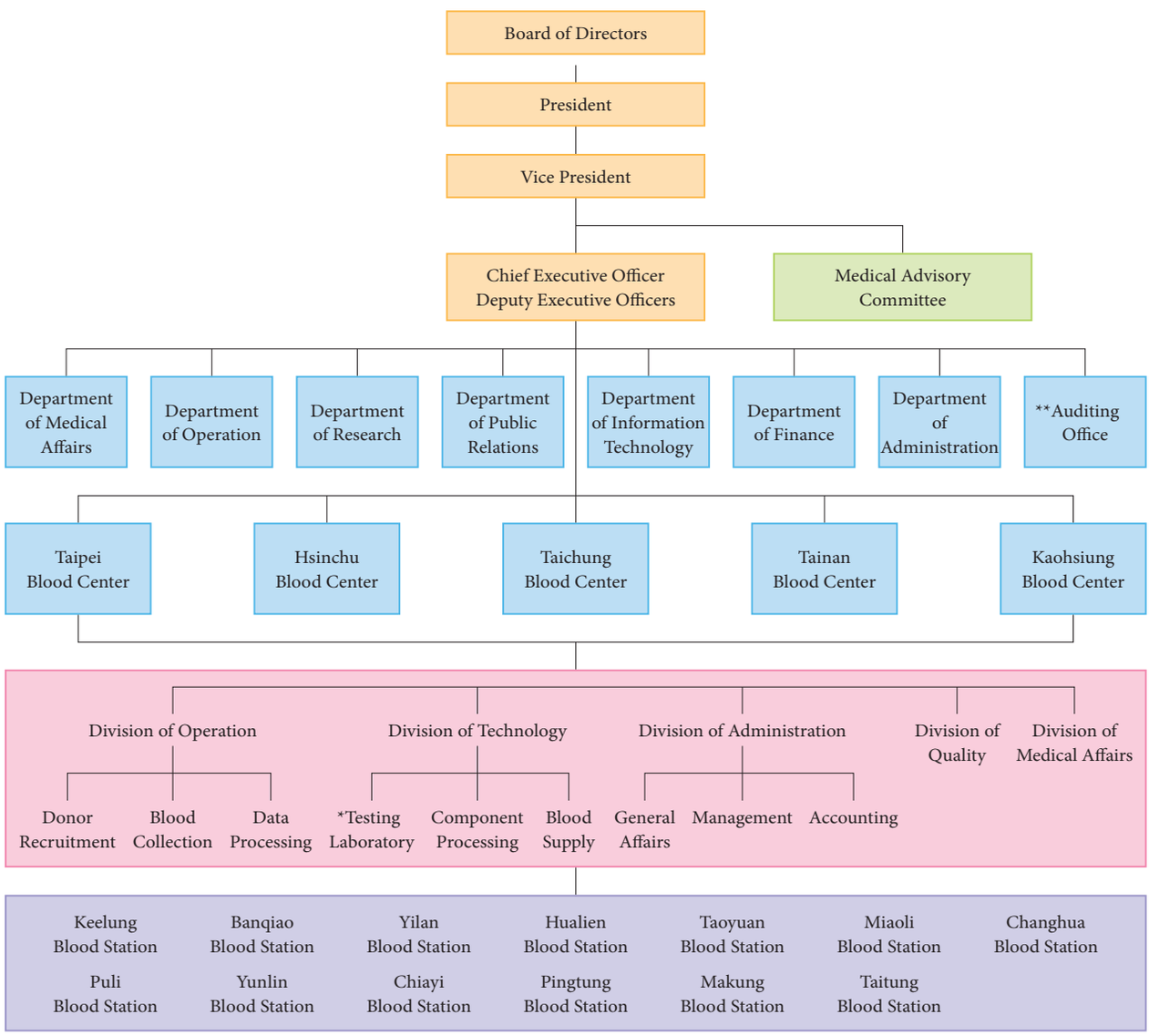
Our Vision

Adhering to sustainable development under the principles of integrity, harmony, efficiency, and innovation, the TBSF vows to become the leader in blood supply for safe clinical uses in Taiwan.

Our Missions

1. To plan and implement blood donation services.
2. To establish blood donation systems, and to conduct research and development on safe blood use.
3. To conduct research on blood science and technology.
4. To collect , laboratory-test, and supply blood for patients of public and private hospital.
5. To conduct research on the health maintenance of blood donors.
6. To conduct matters concerning the use and safety management of blood suitable for transfusion.
7. To plan and supply blood in large quantity at times of major disasters or wars.
8. To commission toll fractionation , to storage and supply domestic plasma derived products.
9. Other matters concerning blood donation and supply.

Organization



Note: * There are 2 centralized testing laboratories in Taipei and Kaohsiung Blood Center.

** As of Jan 1, 2020, the Auditing Office was set up.

History of Taiwan Blood Services Foundation (1974~2019)

1974

April • Chinese Blood Donation Association was established.

August • Taipei Blood Center was established.

1975

October • Taichung Blood Center was established.

1976

December • The Kaohsiung Blood Center was established.

1978

July • Taipei Blood Center started the production and supply of blood components, including packed RBC, washed RBC, WBC concentrates, platelets, fresh frozen plasma and frozen plasma.

1981

July • Tainan Blood Center was established.

1983

January • Taipei Blood Center introduced leukocyte and platelet apheresis.

1985

July • Human leukocyte antigen (HLA) laboratory was established.

1987

June • Hospital-based and Red Cross paid donor blood banks closed.

1988

January • Implementation of anti-HIV-I test.

1989

December • To prevent blood donations from high-risk AIDS groups and other unsuitable donors, the Blood Centers started "a confidential phone call", whereby donors could call to notify the Blood Centers if the blood donated is unsuitable.

1990

January • Chinese Blood Services Foundation which is the predecessor of Taiwan Blood Services Foundation was established.

1991

April • Hualien Blood Center was established.

December • The annual blood donations exceeded one million units, and the blood donation rate reached 5.18%.

1992

May • Hsinchu Blood Center was established.

• Implementation of anti-HCV test.

• Establishment of electronic database of red cell phenotypes.

1993

February • Introduction of HLA-matched apheresis platelets.

September • Implementation of a computer system to replace manual work of blood donation and processing.

1995

April • It is the first time, the President met the 28 outstanding blood donors in the presidential palace for annual blood donor recognition event.

1996

January • Implementation of anti-HTLV test.

1997

January • The Minister of Department of Health, Chang Po-ya and the President of TBSF Lin Kou-Sin announced to start the productions of plasma derivative products.

1998

February • Implementation of RBC irregular antibody screening test.

April • The first public umbilical cord blood bank was established. The plan was ended in January 2013.

1999

March • The Blood Centers got approval of the MCA (Medicines Control Agency) and sent source plasma to plasma fractionation plant of SNBTS (Scottish National Blood Transfusion Service).

2001

August • Consolidation of 6 blood centers' testing labs into 2 centralized labs located in Taipei and Kaohsiung blood centers.

December • The "TBSF" plasma derivative products started to supply.

2007

January • Implementation of bacteria testing for all apheresis platelets.

2009

September • The archive sample bank built in Hsinchu Blood Center was launched.

2013

January • Implementation of Nucleic Acid Amplification Testing (NAT).

2015

July • The TRALI (transfusion-related acute lung injury) prevention policy was initiated with the following two initiatives: 1) male plasma was prioritized for transfusions. 2) HLA & HNA antibody screening for female apheresis donors.

November • Implementation of cholesterol, LDL-C, and HbA1c tests every 3 years for those who have donated blood in the past 2 years and are above 40 years old.

2016

October • Implementation of the mobile social communication app LINE official account named " i-Blood " with intelligent query, personalized notification and instant push broadcast functions.

2017

February • Haemovigilance reporting system was launched.

April • Hualien blood center was reorganized and merged into Taipei and Kaohsiung blood centers.

2018

August • The new Blood Management System based on Internet Data Center was launched.

December • The universal screening of RBC Mia Antigen have been introduced.

• The TBSF hosted at the 5th APEC Blood Safety Policy Forum in Taipei.

2019

June • The singer, Miss Fang Wu, our blood donation spokesperson, composed the song to encourage the public to give blood.

November • Testing and labeling of RBC antigens C, c, E, e, Jka, and Jkb for leukocyte-reduced RBCs.

OUR PERFORMANCE

OUR PERFORMANCE

Recruitment and retention of blood donors

Since its inception, the Taiwan Blood Services Foundation (TBSF) has been promoting the concept of voluntary non-remunerated blood donation to the general public from multiple angles and expecting to actualize it step by step. In 1991, the amount of donated blood exceeded one million units for the first time, exceeding the international threshold of 5% for national blood donation rate. Thus, Taiwan has been since then ranked among advanced countries in terms of blood donation.

Involving celebrities to assist in the promotion of blood donation has always been a very important method of publicity. Many artists who know the importance of blood donation have offered their help, free of charge, in shooting advertisements or posters. All of these are extremely precious and helpful resources to us. We have recently launched the hot-blooded youth recruitment campaign under the slogan of "Young Blood " hoping to promote blood donation in the young population. For the campaign, we have invited a number of “spokespersons”, such as the talented singer-songwriter Lala Hsu (Jia-ying), the new-generation idol Pets Tseng (Pei-tzu), the new female singer-songwriter Fang Wu, and Taiwan’s fastest man Chun-han Yang. We have not only filmed promotional videos, but also used the Internet to spread the concept of voluntary blood donation. Moreover, Fang Wu has recently created a testimonial advertising song for the TBSF, hoping to use her influence to urge more people to join the ranks of blood donors.

Taiwan’s fastest man Chun-han Yang.

Former presidents of Taiwan including Lee Deng-hui, Chen Shui-bian, and Ma Ying-jiu all publicly support blood donation and encourage people to donate blood, while most of the county magistrates and city mayors are regular blood donors. Whenever there is a blood supply shortage, they always spare no effort to play a leading role in persuading people to donate blood.

We need the public to help balance the blood supply and demand. In addition to continuously advocating and educating the public so that the concept of voluntary non-remunerated blood donation can be popularized, we also try to involve the civil society, business groups, social organizations and religious groups to help us achieve this mission. Luckily, they always spare no effort to assist in launching blood donation activities across the country. In addition to regular blood donation campaigns, we also raise funds to build bloodmobiles, so that blood donors can have a more comfortable blood donation environment. All these dedications are based on the trust of the community, enterprises, and enthusiastic people in the society. Without a strong sense of mutual trust and the identification with the concept of blood donation, we cannot accumulate so many social resources for the cause of voluntary blood donation and become an exemplary model in the international community. Based on the concept of "taking from the society and giving back to the society", many enterprises help to promote blood donation activities. This not only helps us recruit blood sources, but also helps themselves enhance their public welfare image, achieving a win-win effect.

Before the Lunar New Year every year, when the weather is cold and every family is busy preparing for the coming festival, blood supply usually fall short during the long holiday period, but patients waiting for blood transmission do not have such a luxury of taking holiday at all. Therefore, we designate the one month before the Lunar New Year as the

The new female singer-songwriter Fang Wu.

The video clips for blood donation.

Blood Donation Month so as to remind ourselves that we must work even harder to reserve sufficient safe blood stocks for the holiday. Therefore, at the beginning of Blood Donation Month, we will hold a press conference in which we will not only make a summary report on the blood donation status in the past year, but also call on people to give blood. Moreover, we will host a series of regional activities to attract the attention of people, hoping that they will provide warmth in winter to help alleviate the shortfall of medical blood.

In order to connect with the world, we always follow the World Health Organization (WHO) to organize the "World Blood Donor Day" event every year to awaken the public's enthusiasm for blood donation through a series of activities. The theme of the WHO in 2019 was "Safe blood for all", which is meant to encourage countries around the world to provide safe blood for medical use under the premise of voluntary non-remunerated blood donation. We held the World Blood Donor Day press conference on June 15, 2019 with the theme of "Love and Be Loved, Thank You!" In that event, Miss Fang Wu, our new-generation blood donation ambassador, sang her newly composed song "Love and Be Loved" to symbolize the transition and the flow of love between blood donors and blood receivers; Miss Wu also asked her fans to donate blood with her on the bloodmobile at the scene. Shui Yin, a blood receiver dubbed with the title of Iron Girl, accompanied Miss Wu to donate blood as a symbol to express gratitude to all blood donors.

In 1995, we held for the first time the high-profile "Love One" event, in which 28 representative blood donors with outstanding donation merit received recognition from President Lee Teng-hui at the Presidential Office. Since then, qualified blood donors have been consulted every year. However, due to the limited space in the Presidential Office, the number of representatives is limited to 38 each year. Thus,

2019. TBSF CEO, Wei Sheng-Tang led all the young donors to swear the theme of "Love and Be Loved, Thank You!"

we ask each Blood Center to firstly divide the quota into two categories: "whole blood donation" and "apheresis donation" and then sort and select the representatives by the number of donations in descending order. As this is a once-in-a-lifetime honor and a national-level recognition, every invited blood donor attends this event in splendid attire. Obvious, this event has not only exerted a positive influence on the promotion of blood donation and social ethics, but also gives blood donors the glory to meet the head of state and to take group photos with him or her. Former presidents including Lee Teng-hui, Chen Shui-bian, Ma Ying-jeou, and the acting president Tsai Ing-wen have all received outstanding blood donors, publicly supported blood donation, and encouraged the public to donate blood. In addition, each Blood Center holds the "Annual Blood Donor Awards Ceremony" in its jurisdiction every year, to express the highest respect and gratitude in a simple but grand way to all those individuals, schools, military, institutions, associations, business enterprise groups for their outstanding blood donations.

