A Review of Two-year 2019-2020 Blood and Blood Component Used in Medical Center Hospital of Mae Fah Luang University, Chiang Rai, Thailand.

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Received 4 April 2021 • Revised 14 April 2021 • Accepted 24 April 2021 • Published online 1 May 2021

Abstract:

Background: Medical Center Hospital of Mae Fah Luang University (MCH-MFU) was opened in December, 2018. It consists with 400 beds but currently initial operation is only 60 beds in 2 general wards and critical care unit. Blood and blood components usage review is a tool for quality monitoring and efficient management.

Objective: The study aimed to know utilization of blood and blood component in MCH-MFU during year 2019 and 2020. The information would guide the executive for the development of the hospital.

Methods: The primary data was collected and retrospectively analyzed. Data between year 2019 and 2020 was compared to see the increment of utilization.

Results: The proportion of blood groups showed that group B and O red blood cell components were mostly used. Increment of blood use was around 1- 2%.

Conclusion: Blood and blood components used in MCH-MFU during 2019-2020 were still low due to the hospital is not yet fully operating. The increment could demonstrate the increasing rate of blood component usage which supported estimation of future blood requirement. Cross match to transfusion ratio reflected appropriateness and improvement of clinical blood use.

Keywords: Blood and blood component, Medical Center Hospital, Mae Fah Luang University

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GMSMJ 2021; 1 (2): 59-64

Introduction

Blood is a resource of medical treatment for the patients with clinical conditions indicated. Medical Center Hospital of Mae Fah Luang University (MCH-MFU) has been founded since 2018, only about 2 years-service, with a vision to be a leader medical center hospital for the people in Chiang Rai province and upper northern part of Thailand as well as for the Greater Mekong Subregion (GMS) countries. The infrastructures and facilities are consisting of 400 beds, operating rooms, labor rooms general laboratory including blood bank lab, outpatient departments and emergency room, x-ray department etc. MCH-MFU aims to be a medical school hospital with several centers of excellence (COE). Currently major constraints are the limitation on recruitment of medical specialists and staff as well as the limitation of patients' accessibility. As the results, the number of patients, both out-patient and in-patient, is not large and only 60 beds for in-patient wards and critical care unit are operating. However, it is expected to grow up rapidly which will affect blood supply management.

A two-year 2019-2020 review used primary data of blood and blood components usage in MCH-MFU since March 2019 to December 2020 to demonstrate number of blood component requested and delivered for transfusion as well as cross match to transfusion ratio. General information in blood groups (A, B, O, AB) used is also prescribed. This review will help understanding blood utilization pattern, leading to future preparedness of blood resource and management as well as improve clinical and academic aspects on appropriate use of blood.

Material and Methods

Primary data from Blood bank division, Pathology section during 2019-2020 was collected and retrospectively analyzed. Packed red cell (PRC), leukocyte reduced packed red cell (LPRC) and fresh frozen plasma (FFP) were 3 blood components (BC) to be reviewed although platelet component (PLT) was also clinically used. Total numbers of BC requested in 2019 and 2020 were showed. The BC delivered for transfusion in 2019 and 2020 were comparably demonstrated in monthly basis. Cross match to transfusion ratio (C/T), blood groups and trends were also observed. This article is limited to deeply review of clinical conditions related to blood transfusion.

Results

In 2019 during 10 months period from March to December, the total number of BC requested were 140 units of PRC, 158 units of LPRC and 25 units of FFP. In 2020, from January to December, blood requirement was gradually increased, the total number of BC requested were 252 units of PRC, 349 units of LPRC and 80 units of FFP.

In 2019 PRC were delivered for transfusion average 14 units per month with the highest number of 25 units in September and November while the lowest is 1 unit in October. LPRC were delivered for transfusion average 15.8 units per month with the highest number of 33 units in July and the lowest was 2 units in April. FFP were delivered for transfusion average 2.5 units per month with the highest number of 6 units in July and there was no FFP transfusion in March, April, May and November 2019.

In 2020 PRC were delivered for transfusion average 21 units per month with the highest number of 45 units in January and no PRC transfusion in August. LPRC were delivered for transfusion average 29.08 units per month with the highest number of 46 units in August and September and the lowest is 11 units in January. FFP were delivered for transfusion average 6.67 units per month with the highest number of

18 units in January and there was no FFP transfusion in April.

Increment rate of PRC used was 1.5% while LPRC was 1.84 and FFP was 2.66%. Comparison of average BC delivered for transfusion during 2019 and 2020 in monthly basis and rate of increment were summarized in Table 1.

Total number for each type of BC requested and delivered for transfusion were calculated to show cross match to transfusion ratio (C/T). In 2019 C/T of PRC, LPRC and FFP were 2.06, 1.98 and 1.19 respectively. The appropriate C/T should not above 2. The fluctuation of PRC C/T above 2 occurred in April = 10, November = 3.1 and December = 2.2, while LPRC C/T in May = 3.0, July = 2.5, October = 2.4 and December = 2.5. In 2020 all BC C/T were below 2 in average. C/T of PRC, LPRC and FFP were 1.79, 1.65 and 1.00 respectively. Nonetheless, the fluctuation of C/T ratio above 2 was also observed and summarized in Table 2.

The proportion of blood groups A, B, O and AB transfused were also demonstrated. In 2019, for PRC group B was highest used at 44.12% of other blood groups, followed by group O at 30.88%, which the pattern was similar to LPRC. In 2020, PRC group O was highest used at 52.48% as well as LPRC group O was highest used at 49.06%. FFP group O was mostly used in both 2019 and 2020. The summarized data are in Table 3 and Figure 1.

Table 1 Comparison of the average BC delivered for transfusion per month in 2019 and 2020 with rate of increment

	2019 Average unit/month [highest, lowest]	**2020** Average unit/month [highest, lowest]	**Rate of Increment%**
PRC	14 [25, 1]	21 [45, 0]	1.5%
LPRC	15.8 [33, 2]	29.08 [46, 11]	1.84%
FFP	2.5 [6, 0]	6.67 [18, 0]	2.66%

Table 2 Cross match to transfusion ratio in 2019 and 2020

	2019		**2020**	
	Average C/T	**C/T ≥ 2 by month**	**Average C/T**	**C/T ≥ 2 by month**
PRC	2.06	Apr =10, Nov = 3.1 Dec = 2.2	1.79	Jun = 3, Sep = 2.6
LPRC	1.98	May = 3.0, July = 2.5, Oct = 2.4, Dec = 2.5	1.65	Apr = 2.1, May = 4.3
FFP	1.19		1.00	

Table 3 Percentage of BC delivered for transfusion by blood groups (A, B, O, AB) in 2019 and 2020

BC transfused by blood group		2019 (%)	2020 (%)
PRC	**A**	20.59	15.60
	B	**44.12**	29.08
	O	30.88	**52.48**
	AB	4.41	2.84
LPRC	**A**	22.50	25.94
	B	**37.50**	18.40
	O	33.75	**49.06**
	AB	6.25	6.60
FFP	**A**	42.86	5.00
	B	19.05	26.25
	O	**47.62**	**68.75**
	AB	9.52	0.00

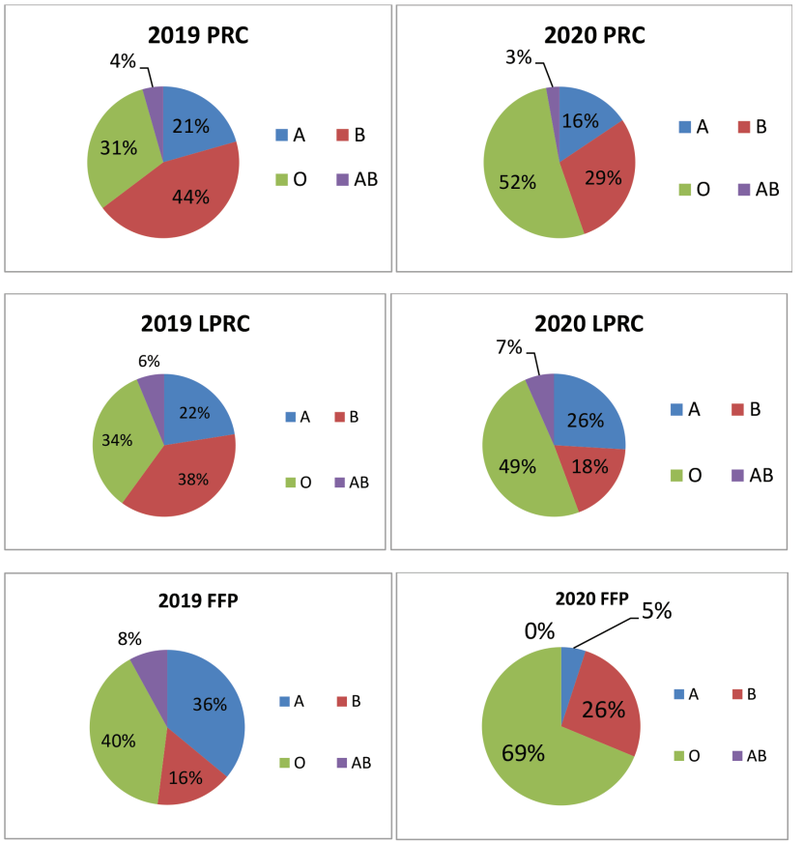

Figure 1 Proportion of blood group (A, B, O, AB) of each BC delivered for transfusion in 2019 and 2020