In recent years, due to declining birthrate and aging population, the number of young blood donors is gradually decreasing, and it becomes an inevitable trend that the volume of donated blood will decline year by year, resulting in the depletion of blood sources in the future. To solve such dilemma, it is an urgent matter that we should encourage more and more young people to give blood regularly, to develop a habit in regular blood donation, and to maintain healthy lifestyles. Therefore, we have since 2015 launched the “Young Blood ” recruitment campaign under

Duncan campaign poster.

the slogan of "I am young! I donate blood!" It is hoped that young people aged 17 to 20 can come to donate blood 10 times within 4 years, so that they become regular blood donors, seeing blood donation as part of their life and keeping on healthy lifestyles so as to give safe blood to help others. As of June 13, 2019, the cumulative number of participants reached 274,658, among whom 293 whole blood donors, including 161 boys and 132 girls, have achieved the goal of donating 24 units for boys and 16 units for girls during the four years. Held on June 15, 2019 was a press conference for the "Love and Be Loved, Thank You!" event in which several representatives with the highest number of blood donations were invited to share their experience and to encourage more people to donate blood. In addition, to call on more passionate youths to come out to donate blood, we have also cooperated with Duncan, an online graphic creator with 3 million followers, to hold nation-wide campus events dubbed as “Dun Ni Can Juan Xue” – literally “when you are willing to donate

blood" – at colleges, universities, high schools and vocational schools around the country. In September, 2019, when school opened, each Blood Center sent out its own dedicated "Duncan" bloodmobile to advocate blood donation among the first-time donors, to whom a set of limited edition paper tapes was given as an exclusive souvenir. This small gift succeeded in arousing young students to discuss the topic of "Dun Ni Can Juan Xue". Duncan also invited his friends from all walks of life to promote the subject matter on the stage, hoping that their influence, as artists and Youtubers, can urge more young people to pay attention to blood donation.

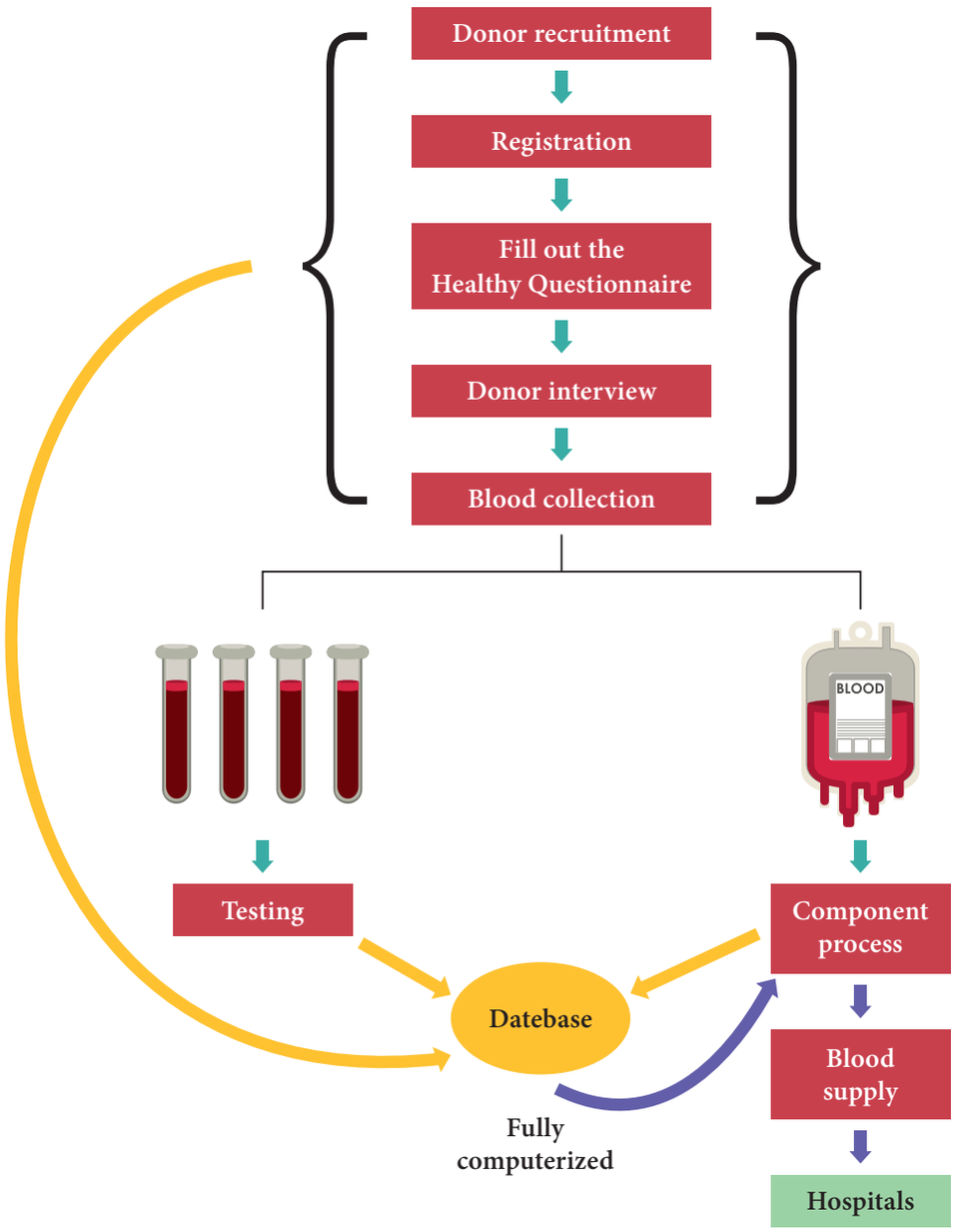
"Good Hearts and Good Hugs", a Hotai Motor-sponsored public welfare microfilm to promote blood donation.

The "Er Mei" blood donation mobile stationed in Ximending is the first anime blood donation mobile in Taiwan.

The blood donation career is built upon public engagement step by step. We must make good use of resources from all walks of life to promote blood donation activities, maximize the effectiveness and impact of limited resources, and make the most effective use of donated medical blood. With changes in lifestyle, social structure, and media ecology, coupled with the development of the Internet and the popularization of digital vehicles, we must also continue to upgrade and strengthen the power of publicity with the times. Therefore, the TBSF pioneered in 2016 the first LINE official account named " i-Blood " through which intelligent query, personalized notification and instant push broadcast are provided.

When an emergency or a disaster occurs and a large amount of specific blood type is needed, we can send through this LINE official account a request to those qualified blood donors with such a specific blood type in a specific region, so that people in an emergent need of blood can get help in the shortest possible time. After a user receives the message and if he or she wants to check whether he or she meets the criteria for blood donation, or where the nearest blood donation point is, he or she can make an inquiry through the LINE official account. As this LINE official account addresses all the needs of blood donors, it doubles up our mobilization and diffusion powers.

Blood operation process



The production of each bag of blood results from regional blood donation activities held after the evaluation and planning by the Donor Recruitment Section of the Blood Center. The personal information of each blood donor is filed and stored after the blood donor completes the blood donation registration form, the physical examination interview, and the blood collecting process. Then, each tube of collected blood is sent to the Laboratory for viral, biochemical, & blood-type testing. The examination results are automatically delivered to the computer for storage. Each blood bag is sent to the Blood Component Processing Section to be further processed as each kind of final plasma product, such as packed RBCs, platelets, and so on. Finally, each qualified blood bag will be sent to the Distribution Section based on the needs of the hospital.

Blood donation operation process

A “Private Interview Space” is arranged in each blood center, blood donation room, and blood donation van so that each blood donor can honestly complete the survey and relevant questions in private surroundings. The following is an introduction to the blood donation process:

A photo ID, such as an Identification Card of Taiwan is needed to verify the identity of a blood donor during the blood donation process. In 2019, more than one million people donated their blood so the blood supply reached approximately 6 billion milliliters.

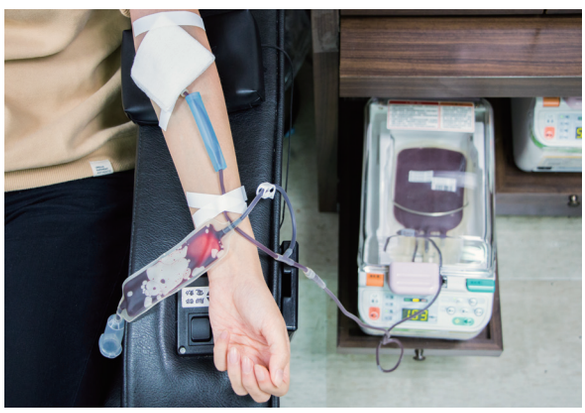
Inside the blood donation van, each seat is equipped with a monitor that plays a health lesson video about blood donation to remind blood donors of the importance of blood safety.

Each person needs to fill in the blood donation registration form, which in addition to basic information, also asks questions concerning recent individual health status and whether there is a high risk of sexual behavior and other issues that need to be answered honestly. Lastly, each person needs to sign the form.

The “Private Interview Space” is arranged to enable blood donors to honestly answer the questionnaire and related questions in private surroundings.

In addition to measuring weight, body temperature, blood pressure and hemoglobin, a staff will provide health education about blood safety and ensure that the blood donor is qualified. This is the first step for blood safety check.

The “Conscience Call Back” sheet can remind blood donors to call the blood center back via the phone number on the sheet to ensure appropriate follow-up treatment of the blood can be carried out if they have not told health professionals of high-risk behaviors or any issues that they think may affect the safety of the blood.



During the blood collection process, each blood bag is put in the automatic oscillator for weight measurement, and the quantity of collected blood is monitored to protect the safety of blood donors.

Each blood unit will have four tubes reserved for each test. Three of them are for viral, biochemical, blood-type testing and the other one is for archieve sample.

The collected blood will be temporarily stored in a temperature-controlled container to maintain quality.

In the bright and open blood donation rest area, snacks like cookies and milk are served. Magazines and TVs are also provided in the area so that blood donors can relax after the process.

The collected blood and tubes will be delivered to the blood center by professionals in dedicated incubators and trolleys.

The following table lists relevant criteria and conditions for blood donation:

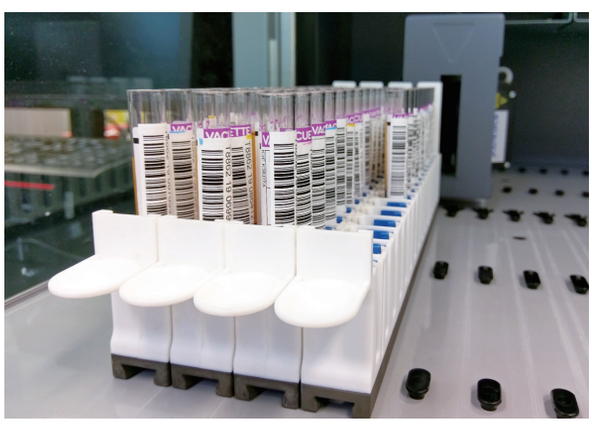
	Whole blood		Platelet apheresis	
Volume	250 ml	500 ml	1 unit	2 units
Age	17-65	17-65	17-65	17-65
Body weight	male: 50 kg female: 45 kg	60 kg	60 kg	60 kg
Oral Temperature	35.5~37.5°C			
Hemoglobin	male: 13g% female: 12g%			
Platelet count			180,000/uL	Trima: 250,000/uL MCS: 300,000/uL Amicus: 250,000/uL
Interval	2 months	3 months	2 weeks	
Max donations per year	male: 1500 cc female: 1000 cc		24 donations	

Blood testing

To ensure that the quality of examination is consistent and labor costs are kept low, laboratory testing is mainly performed in two sites. Testing Sections in Taipei Blood Center and Kaohsiung Blood Center are in charge of nationwide blood examination operations. Currently, standard examination items include: ABO blood type, Rh blood type, irregular antibody screen, ALT, HBsAg, anti-HCV, anti-HTLV, anti-HIV, syphilis, and viral nucleic acid testing (HBV, HCV, and HIV-1). The examination operating procedure is as follows:

Daily inspection operations can accommodate up to 6,000 specimens using fully automated testing equipment. Test results are delivered via an exclusive network to each blood donation center to meet the goals of speed, accuracy, and safety.

The specimen will undergo a centrifugal operation process for the convenience of fully automated testing operations.



After tubes are ranked in order, a fast fully automated barcode scan is performed to accurately and safely obtain information.

A variety of automated test equipment

Freedom EVOlyzer:

used to test HBsAg, anti-HCV, anti-HTLV, anti-HIV and so on. To ensure test sensitivity, British working standards are used for each test run.

Beckman AU5800:

Fully automated ALT, Cholesterol, and LDL-C test equipment.

Beckman PK7400:

Fully automated blood type, syphilis test equipment, and irregular antibody screening.

TIGRIS:

Fully automated viral nucleic acid test (HBV, HCV, and HIV-1)

In 2016, the TBSF sent staff to the Kanto-Koshihisa Blood Center, Japanese Red Cross Society, to study the production of monoclonal antibody reagents for rare blood types and then produce the hybridoma cell line that can stably subculture and secrete the antibody of Anti-Mia.

Since December 5, 2018, the TBSF has expanded its tests on the Mia antigens, and up to now more than 130,000 Mia antigen-negative blood donors have been tested. All the Mia antigen test results are indicated on each bag of red blood cell products, so that if a patient needs to transfuse the antigen-negative blood products, the hospital can directly select the right blood products according to the labeling on the blood bags and immediately inject them to the patient. The labeling of Mia blood group antigen on each blood bag is not only the first new record in the world, but also helps the hospital blood bank to effectively improve blood transfusion safety.

Using the theme of "Comprehensive and highly efficient laboratory testing of donor blood to ensure Transfusion Safety in Taiwan of Taiwan Blood Services Foundation" to participate in the accreditation for 2018 SNQ (Symbol of National Quality) in the category of "Peripheral Medical - Public Welfare Service Group," the TBSF passed the evaluation to win the certification. Later, the TBSF was even awarded "Bronze Award" in the National Biotechnology and Medical Care Quality Award.

Blood donor services

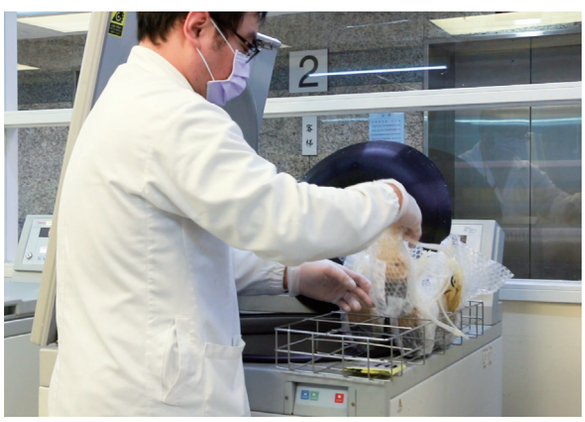
In addition to the routine regular blood donation testing, since November 1st 2015, our Foundation has also performed three tests, namely, Total Cholesterol, LDL-C, & HbA1c, every three years for consenting blood donors who are older than 40 years old and have donated blood more than once within the past two years. The BMI of a blood donor is shown in the test report. Blood donors who have shown a positive response to hepatitis (HBV and HCV) tests are provided with counseling (referral) messages. Furthermore, for blood donors who are older than 40 years old and have donated blood more than once within the past two years, if they have donated whole blood more than 100 times or apheresis blood more than 500 times, they can receive one free abdominal ultrasonic examination in one of our Foundation's appointed hospitals.