Discussion

The importance of blood products is further emphasized by inclusion of whole blood, red blood cell, platelets and FFP in the World Health Organization Model List of Essential Medicine[1]. Blood establishments (BEs) including blood center, blood service organization and hospital blood bank have to manage blood services effectively in terms of safe, sufficient and quality-assured. WHO has published the Action framework to advance universal access to safe, effective and quality-assured blood products 2020-2023[2] which includes strategies that BEs should follow in order to achieve the purpose of adequate and safe blood supply. At the level of hospital blood bank, blood utilization review is one of the quality tools for approaching blood utilization auditing[3]. This review has not yet been reached to determine the clinical appropriateness of blood use, but will get statistic data for future preparedness of blood supply and observation of clinical trends for blood use during 2019-2020 in MCH-MFU.

Estimation of blood requirement and preparedness

According to the number of patients was not large, blood was still adequate for requirement. By calculating the increment rate of blood used in 2020, estimate units of PRC, LPRC and FFP requirement in 2021 are 256, 355 and 82 units respectively, which are not significantly increased compared to the previous year. There was no global standard for estimating countries needs for blood/blood products, and estimates have to be made for each country and each region. In February 2010, from the forum of WHO Experts' Consultation on Estimation of Blood Requirements set up at WHO-HQ, Geneva, the expert presentation proposed blood requirement at 10-30 units per bed per year (Super-specialty - 30, Specialty - 20, General -10). In case of MCH-MFU full operation at 400 beds in the level of super-specialty COE, the estimation of blood requirement should be 8,000-12,000 units of red cell component per year.

Cross match to transfusion ratio (C/T)

C/T is one of the tools to observe appropriateness of clinical blood ordering. C/T above 2 should consider over requested from clinicians. Continuing medical education on appropriate use of blood and some other hospital strategies, such as "single unit transfusion policy" and Maximum surgical blood order schedules (MSBOS) should be considered for implementation. High C/T also affects blood stock management in blood bank. The cross matched units may be hold for many days and may not circulate for the other cases adequately; stock number will increase and may lead to expire.

In 2019, C/T for PRC was 2.06 with very high C/T found in several months, but in 2020, this review showed C/T for all BC below 2 and less occurrence of high fluctuation. This satisfactory improvement might result from clinicians' operative experience, appropriate blood use recognition as well as trust in blood ordering system and blood bank management.

Types of blood component

Due to the number of patients was not large and not wide variety of clinical conditions, platelet blood component (PLT) was not often used currently, therefore PLT was not analyzed in this 2-year review.

Shifting usage of PRC to LPRC was found. LPRC is a BC which some of white blood cells (WBC) are removed into buffy-coat layer by centrifugation during the process of preparation in order to reduce complications from WBC transfusion. However, the better way to remove WBC should be filtration, resulting BC as leukocyte depleted (LD), which blood bank of MCH-MFU plans to implement soon.

Blood group mostly used

The majority blood group of Thais is group O, follows by B while blood group A and AB are lesser. In general situation blood group B and O are adequately supplied and sometime over stock of group B, but on the other hand, when blood supply is short, blood group A is usually affected first.

The review showed that in 2019 blood group B transfusion was dominated while in 2020 was blood group O. This simply due to a hematologic malignancy patient with blood transfusion dependent was group B, who received chemotherapy and blood till expired by 2019, then a new case was group O, enrolled in 2020.

Conclusion

Blood and blood components used in MCH-MFU during 2019-2020 were still low due to the hospital is not yet fully operating. Increment of blood use was around 1- 2%. Estimation of future blood requirement depends upon expediting clinical services to its full potential. C/T indicated improvement of clinical requirement that below 2. LPRC usage was increased over PRC. Blood utilization review, patient blood management and hemovigilance are interesting programs which should be considered to implement in the COE hospital as well.

References

1. WHO Model List of Essential Medicines: 21st list 2019. Geneva: World Health Organization; 2019 [https://apps.who.int/iris/handle/10665/325771, accessed 9 December 2019].
2. WHO Action framework to advance universal access to safe, effective and quality-assured blood product 2020-2023. Geneva: World Health Organization; 2020.
3. Maramica I, Shulman IA, Approaches to Blood Utilization Auditing. Technical Manual. 19th ed. Bethesda, MD: AABB, 2017.