Component processing

After non-remunerated blood donated is returned to the blood donation center, it will go through the counting process, computer input, blood component processing, checking and bacteria testing (Apheresis platelet) to be made into a variety of final blood products. These final products will be supplied to each hospital for patient blood transfusions after undergoing strict blood testing processes.

Generally, blood will be sent to the Component Process Section within 8 hours of blood collection.

The number of blood units is counted and recorded in the computer.



Based on different centrifugal criteria, different final blood products can be produced.

Blood can be separated into plasma in the upper layer and red blood cells in the lower layer based on the principle of different blood composition density. The automatic blood components extractor can squeeze plasma out into adjunct bags to be sealed.

Using a leukocyte reduction filter or inline filtration blood bags, white blood cells triggering an immune response can be removed to make the blood safer for transfusion recipients.

Packed RBC is sealed into four sections for blood group testing and cross matching in the future. Each blood bag tubing has a unique blood section number for further tracing, checking, and testing.

Every blood bag has a unique barcode and blood-type label for further tracing, checking, and testing.

Qualified blood products are put in blue baskets while unqualified ones are put in red baskets; while ones with quarantined blood products are put in green baskets, and ones that have not been examined are in yellow baskets.

Separated plasma and each final product needs to be carefully placed neatly to avoid stacking for uniform freezing.

Each qualified component needs to be labeled and placed neatly in blue baskets. These items are then managed in the warehouse according to different temperature conditions.

Other matters

Each unit of apheresis platelets is supplied only after passing bacteria testing to ensure the safety of transfusion recipients.

The preservation time, temperature, and material cost for each final product are listed in the table below:

Component	Expiration	Storage temperature	Cost (Dollar/ unit)
Packed RBCs	35 days	1~6°C	475
Washed red blood cells	24 hours	1~6°C	675
Deglyceride Frozen RBC	24 hours	1~6°C	1,375
PLT Concentrate	5 days	20~24°C	300
White blood cell concentrate	1 day	20~24°C	300
Apheresis platelets	5 days	20~24°C	4,300
Fresh frozen plasma	1 year	< -20°C	300
Frozen plasma	5 years	< -18°C	200
Cryoprecipitates	1 year	< -20°C	150
Whole blood	35 days	1~6°C	575
Leukocyte-Reduced RBC	35 days	1~6°C	925
Pre-storage Leukocyte-Reduced Apheresis Platelet	5 days	20~24°C	7,300

Distribution

The management, allocation, and transportation of blood for medical use are monitored based on the strictest standards in the five blood donation centers. The blood storage warehouse in each blood donation center sets different conditions for preservation temperature, environment, and equipment for different blood products. Blood supplies for hospitals are always available 24 hours. Specific refrigerator vans for blood freezing/storage are responsible for the allocation and transportation of blood for medical use in each hospital blood bank.

Current blood supply channels include five blood centers, 13 blood stations, and several proxy-supply hospitals.

Each blood storage warehouse of a blood center is equipped with a central temperature monitoring system to monitor blood temperature 24 hours/day. In addition to written documents, relevant information about temperature is filed and stored in electronic files so the records are more complete and accurate, and both the blood items and the equipment are safer and more secure. Each blood transportation vehicle of a blood donation center is equipped with the latest cold-storage/freezing system to monitor whether the temperature is stable and maintained within the standardized range so that the quality of each blood item can be ensured.

Blood supplies are currently classified into two categories: individual and group. Individual blood supply refers to the approach for an individual to get blood from the blood center when patients in hospitals that neither have blood banks nor a signed group-supply contract for the need of a blood transfusion. Group blood supply refers to hospitals that have blood banks or have signed a "group-supply contract" with a blood center. With this approach, the blood center will regularly deliver blood products needed to each hospital for storage so that blood is ready for transfusion at any time.

Meanwhile, each blood center has established a list of blood donors filed by red blood cell antigen. If a blood usage emergency occurs, the center will contact blood donors for immediate support.

The blood supplies of each blood center are available to hospitals 24 hours/day.

The quantity of stored blood in each blood center needs to be maintained at more than seven days for safety concerns. Four to seven days of storage are a bit lower, while less than four days of storage is considered dangerous. There is a safe storage quantity signal display set up on the official website of Taiwan Blood Services Foundation so that people can check the latest information of each blood donation center.

Each kind of final blood product to be dispatched to hospitals will be checked by computer one-by-one to ensure safety.

Based on the needs of each hospital, final products are put into boxes with clear labels for blood-type and blood item name.

Each packaged box of blood items will be put into a dedicated incubator bags.

They are put in specific transportation vehicles according to the temperature requirement of the blood item with temperature-monitored equipment and are ready to be delivered to each hospital.

In line with the health policy of "National blood used by the nation", our Foundation started to collect source plasma in January 2007 to ease the difficult situation of a lack of blood preparations in Taiwan. The collected blood plasma's original material is delivered by batch to the CSL plasma factory in Australia to be further processed into blood derivatives. Four blood derivatives of the TBSF are made: 20% Human albumin for Intravenous Use, Human Immunoglobulin for Intravenous Use, 250IU Blood Coagulation Factor VIII Concentrate, and 500IU Blood Coagulation Factor IV Concentrate. Among them, TBSF Human Immunoglobulin for Intravenous Use is the main supply in Taiwan and can already achieve the 100% supply-to-demand goal.

Reference laboratory

As medical treatment improves, the demand for each subtype of blood clinically provided to patients receiving long-term blood transfusion also increases. Some blood types are quite rare. We continue to provide red cell testing services, transfusion reactions, and transfusion infection survey services, as well as source red cell to produce the testing reagents for pre-transfusion antibody screening. The clinical safety of blood transfusion is ensured through the following actions,

1. To provide HLA- or HPA-matched platelets.
2. To supply antigen-negative red blood cells (mainly E-, c-, Mia-) .
3. To supply predominately male donor plasma and the screening for leukocyte (HLA & HNA) antibodies among female platelet donors.

Research

We completed the initial study of the Dengue fever outbreak in Southern Taiwan in 2015, and these reports were presented at the ISBT in 2016.

Regarding blood donor management, we have analyzed the following repeat-donation behavior of blood donors with increasing willingness to donate from Northern Taiwan due to significant events, namely the relevant factors influencing the quantity of the blood donation group, the corresponding construction for a predictive model of blood donation quantity, the effect analysis of introducing "Encouraging blood donors to donate fixed locations on regular weekdays" to the blood donation forecasting model, and the research of sleep quality and discomfort due to blood donation of blood donors from Eastern Taiwan. Regarding blood quality, the quality of packed RBCs returned and proxy-issued by hospitals has been discussed. With regard to the data bank, we accumulate, plan and organize huge amounts of data of blood donation/supply every year so we hope that such data may benefit relevant research.

To improve blood quality and increase blood safety, we continue our research programs. All research programs have been reviewed by the IRB (Institutional Review Board), and the IRB of our Foundation has passed the audit by the Ministry of Health and Welfare. Our research results are primarily recognized by blood transfusion medical experts and published in academic journals and at medical associations of blood transfusion both internationally and domestically.

Blood transfusion safety

To assist the hospitals in seeking possible causes of blood transfusion adverse reactions, we had established of Taiwan Haemovigilance System with Taiwan Society of Blood Transfusion in 2016, which five hospitals (namely National Taiwan University Hospital, Taipei Veterans General Hospital, Far Eastern Memorial Hospital, Linkou Chang Gung Memorial Hospital, and Tri-Service General Hospital) have taken the lead in demonstrating how to send notifications since 2017. In the year of 2019, 35 hospitals had been qualified for notification, with a total of 3,058 notified cases. It is expected that after the system is gradually expanded to all the hospitals in Taiwan, we will be able to collect and analyze blood data from patients, provide better blood transfusion strategies to solve those issues related to blood donation and transfusion, and help to improve blood transfusion safety.

Furthermore, to reduce the risk of transfusion-related acute lung injury (TRALI), the policy of supplying male-donor-predominant plasma has been implemented since July 11th, 2015. Female blood donors for apheresis donation must pass the leukocyte antibody screening, which has led to the reduction in donations of antibody-positive blood. Therefore, more protection is provided for our blood supply. In addition, medical doctors at our Foundation actively hold medical lectures about blood transfusion in each hospital to advocate the concepts of "Blood transfusion adverse reactions and preventive procedures", "Blood component therapy-usage of pre-storage leukocytes reduced blood components before blood transfusion", and "Proper and effective blood transfusion", "Taiwan Haemovigilance System and Practice". These concepts can help to reduce the possibility of patient injury caused by blood transfusion, improve recovery, and reduce hospitalization costs so that the medical quality of blood transfusions can be promoted even further.

International exchange and training plan

Exchanges with other nations through active participation in international conferences and acquiring relevant new knowledge not only provides an important reference for every aspect of improvement but also serve as important channels for better understand of international situations.

From November 25 to 28, 2019, the Hong Kong Red Cross Blood Transfusion Service dispatched 2 Advanced Practice Nurses to Taiwan. They made a study trip to the Taipei Blood Center and the Kaohsiung Blood Center to learn about the recruitment of blood donors and the process to collect blood. They also visited the blood donation rooms, fixed site bloodmobiles and outgoing blood donation sites.

A delegation from South Korea visited the Ministry of Health and Welfare on the morning of December 16, 2019. TBSF CEO, Wei Sheng-Tang went to the Department of Medical Affairs to report on the agenda of blood donation and supply. From the afternoon of December 16 to 17, the delegation visited our Taipei Blood Center to

the Hong Kong Red Cross Blood Transfusion Service visited Taipei Blood Center bloodmobile.

learn some lessons focusing on the recruitment of blood donors, the blood safety management system, GMP, and other topics.

To strengthen the interaction and the mutual learning between Taiwan and mainland China, our Foundation has started the "Health professionals of blood donation & blood supply" training class, which covers topics including recruitment of blood donors, blood collection, testing and blood composition supply since March 2015. We held 1 training sessions in 2019 with 4 people from China (the Zhejiang Blood Center) participated in the training course.

Information business and network security

Our Foundation has used the previous blood donation/supply management information system for more than a decade. Considering the assessment and concern of future blood donation services, the improvement of internal operational processes, blood safety, and quality control, our Foundation have completed the updated blood management information system and formally launched it online at August 8th of 2018. We hope to take advantage of these computer technologies to attain our digitalized, paperless, and automation goals to promote both operation quality and blood donor services.

To strengthen the prevention of malevolent software spread by new blackmail software via webpages or e-mail, we regularly invite

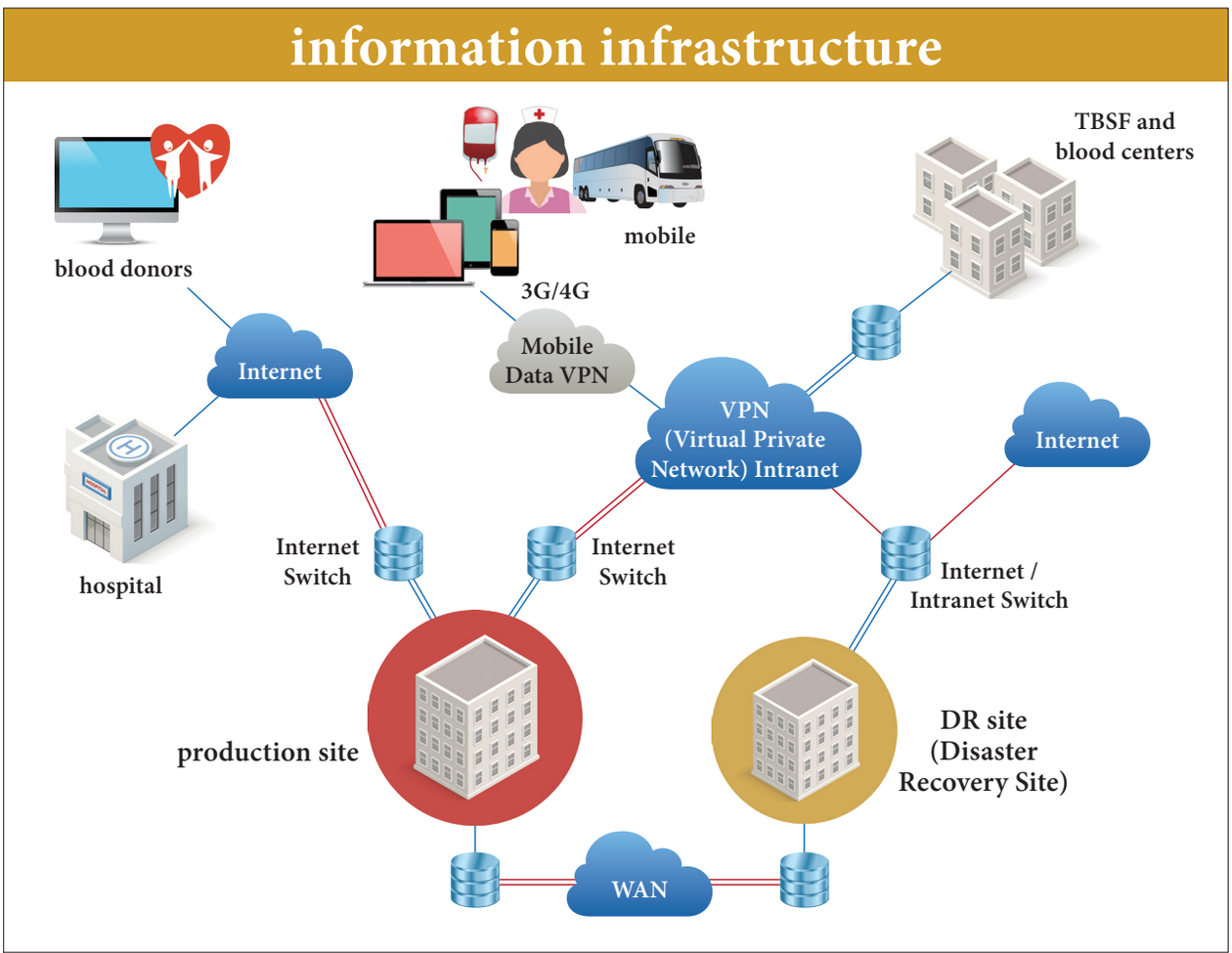


Illustration: Our Foundation provides the internet framework for the blood donation/supply system. Via a high-speed internet cable and wireless transportation, the information of blood donors can be checked quickly and accurately at each blood donation site.

professional lecturers to give educational training to all the staff at each blood donation center, in addition to daily updating of computer viral protection software codes. We hope to protect the personal information of blood donors, employees, and internet friends in a highly standardized way through everyone's efforts and the monitoring by the personal information management committee. To increase complete network efficiency and effectiveness and the safety of computer information, we conduct risk assessments of information assets on information facilities and data. The risk classifications are all controlled in the range of low risk. In March 2016, the AD (Active Directory) web domain and virtual platform setup project was launched to establish and integrate the internet service management framework of activity contents at our Foundation and blood donation centers.

The system framework of the LINE interactive application platform adopts Gateway and Firewall to separate the LINE OA server from the backstage management server and database to ensure the safety of blood donor information. The backstagse function of the system can execute

all automatic displays and accurately display to respective blood donors for blood donation activity broadcasts or individual blood donation invitations. In the future, more functions will be developed for the purpose of promoting blood donations.

To ensure computer information security, the TBSF has not only updated its anti-virus software virus codes this year but also established the Symantec Messaging Gateway (SMG) to strengthen the mail functions in filtering malware, web sites, viruses, and so on. When an attached file is identified by the system as malware, the attachment to the email will be automatically deleted by the system.

New system online, building a smart management donation blood supply process

The TBSF's newly customized information system was finally launched on August 8, 2018 after undergoing the process of system analysis, program writing, unit testing, integration testing, data conversion, parallel testing, environmental construction, and education and training.

In operation from 1999 to 2018, the original donation and blood supply system has existed for nearly 20 years. As a result, all its software and hardware were no longer able to carry and calculate millions of pieces of data. In the face of the leap forward in digital technology and the need to update many functional requirements, the TBSF has since 2015 fully re-evaluated its user requirements, network architecture, programming language, and database. Interviews and planning were carried out across the entire line of blood collection, recruitment, testing, and component, blood supply, medical services, quality management and work processes. In addition, online blood donor appointments, filling forms, inquiry systems, and hospital network operating systems were developed. In order to build a system that meets the needs and is in line with the times, the TBSF has invested a lot of manpower and time to plan this highly automated blood management information system and applies cloud technology to fully upgrade the software and hardware devices and uses the network and digital technology to integrate the workflows and services from the system side. It is expected that the system developed this time will enhance the consistency in work performance, the rigor in quality control and the service efficiency.

The TBSF has not only overcome the overwhelming challenge in transferring the information on blood donors that has been accumulated for more than 40 years to the new system, but has also incorporated the databases originally scattered in the blood donation centers across the country into the era of cloud synchronization and virtual and real integration. In the part of the blood donation process, the TBSF has used the cross-platform APPs in the cloud technology to import by a single click the blood donor's data into the database, making the work and service processes even more rigorous and smoother. All high-end information devices are placed in the professional IDC (Internet Data Center) computer rooms, so as to synchronize remote backup and improve system stability and availability.

The most significant change for blood donors is the high degree of electronization of the process and the simultaneous uploading of the blood donor data to the database. After a blood donor logs in the system, he or she can key in through a tablet the blood donation registration form and the health questionnaire and then confirms his or her personal information by a digital signature. As this data collection process is digitized and can be carried out online in advance, blood donors do not waste time in waiting for the registration and filling the form on the spot. This paperless movement is not only more environmentally friendly but also more convenient in that a blood donor can either insert his or her health insurance card or read the barcode on his or her ID card to get his or her name and other personal information, accelerating the data display time and replacing the manual operation with automation for double certification to greatly reduce human errors.

It is particularly worth mentioning that the health questionnaire is designed to be more rigorous. This is to strengthen blood safety management by linking a donor's reply to each question in the front-end health questionnaire to each of the blood products and the control code of donors in the blood management information system. If any condition not suitable for blood donation is triggered, the system will automatically intercept the blood donor and trace back all the blood products in the past according to the conditions set by the system, forming a completely monitored protection network in the blood safety management.

In order to shorten the waiting time for the blood donors, the new Blood Management Information System provides an appointment service for making blood donations. Those who donate whole blood can make appointments in advance within one month, and the system will take the initiative to remind the donors by email 2 days before the appointment date. Those who donate blood by apheresis can make 2 appointments within a month, but if your blood donation conditions are not met, the system will suspend your appointment for blood donation.

In the "Donor Special Zone" system, you can check the previous blood donation records, the next donation date, the records of praise and recognition, and even download the blood donation certificate online. All of these operations can be done not only on a personal computer, but also on your mobile phone or tablet. Now, the processes and services before and after blood donation are more convenient, and closer to the donors, making blood donation a convenient and simple good thing!

For the hospitals, we have also constructed a "hospital network operation platform" on the system. Not only can the hospital blood bank directly subscribe to various required blood products through the platform, but it can also answer in the system such information as blood uses, blood transfusion investigation, blood consultation application, etc. This horizontal integration of the hospital's blood and blood supply operations improves the response efficiency, making the two-way management of

blood products more rapidly and more reliably. It not only provides better and more efficient services for the hospitals, but also improves the blood quality for medical uses.

At the beginning of the launch, people may feel a little bit unaccustomed, but in order to improve the overall quality for the supply of blood and blood products through the efficient digital network and cloud technology, people are urged to support the smart blood information management system so as to create a highly efficient mechanism for blood donation and supply service.

Information security issue is never ending

After the new information system was launched, we have installed the information security system on the Gateway of the TBSF main office and the end points of each of the TBSF Blood Donation Centers so as to strengthen information security and meet the requirements of the regulations.

To ensure the security of TBSF computer information system, we need not only to continuously update the antivirus software, but also to establish the Symantec Messaging Gateway (SMG) to enhance the filtering of malware and virus from the email and URL system. When the system judges an attachment of an email to be malicious software, the email attachment will be deleted automatically by the system.

We conduct information asset risk assessments on information equipment and materials every year and control the possible risk levels to a low risk range. The enhancement of information security requires a high degree of cooperation from all our colleagues. As everyone must have a correct concept, we hold annual all-round education and training to give lectures and conduct assessments and continue to deepen the publicity of security issues, so that our colleagues can collect, handle and utilize personal information according to relevant laws, administrative orders or internal norms. We also send letters to our subcontractors, requesting them to conduct on-site audit on personal information management for the printing of inspection reports that we outsource to them, and no major defects have been found so far. We also regularly convene the Personal Information Management Committee to examine how effectively each blood donation center manages its personal information in a particular year. It is hoped that while strengthening the information security management, we can also protect the private information for our blood donors and internal colleagues.

Reward records

1992

Gold Medal of Times Advertising Awards in the Corporate Charity category

Award-winning work: "Jackie Chan and Blood Donation" TV Ad

1992

The 1st National Public Welfare Award

1993

"Creator of History" Charity Model Award

1995

Honorable Mention of the 2nd Best Advertising Slogan Awards

Award-winning work: "Give Blood, Save Lives."

1996

Bronze Medal of the 3rd Best Advertising Slogan Awards

“I thank you even though I don’t know who you are!"

1999

National Public Welfare Award

2008

Internet Activity Award Contribution Award

Website Vitality Award

2018

The certification of SNQ (Symbol of National Quality) and Bronze Award in the National Biotechnology Clinical Quality Award.

The Theme: "The comprehensive and highly efficient laboratory testing of donor blood to ensure transfusion safety in Taiwan"


SNQ國家品質標章證書
CERTIFICATE OF SYMBOL OF NATIONAL QUALITY
台灣血液基金會
全方位、高效能的捐血檢驗 守護國人輸血安全
參加 2018 SNQ 國家品質標章 醫療選邊類 / 公益服務組 評鑑活動，
經大會評審委員會評選，決議通過認證，特此證明。
有效期限：中華民國 108 年 12 月 31 日止
This is to certify that **The comprehensive and highly efficient laboratory testing of donor blood to ensure transfusion safety in Taiwan** of **Taiwan Blood Services Foundation** has been awarded The Symbol of National Quality in the **Public Service Group, Medical Periphery Category** by Research Center for Biotechnology and Medicine Policy.
Date of Validity: Until Dec. 31st, 2019
Convener **Wei-Jan Chen**
Founder **Jin-Peng Wang**
中華民國 一〇七年十一月三十日

2017

The certification of SNQ (Symbol of National Quality) and Silver Award in the National Biotechnology Clinical Quality Award.

The Theme: "The Pioneer of Safe and Sufficient Blood Supply"


SNQ國家品質標章證書
CERTIFICATE OF SYMBOL OF NATIONAL QUALITY
醫療財團法人台灣血液基金會
安全醫療用血來源的領航者－台灣血液基金會
參加 2017 SNQ 國家品質標章 醫療選邊類 / 公益服務組 評鑑活動，
經大會評審委員會評選，決議通過認證，特此證明。
有效期限：中華民國 107 年 12 月 31 日止
This is to certify that **The Pioneer of Safe and Sufficient Blood Supply-Taiwan Blood Services Foundation** of **Taiwan Blood Services Foundation** has been awarded The Symbol of National Quality in the **Public Service Section, Medical Periphery Category** by Institute for Biotechnology and Medicine Industry.
Date of Validity: Until Dec. 31st, 2018
Convener **Wei-Jan Chen**
Founder **Jin-Peng Wang**
中華民國 一〇六年十二月八日

2019

The certification of SNQ (Symbol of National Quality) and Bronze Award in the National Biotechnology Clinical Quality Award.

The Theme: "Guardian angel for patients in southern Taiwan, remote areas and offshore islands --Kaohsiung Blood Center"


SNQ國家品質標章證書
CERTIFICATE OF SYMBOL OF NATIONAL QUALITY
醫療財團法人台灣血液基金會高雄捐血中心
南台灣、偏鄉、離島病患用血的守護神 --高雄捐血中心
參加 2019 SNQ 國家品質標章 醫療選邊類 / 公益服務組 評鑑活動，
經大會評審委員會評選，決議通過認證，特此證明。
有效期限：中華民國 109 年 12 月 31 日止
This is to certify that **Guardian angel for patients in southern Taiwan, remote areas and offshore islands --Kaohsiung Blood Center** of **Taiwan Blood Services Foundation, Kaohsiung Blood Center** has been awarded The Symbol of National Quality in the **Public Service/Medical Supplies & Services Category** by Research Center For Biotechnology and Medicine Policy.
Date of Validity: Until Dec. 31st, 2020
Convener **Wei-Jan Chen**
Founder **Jin-Peng Wang**
中華民國 一〇八年十二月五日

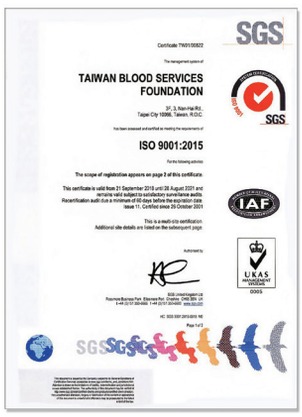
Quality assurance

1999

Approval of the Medicines Control Agency (MCA, UK) to meet their standards of the blood quality.

2001

Implementation of the ISO 9001 quality system.


SGS

TAIWAN BLOOD SERVICES FOUNDATION

ISO 9001:2015

2006

Approval of the Therapeutic Goods Administration (TGA, Australia) to meet their standards of the blood quality.

2010

The testing laboratories accredited by the Taiwan CDC for syphilis, HIV and HCV.

2012

ISO 15189 laboratory accreditation.

2012

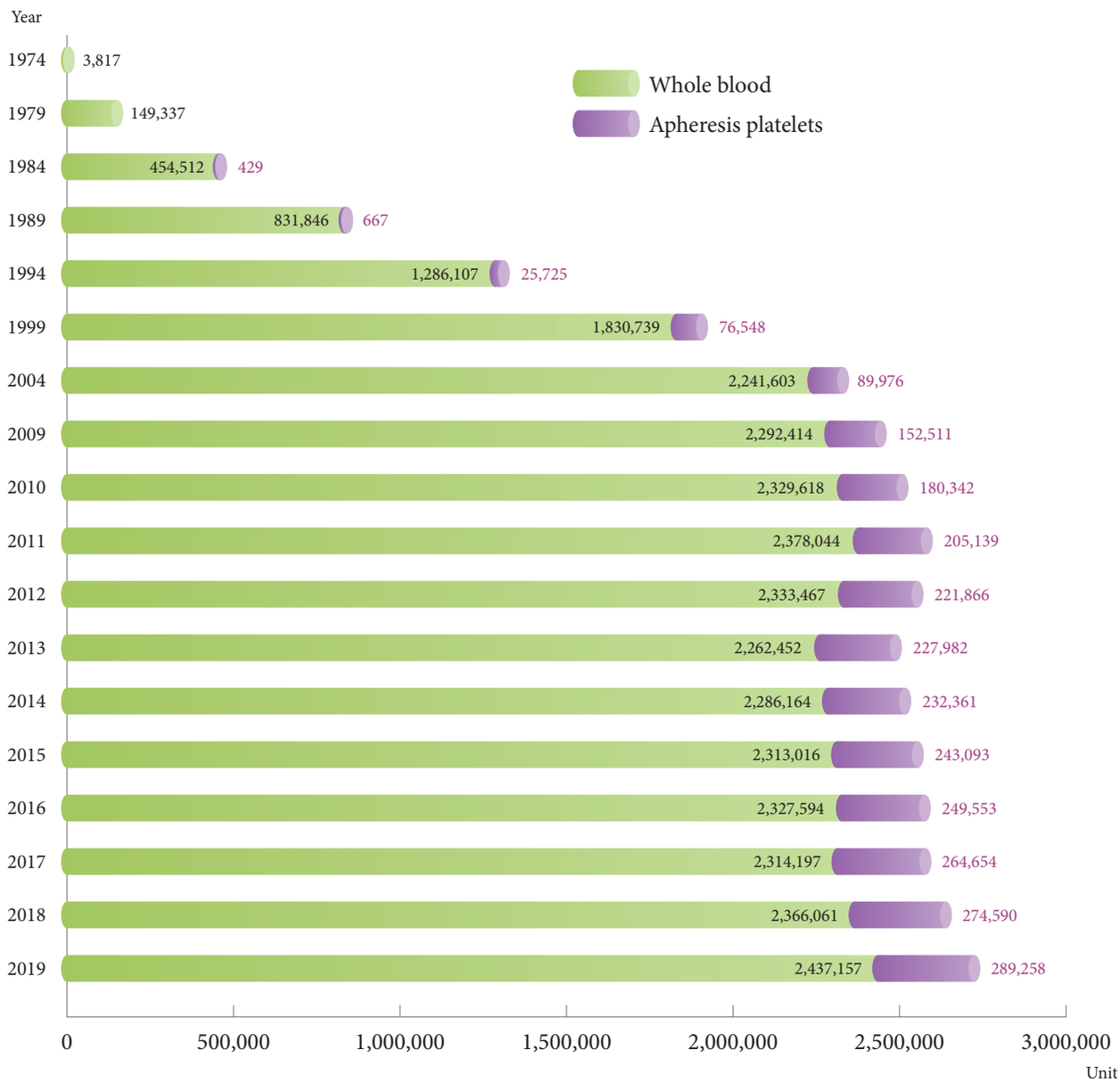
GMP manufacturing facilities licensed by the Taiwan Food and Drug Administration (TFDA).

2018

GDP Distribution facilities licensed by the TFDA.

STATISTICS

Annual blood collection, 1974-2019



Note: 1. 250ml per unit for whole blood and 500ml counts for 2 units.

2. Single adult dose per unit for apheresis platelet and double dose counts for 2 units.

Annual blood collection by blood centers, 1974-2019

Unit

Year \ Blood centers	Taipei Blood Center	Hsinchu Blood Center	Taichung Blood Center	Tainan Blood Center	Kaohsiung Blood Center	Hualien Blood Center	Total
1974	3,817	0	0	0	0	0	3,817
1979	92,730	0	24,723	0	31,884	0	149,337
1984	187,362	0	101,219	60,123	106,237	0	454,941
1989	312,578	0	231,199	119,179	169,557	0	832,513
1994	406,604	161,765	252,889	173,297	252,897	64,380	1,311,832
1999	553,940	266,497	378,516	257,309	360,060	90,965	1,907,287
2004	642,945	333,898	489,079	321,441	437,362	106,854	2,331,579
2009	718,841	326,619	487,230	382,251	420,616	109,368	2,444,925
2010	738,274	343,531	500,298	389,938	423,333	114,586	2,509,960
2011	753,611	347,807	507,104	405,553	453,274	115,834	2,583,183
2012	752,304	343,225	504,362	405,409	434,767	115,266	2,555,333
2013	737,642	336,853	487,170	401,442	414,876	112,451	2,490,434
2014	743,926	337,408	485,767	409,314	431,181	110,929	2,518,525
2015	744,106	355,943	498,956	418,909	423,721	114,474	2,556,109
2016	771,779	364,244	507,973	421,457	447,145	64,549	2,577,147
2017	841,241	360,146	520,231	420,428	436,805	-	2,578,851
2018	869,019	373,358	536,306	424,617	437,351	-	2,640,651
2019	894,031	393,568	551,889	426,291	460,636	-	2,726,415

Note: 1. Total blood collection units: calculated by both whole blood and apheresis collection.

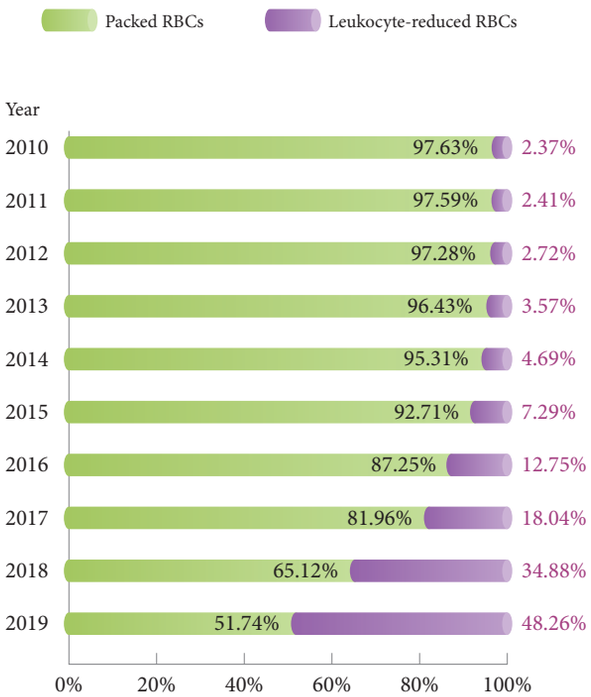
2. 250ml per unit for whole blood and 500ml counts for 2 units.

3. Single adult dose per unit for apheresis platelet and double dose counts for 2 units.

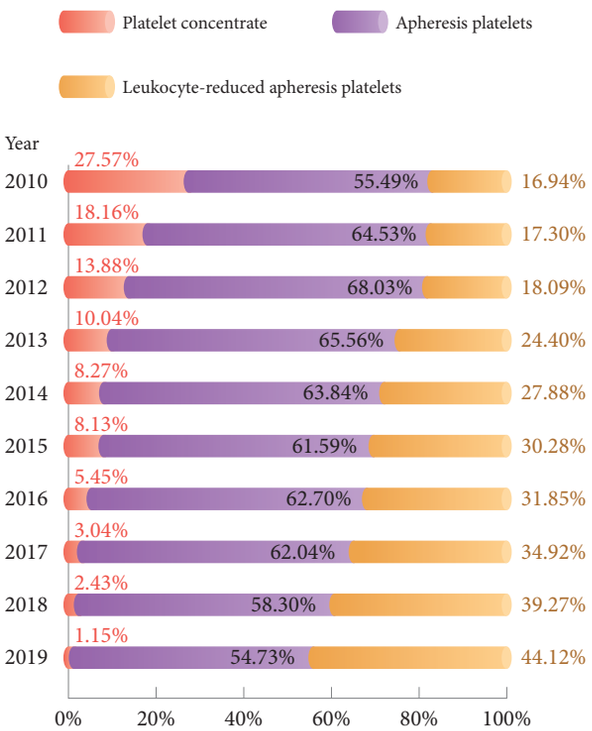
Annual blood supply, 2010-2019

Unit

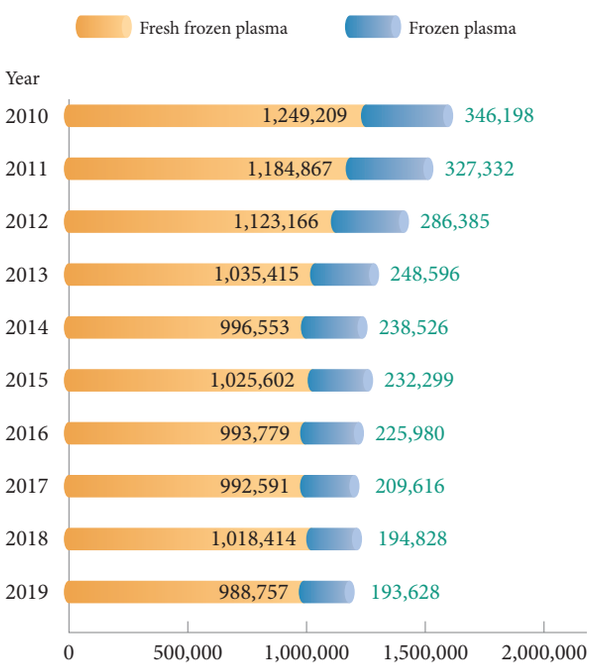
Red blood cell products



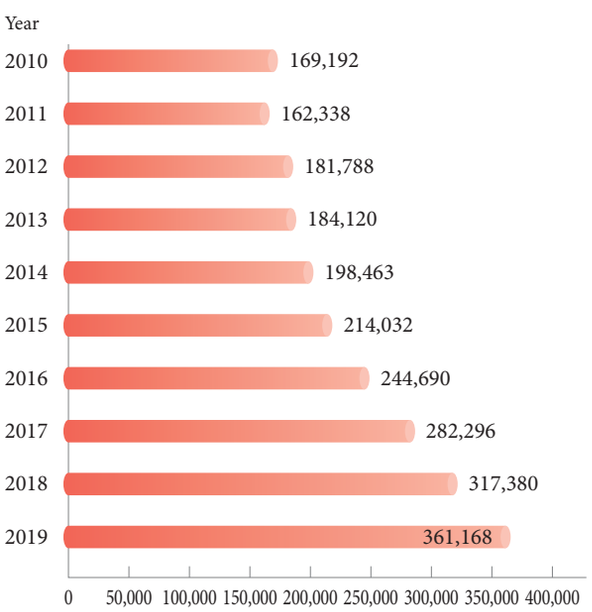
Platelet products



Plasma products



Cryoprecipitate



Note: 1. 250ml per unit for whole blood and 500ml counts for 2 units.

2. Single adult dose per unit for apheresis platelet and double dose counts for 2 units.

3. Platelet concentrate per dose for adults 12 units.

Blood and blood components issued in 2019

Unit

1. Whole blood

Blood \ Blood centers		Taipei Blood Center	Hsinchu Blood Center	Taichung Blood Center	Tainan Blood Center	Kaohsiung Blood Center	Total
RBCs	Whole blood	9,437	4,511	2,029	3,301	1,032	20,310
	Packed RBCs	380,237	181,350	172,116	204,892	273,874	1,212,469
	Washed RBCs	8,843	1,769	2,712	3,133	3,762	20,219
	Leukocyte-reduced RBCs	376,882	158,412	313,674	157,213	124,862	1,131,043
	Frozen thawed deglycerolized RBCs	18	0	0	0	0	18
Subtotal		775,417	346,042	490,531	368,539	403,530	2,384,059
Plasma	Fresh frozen plasma	299,729	159,582	202,557	176,326	150,563	988,757
	Frozen plasma	42,622	28,950	36,566	31,682	53,808	193,628
Cryoprecipitate		160,238	51,736	72,464	53,452	23,278	361,168
Platelet concentrate		16,568	11,546	9,644	2,192	0	39,950
WBC concentrate		4,928	318	0	42	24	5,312
Total units issued		1,299,502	598,174	811,762	632,233	631,203	3,972,874
Rate of components		99.27	99.25	99.75	99.48	99.84	99.49
Rate of whole blood		1.22	1.30	0.41	0.90	0.26	0.85
PR ratio		44.15	54.48	48.75	56.44	50.65	49.60

2. Apheresis

Blood \ Blood centers	Taipei Blood Center	Hsinchu Blood Center	Taichung Blood Center	Tainan Blood Center	Kaohsiung Blood Center	Total
Apheresis platelets	60,182	13,937	31,602	26,327	26,580	158,628
Leukocyte-reduced apheresis platelets	49,656	23,985	19,676	15,931	18,633	127,881
Total	109,838	37,922	51,278	42,258	45,213	286,509

Note: 1. 250ml per unit for whole blood and 500ml counts for 2 units.

2. Single adult dose per unit for apheresis platelet and double dose counts for 2 units.

3. The plasma numbers issued are for medical usage only,plasma for fractionation not included.

4. PR ratio=Plasma/RBCs

Whole blood collection per 1000 head of population, 2010-2019

Liter/1,000 population

Year	Item \ Blood centers	Taipei Blood Center	Hsinchu Blood Center	Taichung Blood Center	Tainan Blood Center	Kaohsiung Blood Center	Hualien Blood Center	Total
2010	Blood collection (Liter)	166,138	81,744	120,517	90,927	96,025	27,055	582,405
	Population	6,974,554	3,499,663	4,477,114	3,409,906	3,745,132	1,032,012	23,138,381
	Liter/1,000 population	23.82	23.36	26.92	26.67	25.64	26.22	25.17
2011	Blood collection (Liter)	168,680	81,785	120,913	93,291	102,674	27,168	594,511
	Population	7,054,442	3,498,987	4,484,098	3,400,813	3,737,885	1,026,326	23,202,551
	Liter/1,000 population	23.91	23.37	26.96	27.43	27.47	26.47	25.62
2012	Blood collection (Liter)	167,283	80,345	118,749	92,669	98,441	25,880	583,367
	Population	7,086,152	3,525,575	4,496,195	3,397,242	3,734,579	1,021,830	23,261,573
	Liter/1,000 population	23.61	22.79	26.41	27.28	26.36	25.33	25.08
2013	Blood collection (Liter)	163,347	78,323	113,190	91,759	93,637	25,359	565,613
	Population	7,131,766	3,555,325	4,510,598	3,394,334	3,733,713	1,018,477	23,344,213
	Liter/1,000 population	22.90	22.03	25.09	27.03	25.08	24.90	24.23
2014	Blood collection (Liter)	164,463	78,068	112,667	93,876	97,458	25,009	571,541
	Population	7,160,559	3,579,347	4,517,652	3,388,101	3,728,935	1,017,442	23,392,036
	Liter/1,000 population	22.97	21.81	24.94	27.71	26.14	24.58	24.43
2015	Blood collection (Liter)	164,554	81,996	114,808	95,724	95,492	25,681	578,254
	Population	7,187,196	3,623,818	4,532,292	3,379,761	3,724,569	1,013,926	23,461,562
	Liter/1,000 population	22.90	22.63	25.33	28.32	25.64	25.33	24.65
2016	Blood collection (Liter)	165,198	83,228	116,315	96,395	101,248	19,516	581,899
	Population	7,192,687	3,687,412	4,557,494	3,366,498	3,940,509	789,180	23,533,780
	Liter/1,000 population	22.97	22.57	25.52	28.63	25.69	24.73	24.73
2017	Blood collection (Liter)	184,975	81,657	117,976	95,089	98,853	-	578,550
	Population	7,979,516	3,712,819	4,564,263	3,361,871	3,934,001	-	23,552,470
	Liter/1,000 population	23.18	21.99	25.85	28.28	25.13	-	24.56
2018	Blood collection (Liter)	191,341	84,391	121,787	95,958	98,039	-	591,516
	Population	7,969,664	3,753,798	4,578,749	3,351,546	3,925,863	-	23,579,620
	Liter/1,000 population	24.01	22.48	26.60	28.63	24.97	-	25.09
2019	Blood collection (Liter)	196,210	88,549	125,071	95,623	103,838	-	609,291
	Population	7,965,793	3,788,788	4,580,226	3,338,816	3,917,408	-	23,591,031
	Liter/1,000 population	24.63	23.37	27.31	28.64	26.51	-	25.83

Note: 1. Mid-year population, data from the ministry of interior.

2. 250ml per unit for whole blood.

Blood donation by blood centers, 2010-2019

Donation

Year	Item \ Blood centers	Taipei Blood Center	Hsinchu Blood Center	Taichung Blood Center	Tainan Blood Center	Kaohsiung Blood Center	Hualien Blood Center	Total
2010	Blood donation	531,254	255,439	372,360	291,710	313,490	84,989	1,849,242
	Population	6,974,554	3,499,663	4,477,114	3,409,906	3,745,132	1,032,012	23,138,381
	Donation rate	7.62%	7.30%	8.32%	8.55%	8.37%	8.24%	7.99%
2011	Blood donation	534,349	254,731	377,883	303,895	329,804	85,445	1,886,107
	Population	7,054,442	3,498,987	4,484,098	3,400,813	3,737,885	1,026,326	23,202,551
	Donation rate	7.57%	7.28%	8.43%	8.94%	8.82%	8.33%	8.13%
2012	Blood donation	526,216	248,420	371,259	304,184	300,906	83,536	1,834,521
	Population	7,086,152	3,525,575	4,496,195	3,397,242	3,734,579	1,021,830	23,261,573
	Donation rate	7.43%	7.05%	8.26%	8.95%	8.06%	8.18%	7.89%
2013	Blood donation	513,907	241,765	351,790	294,771	278,740	79,992	1,760,965
	Population	7,131,766	3,555,325	4,510,598	3,394,334	3,733,713	1,018,477	23,344,213
	Donation rate	7.21%	6.80%	7.80%	8.68%	7.47%	7.85%	7.54%
2014	Blood donation	509,548	239,797	345,234	295,028	287,690	76,822	1,754,119
	Population	7,160,559	3,579,347	4,517,652	3,388,101	3,728,935	1,017,442	23,392,036
	Donation rate	7.12%	6.70%	7.64%	8.71%	7.72%	7.55%	7.50%
2015	Blood donation	509,230	251,630	349,238	296,569	282,832	78,382	1,767,881
	Population	7,187,196	3,623,818	4,532,292	3,379,761	3,724,569	1,013,926	23,461,562
	Donation rate	7.09%	6.94%	7.71%	8.77%	7.59%	7.73%	7.54%
2016	Blood donation	511,032	253,135	349,751	293,792	296,706	58,592	1,763,008
	Population	7,192,687	3,687,412	4,557,494	3,366,498	3,940,509	789,180	23,533,780
	Donation rate	7.10%	6.86%	7.67%	8.73%	7.53%	7.42%	7.49%
2017	Blood donation	570,695	248,783	356,189	288,466	288,391	-	1,752,524
	Population	7,979,516	3,712,819	4,564,263	3,361,871	3,934,001	-	23,552,470
	Donation rate	7.15%	6.70%	7.80%	8.58%	7.33%	-	7.44%
2018	Blood donation	590,235	256,830	361,137	283,349	288,327	-	1,779,878
	Population	7,969,664	3,753,798	4,578,749	3,351,546	3,925,863	-	23,579,620
	Donation rate	7.41%	6.84%	7.89%	8.45%	7.34%	-	7.55%
2019	Blood donation	608,656	269,379	366,544	285,584	303,388	-	1,833,551
	Population	7,965,793	3,788,788	4,580,226	3,338,816	3,917,408	-	23,591,031
	Donation rate	7.64%	7.11%	8.00%	8.55%	7.74%	-	7.77%

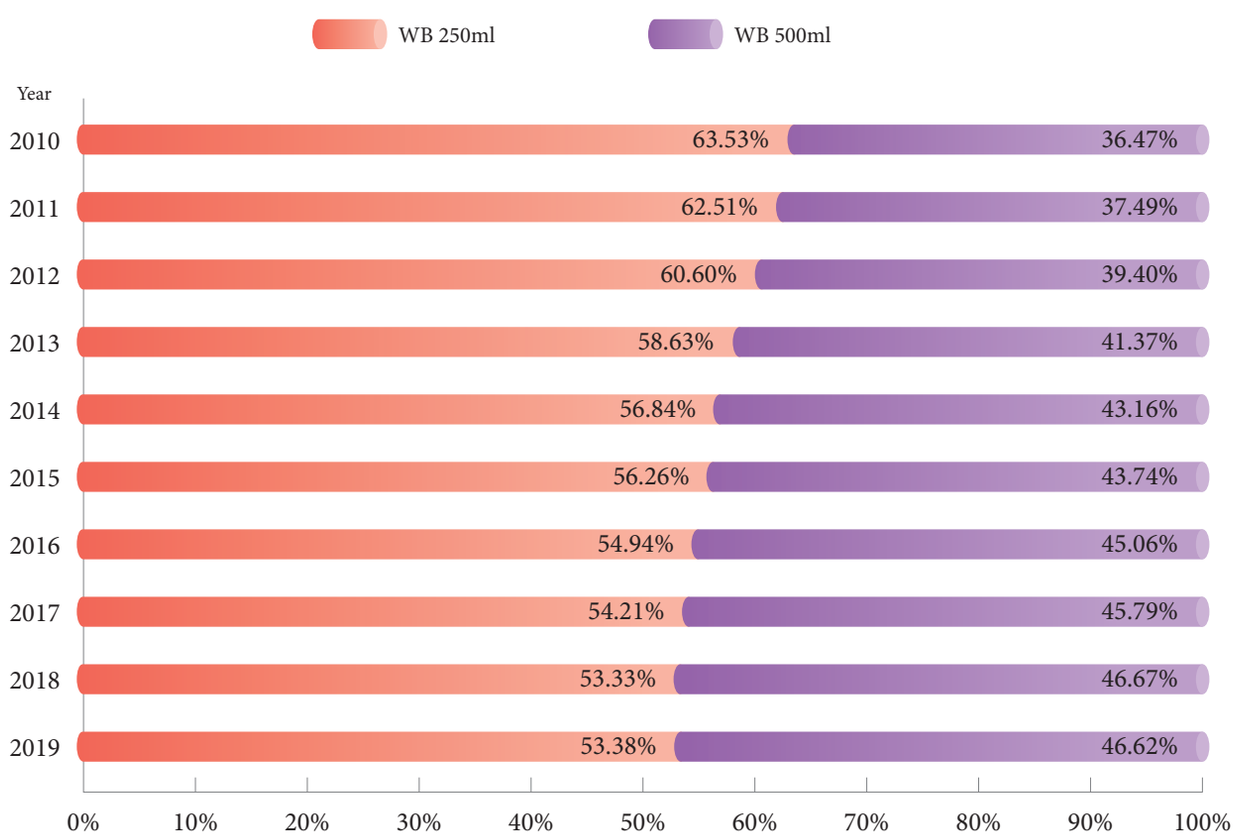
Note: 1. Mid-year population, data from the ministry of interior.

2. Both whole blood and apheresis donations are included.

Types of blood donation in 2019

Type / Blood centers	Whole blood				Apheresis				Total
	250ml	%	500ml	%	Apheresis - 1U	%	Apheresis - 2U	%	
Taipei Blood Center	293,279	48.18	245,780	40.38	30,002	4.93	39,595	6.51	608,656
Hsinchu Blood Center	131,942	48.98	111,126	41.25	13,248	4.92	13,063	4.85	269,379
Taichung Blood Center	178,008	48.56	161,137	43.96	3,191	0.87	24,208	6.60	366,544
Tainan Blood Center	137,832	48.26	122,330	42.84	7,045	2.47	18,377	6.43	285,584
Kaohsiung Blood Center	146,140	48.17	134,605	44.37	0	0	22,643	7.46	303,388
Subtotal	887,201	48.39	774,978	42.27	53,486	2.92	117,886	6.43	1,833,551

Types of whole blood donation, 2010-2019



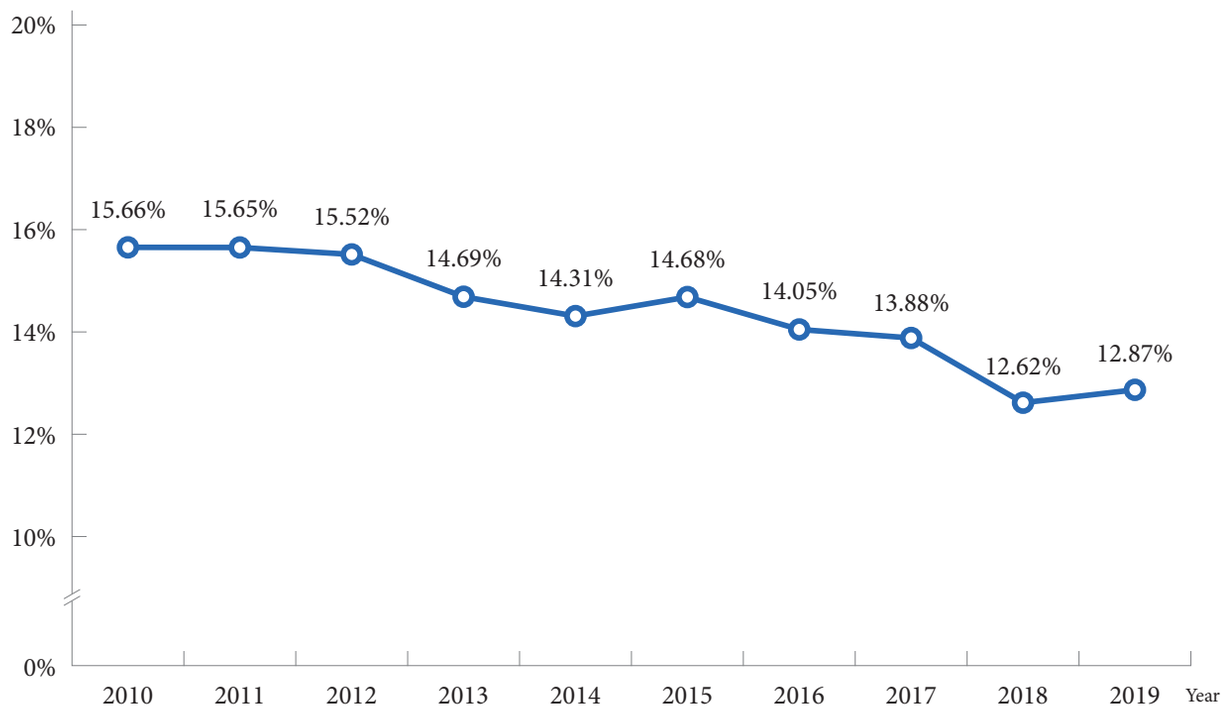
First-time donors in 2019

Donor

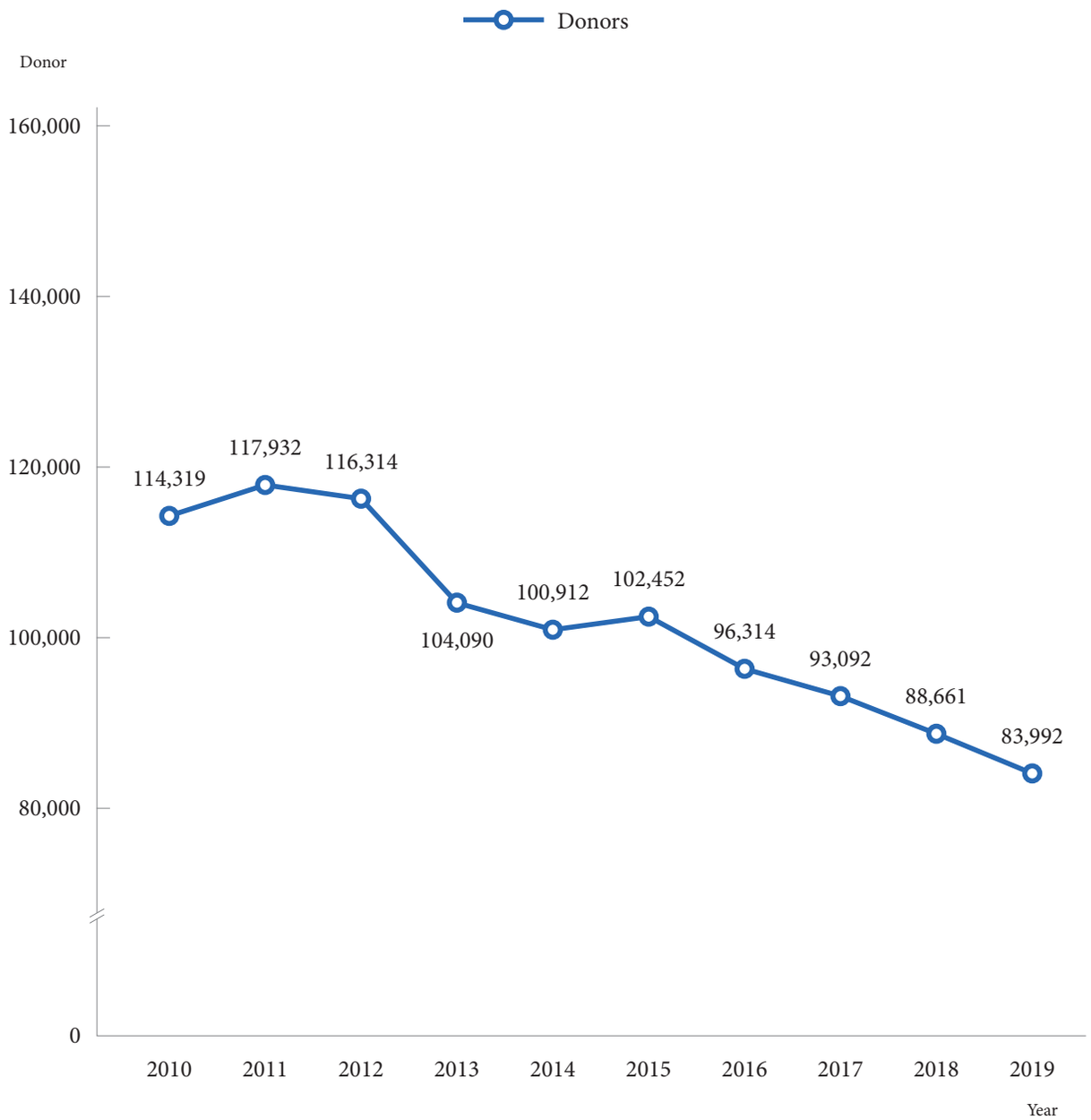
Item \ Blood centers		Taipei Blood Center	Hsinchu Blood Center	Taichung Blood Center	Tainan Blood Center	Kaohsiung Blood Center	Total
Total donors(A)		345,193	157,467	222,671	165,632	171,874	1,029,500
First-time donors	No.(B)	41,749	21,068	26,310	22,379	20,962	132,468
	%(B/A)	12.09%	13.38%	11.82%	13.51%	12.20%	12.87%
First-time donors Age≦24	No.(C)	24,069	12,836	16,278	16,465	14,344	83,992
	%(C/B)	57.65%	60.93%	61.87%	73.57%	68.43%	63.41%

Note: Donors who donated on more than one occasion in this year would be counted as once.

Trends in the rate of first-time donors, 2010-2019



≤24 age first-time donors, 2010-2019

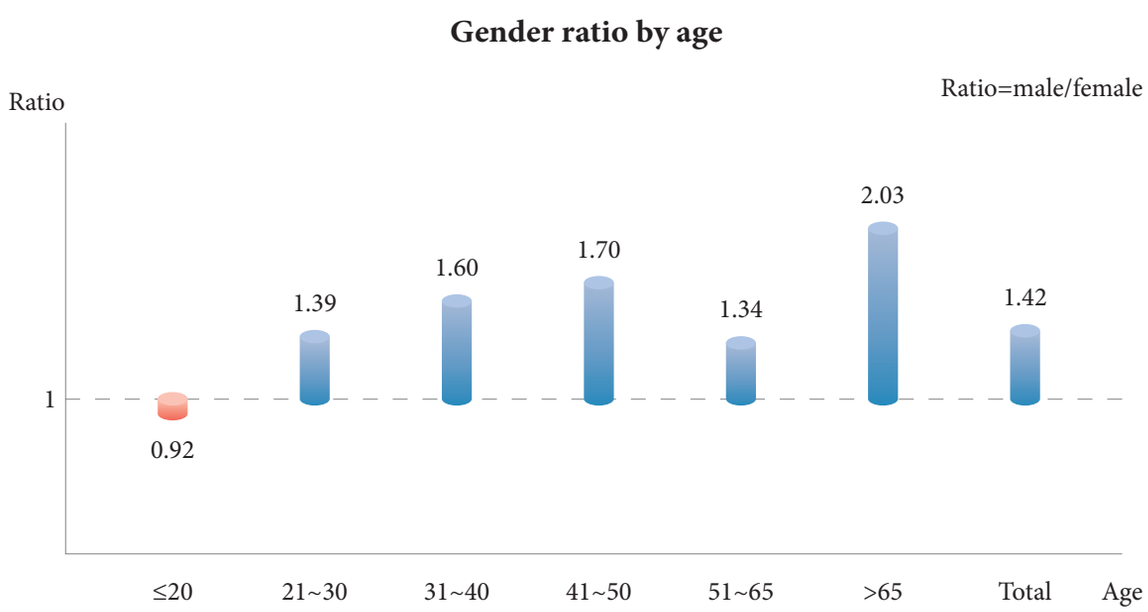


Distribution of donor by gender and age in 2019

Donor

Gender \ Age	≤20	21~30	31~40	41~50	51~65	>65	Total
Male	52,180 (8.64%)	140,616 (23.29%)	162,450 (26.90%)	140,811 (23.32%)	120,252 (19.91%)	878 (0.15%)	603,877 (58.66%)
Female	56,935 (13.38%)	101,452 (23.84%)	101,678 (23.89%)	82,728 (19.44%)	89,621 (21.06%)	433 (0.10%)	425,630 (41.34%)
Total	109,115 (10.60%)	242,068 (23.51%)	264,128 (25.66%)	223,539 (21.71%)	209,873 (20.39%)	1,311 (0.13%)	1,029,500 (100.00%)

Note: Both whole blood and apheresis donations are included.



Donation frequency by gender and age in 2019

Donation frequence

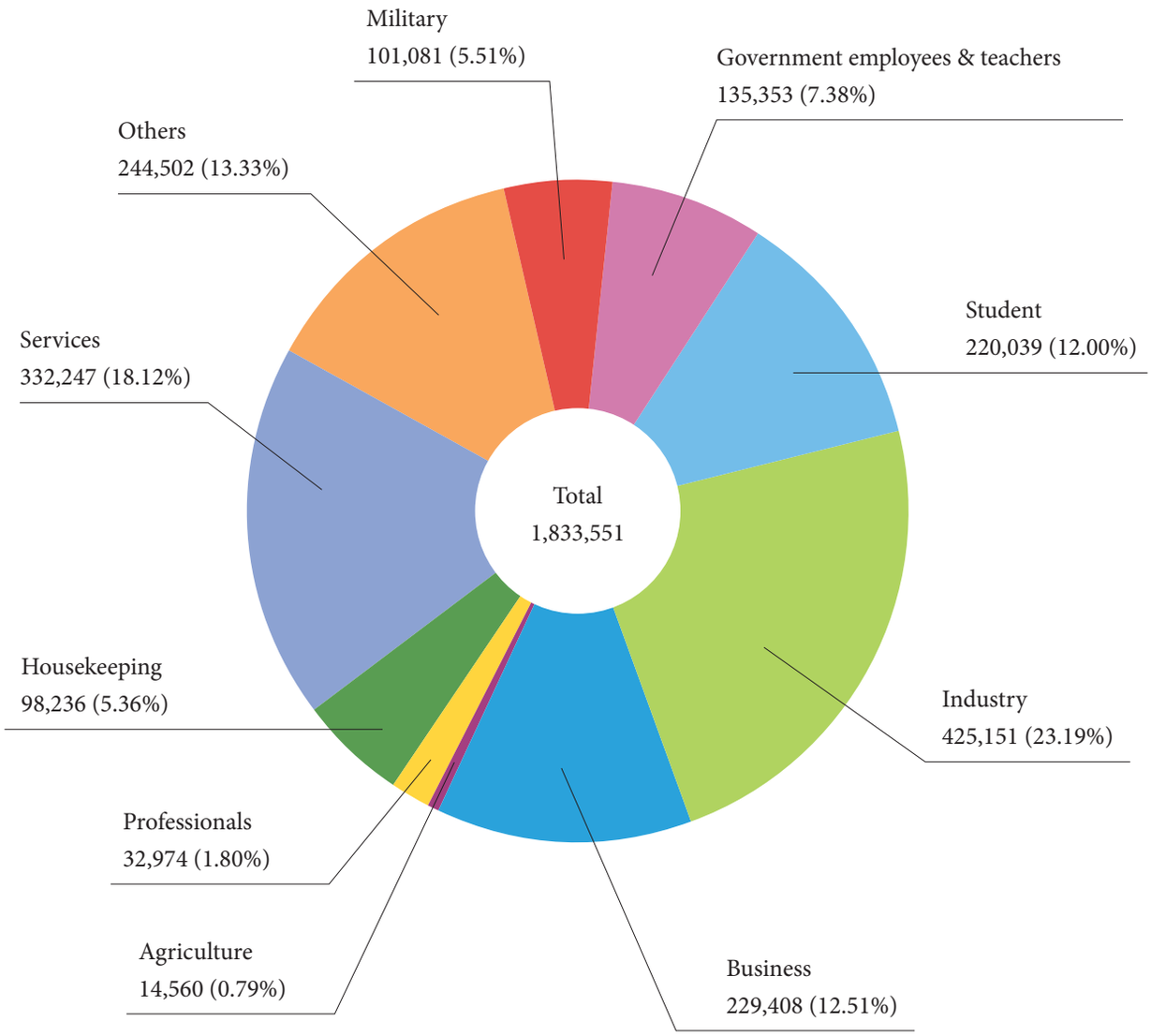
Age / Gender		Donation frequence	
≤20	Male	1.33	1.37
	Female	1.40	
21-30	Male	1.55	1.51
	Female	1.47	
31-40	Male	1.85	1.73
	Female	1.53	
41-50	Male	2.08	1.91
	Female	1.63	
51-65	Male	2.24	2.05
	Female	1.80	
>65	Male	3.35	2.99
	Female	2.26	
Total	Male	1.91	1.78
	Female	1.60	

Blood collection by sites in 2019

Donation

Blood centers / Sites	Taipei Blood Center	Hsinchu Blood Center	Taichung Blood Center	Tainan Blood Center	Kaohsiung Blood Center	Total
Fixed site	344,473	134,611	163,283	150,227	184,307	976,901
	56.60%	49.97%	44.55%	52.60%	60.75%	53.28%
Mobiles	264,183	134,768	203,261	135,357	119,081	856,650
	43.40%	50.03%	55.45%	47.40%	39.25%	46.72%
Total	608,656	269,379	366,544	285,584	303,388	1,833,551

Occupational distribution of donors in 2019



Pre-donation donor deferral in 2019

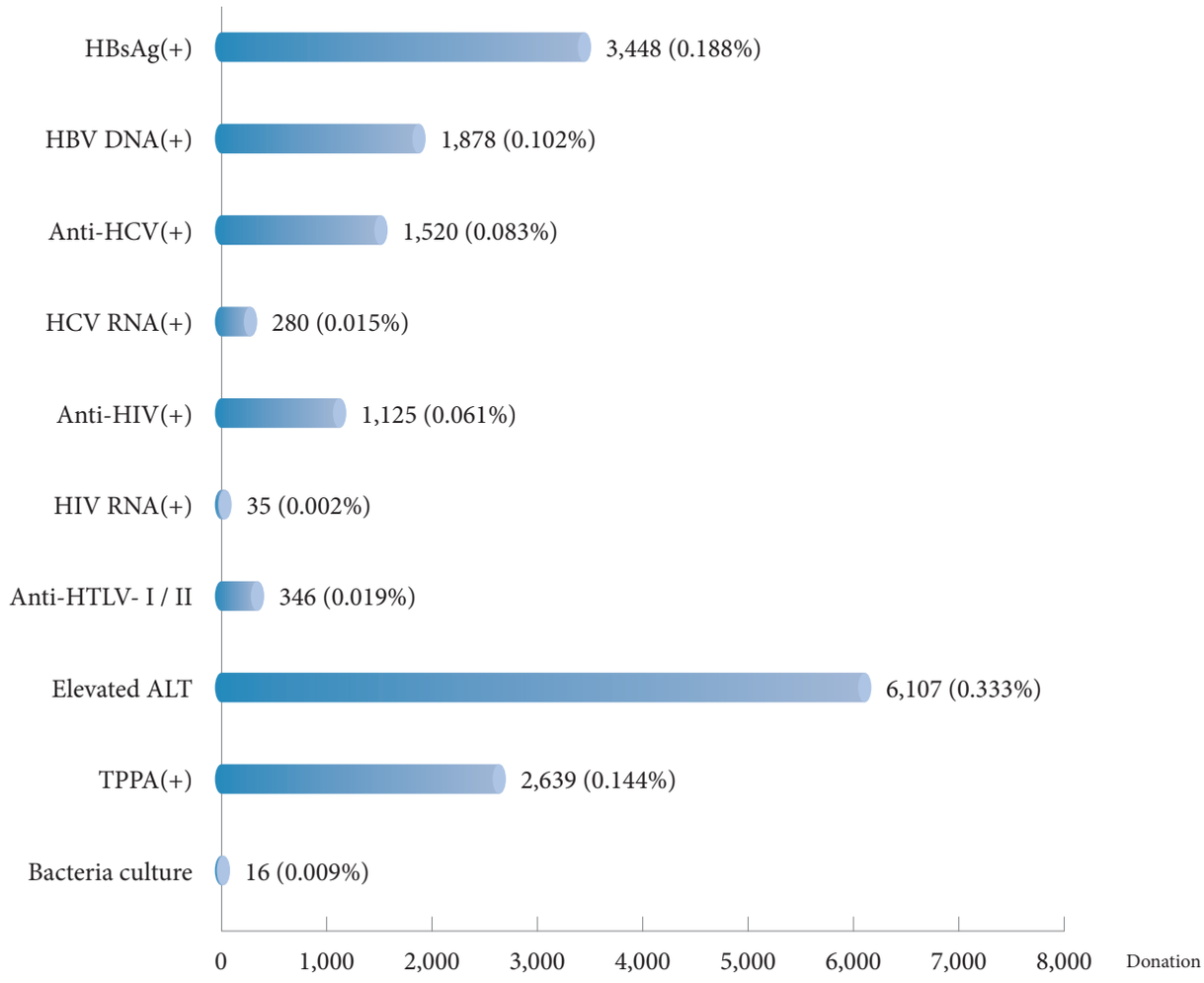
Participants

Reasons of deferral \ Blood centers		Taipei Blood Center	Hsinchu Blood Center	Taichung Blood Center	Tainan Blood Center	Kaohsiung Blood Center	Total
1	Low hemoglobin	37,547	7,522	30,299	13,711	22,892	111,971
2	Health questionnaire defferal	39,822	8,739	16,463	13,337	10,381	88,742
3	Blood pressure too high or too low	7,345	2,301	4,368	1,761	1,148	16,923
4	Blood vessels too thin	429	185	556	397	344	1,911
5	Low body weigh	328	108	98	242	208	984
6	Platelet count less than 150,000/ul or more than 600,000/μL	459	45	215	39	144	902
7	Tension	39	32	73	46	58	248
8	Body temperature too high	117	30	14	21	33	215
9	Other abnormalities	6,826	2,767	4,156	1,352	2,663	17,764
Deferred participants		92,912	21,729	56,242	30,906	37,871	239,660
Total participants		701,568	291,108	422,786	316,490	341,259	2,073,211
%		13.24%	7.46%	13.30%	9.77%	11.10%	11.56%

Note: Total participants include deferred participants and successful donations.

Infectious disease screening for blood issue in 2019

Positive rate：0.85%



Note: Only platelet apheresis donations were tested for bacteria culture.

Irregular erythrocyte antibody detected in 2019

Sample: 6,393

Irregular erythrocyte antibody reactive: 5,763 donations (0.3%)

Antibody	Number		Antibody	Number	
Anti-C	22	0.34%	Anti-Jk^{a}	2	0.03%
Anti-c	84	1.31%	Anti-Jk^{b}	4	0.06%
Anti-D	61	0.95%	Anti-Jk3	1	0.02%
Anti-E	884	13.83%	Anti-Mi^{a}	2,205	34.49%
Anti-e	25	0.39%	Anti-P1	451	7.05%
Anti-G	6	0.09%	Anti-I/HI	1,367	21.38%
Anti-M	474	7.41%	Anti-Ku	3	0.05%
Anti-N	3	0.05%	Anti-Di^{a}	36	0.56%
Anti-S	27	0.42%	Anti-Wr^{a}	1	0.02%
Anti-s	0	0.00%	Anti-Jr^{a}	3	0.05%
Anti-Le^{a}	360	5.63%	Anti-LW^{a}	1	0.02%
Anti-Le^{b}	207	3.24%	Anti-Pr	2	0.03%
Anti-Fy^{a}	0	0.00%	Cold agglutinin	38	0.59%
Anti-Fy^{b}	20	0.31%	Other	106	1.66%

Detection of donor Mi^{a} antigen in 2019

Donation

	Taipei Blood Center		Hsinchu Blood Center		Taichung Blood Center		Tainan Blood Center		Kaohsiung Blood Center		Total	
Mi^{a}+	29,245	4.8%	13,439	5.0%	15,713	4.3%	10,814	3.8%	13,018	4.3%	82,229	4.5%
Mi^{a}-	579,405	95.2%	255,939	95.0%	350,831	95.7%	274,770	96.2%	290,369	95.7%	1,751,314	95.5%

Statistics of ABO and RhD in 2019

Donation

Blood Group	RhD+	RhD-	Total	%
A	486,310	2,141	488,451	26.64%
B	429,109	1,942	431,051	23.51%
O	801,832	3,698	805,530	43.93%
AB	108,005	501	108,506	5.92%
Total	1,825,256	8,282	1,833,538	100.00%
%	99.55%	0.45%		

Note: Sample amounts are not the same as the total donations , because of the blood drive records but some of them have no testing results.

Statistics of ABO subgroups in 2019

Donation

A subgroups		B subgroups		AB subgroups		Para-Bombay	
A_2	33	B_3	741	A_2B	97	O_{Hm}^{A}	69
A_3	9	B_{el}	54	A_3B	10	O_{Hm}^{B}	77
A_{el}	102	B_w	1	$A_{el}B$	18	O_{Hm}	36
A_m	3			AB_3	182	O_{Hm}^{AB}	13
A_x	4			AB_{el}	4		
A_{int}	11			AmB	1		
				AwB	3		
				ABx	1		
				AxB	2		
				$A_{int}B$	7		
				B(A)	2		
				cisAB	2		
				A1B chimera	1		
				A1B+B chimera	1		

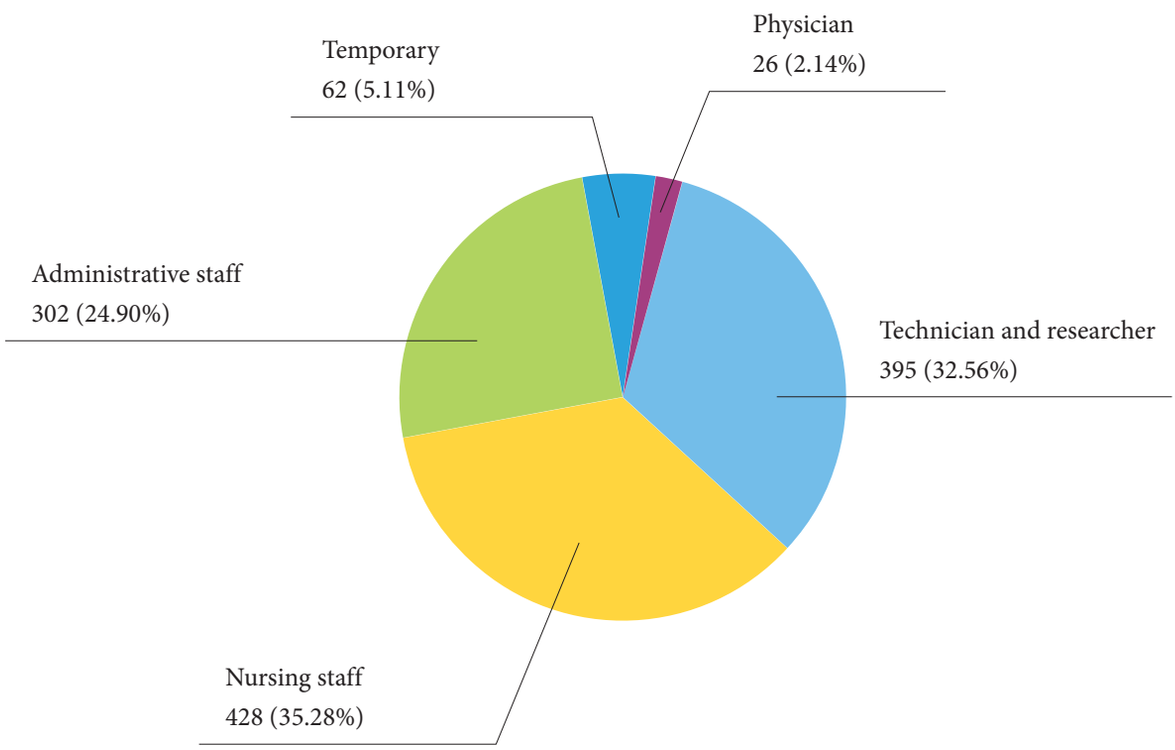
Inventory of rare RBCs

Blood groups		Unit
Rare blood groups	ABO blood groups	
para-bombay	A	8
	B	4
	O	12
	AB	2
RzRz	B	4
	O	20
	AB	2
s(-)	O	24
Lu(a-b-)	A	24
	O	10
K(-)	O	2
	AB	2
K_0	A	8
Fy(a-)	A	4
	O	28
Fy(a-)s(-)	O	14
D(-)Fy(a-b-)	O	2
Jk(a-b-)	A	42
	B	40
	O	50
	AB	2
Di(b-)	A	4
	O	10
i adult cell	A	2
	B	1
	O	3
Jr(a-)	O	3
p phenotype	A	4
	B	1
Lan(-)	AB	3
Dc-	O	8

Human Resources in 2019

Person

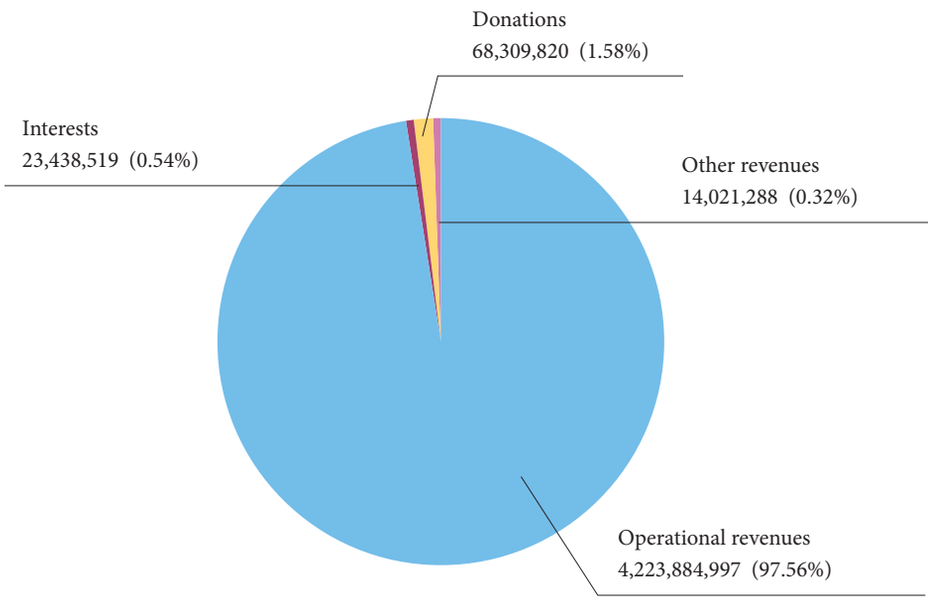
Classufucation / Blood centers	Physician	Technician and researcher	Nursing staff	Administrative staff	Temporary	Total	%
Head office	1	13	0	29	0	43	3.54
Taipei Blood Center	10	152	157	94	34	447	36.85
Hsinchu Blood Center	2	52	55	42	1	152	12.53
Taichung Blood Center	3	55	79	48	3	188	15.50
Tainan Blood Center	4	44	72	46	11	177	14.59
Kaohsiung Blood Center	6	79	65	43	13	206	16.98
Total	26	395	428	302	62	1,213	



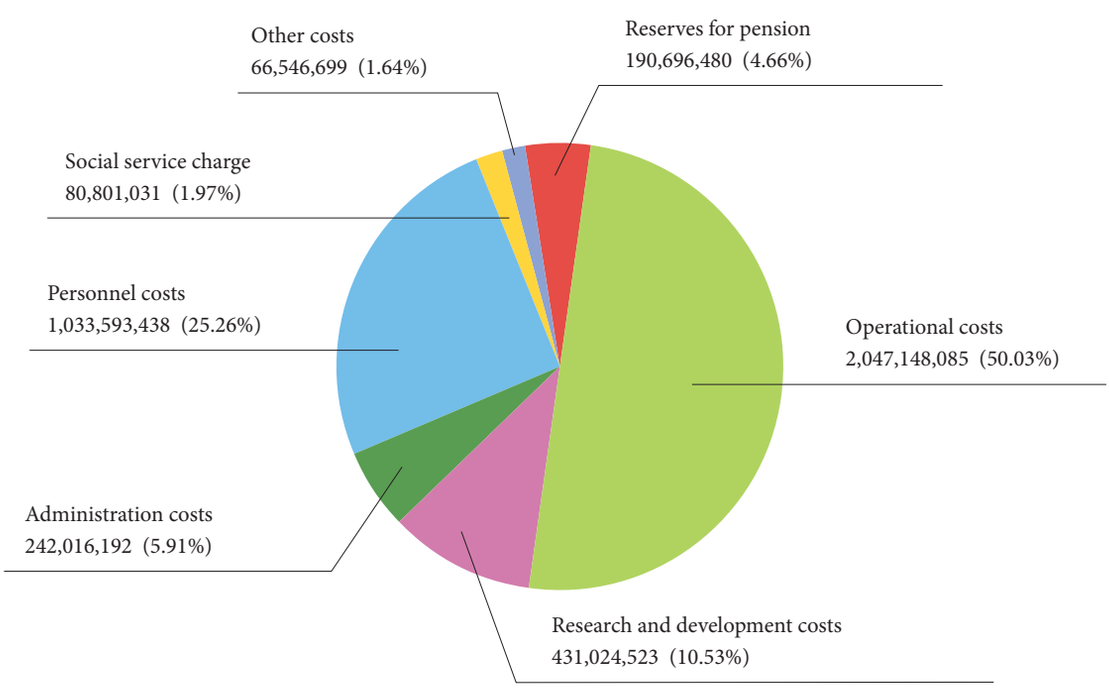
Incomes and expenditures in 2019

NT Dollar

1. Total incomes：NT$ 4,329,654,624



2. Total expenditures：NT$ 4,091,826,448



3. Balance after tax：NT$ 237,828,176

4. Capital expenditures：NT$ 100,039,986（Equipments purchase）

APPENDIX

Blood centers in Taiwan

Head office

Taiwan Blood Services Foundation

3 FL. No. 3, Nan-Hai Road, Taipei 10066, Taiwan, R.O.C.
TEL: 886-2-2351-1600 FAX: 886-2-2395-1002
Website: www.blood.org.tw

Regional office

Taipei Blood Center

No. 123, Lih-Der Road, Taipei 112, Taiwan, R.O.C.
TEL: 886-2-2897-1600 FAX: 886-2-2897-1601
Executive Region: Taipei City, New Taipei City, Keelung City, Kinmen County, Matsu County, Hualien County, Yilan County.

Hsinchu Blood Center

No. 8, Lane 215, Guangming 11th Road, Jhubie City, Hsinchu County 302, Taiwan, R.O.C.
TEL: 886-3-555-6111 FAX: 886-3-555-0305
Executive Region: Taoyuan County, Hsinchu County, Miaoli County

Taichung Blood Center

No. 1176, Sec. 4, Taiwan Boulevard, Xitun Dist., Taichung City 407, Taiwan, R.O.C.
TEL: 886-4-2461-2345 FAX: 886-4-2461-3939
Executive Region: Taichung City, Changhwa County, Nantou County, Yunlin County

Tainan Blood Center

No. 85, Sec. 1, Yongfu Road, West Central Dist., Tainan City 700, Taiwan, R.O.C.
TEL: 886-6-213-1212 FAX: 886-6-213-3201
Executive Region: Tainan City, Chiayi City, Chiayi County

Kaohsiung Blood Center

No. 1837, Gaonan Highway, Nanzi Dist., Kaohsiung City 811, Taiwan, R.O.C.
TEL: 886-7-366-0999 FAX: 886-7-364-1556
Executive Region: Kaohsiung City, Pingtung County, Penghus County, Taitung County

Blood centers and stations

Published by the Taiwan Blood Services Foundation

3F, 3, Nanhai Road, Taipei, Taiwan 10066
Tel: +886-2-23511600
Fax:+886-2-23951002
E-mail:blood@blood.org.tw
http://www.blood.org.tw

Printed in Taiwan, July. 2020