

Red Blood Cells Transfusion Monitoring in Blood Transfusion Centre, Faculty of Medicine, Khon Kaen University, Thailand

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ABSTRACT

Background: Cross match to transfused ratio (C/T ratio) in 2015 in Srinagarind hospital was 1.6, the Red cells (RC) unit requested 33,508 units, transfused 22,951 units and returned to Blood Bank 10,557 units. 60% for RC supply brought wastes in blood expired and work load. There lead us to implement new method and set Type and Screen channel for un-risk diagnosis. And blood logistics was started at end of 2015 for transfer the RC units to the wards. The diagnosis and hematocrit of patients must be considered for cross match.

Objectives: (I) To evaluate transferred to transfused ratio (T/T ratio) in patient's diagnosis, count on transfused units and the result will lead to reduce blood inventory and decrease blood wastage and budget for blood stocking. (II) To understand the diagnosis scope of RBC cross matching and issuing practices and measure efficiency using a novel quality indicator.

Methodology: RC units transfer by logistic system was collected in September 2016 to May 2018. The data was defined into diagnosis, unit cross matched and monitored transfer to transfuse ratio (T/T ratio).

Results: (I) Finding: C/T ratio from 2015 to 2018 were 1.72, 1.72, 1.68 and 1.68, respectively and T/T ratio for all RC transfer has calculated to 1.3, 1.3, 1.4 and 1.4, respectively. From 53 wards in tertiary hospital, 38 wards (71.7%) has T/T ratio <1.5; were intensive care units (MICU, PICU, SEICU, CCU, CVT ICU, NICU, NSICU), semi crisis units, chemotherapy patients, radiotherapy patients. In specific diagnosis found patients with severe or life-threatening illness (admit in ICU) and cancer treatment have T/T ratio closed to 1 (1.17-1.27). T/T ratio more than 1.5 (28.3%) for orthopedics and stenosis, eye disease, emergency injury and trauma, general practice and general surgery, and organ transplant have T/T ratio 1.51 to 1.85. The abdominal surgery found highest T/T ratio (3.33), and general surgery found T/T ratio 2.38.

Conclusion and Discussion: T/T ratio lowers than C/T ratio 37%. The data found 28.3% from 53 wards can consider for on call matching, to decrease work load and blood stocking. The expense from cross matching and blood inventory can provide to other plan for therapeutic support. The abdominal surgeries, general surgery, labour room, pre and post operation should be considered in type and screen.

Keywords

Cross match, Red cells transfusion.

Introduction

Blood Transfusion is the important part of clinical practice and

clinical threatening. Blood and blood products provide unique and therapeutic for patients, due to anemia. When blood is required for transfusion, the prescribing should complete and sign blood request form. Especially red cells request, the process need to red cells compatibility test for ABO and RhD grouping on

patients and donor. Antibody screening on patient, cross matching between serum/plasma of patients and donor have to test. The term compatibility test and cross match are sometime used interchangeably; they should be clearly differentiated. The cross match is the most important procedure for pre-transfusion. The purpose of compatibility testing mean to select blood components that will cause no harm to recipient and will have acceptable survival rates when transfused. Many times the red cells requesting or demand more than necessary real situation, or more than common needs. Compatibility testing includes a number of blood bank procedures performed before a transfusion to ensure the proper selection of blood for the patient. These procedures should include the following:

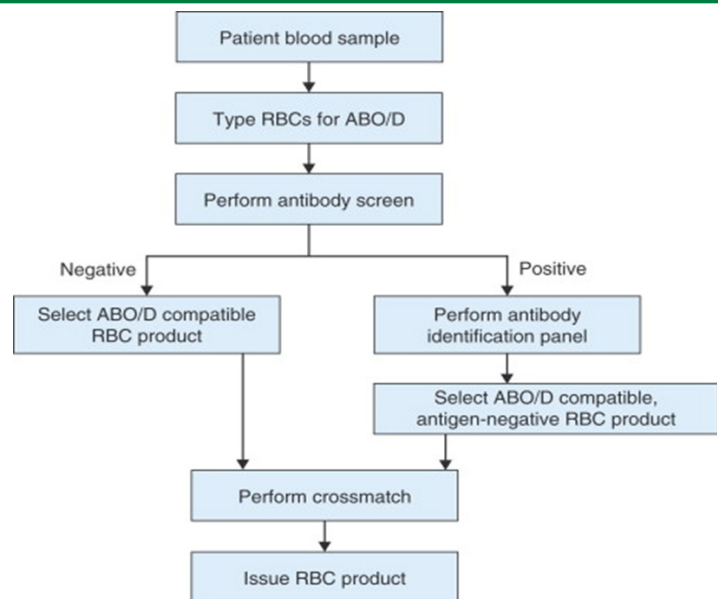
- A review of blood bank records for previous testing of the transfusion candidate. Previous ABO, D and antibody detection test results should be compared with current interpretations and any discrepancies resolved.
- Determination of ABO and D groups and examination for unexpected antibodies on each recipient sample received.
- Selection of ABO and D compatible donor units that have been tested in accordance with standards and found acceptable for transfusion.
- Cross matching tests between patient serum and donor red cells for evidence of serologic incompatibility.

Scientific and technical advances in blood group immunology have made the transfusion of blood a relatively safe procedure, but serious adverse effects of transfusion still result because of human error. Only individuals who understand the importance of blood bank protocols and adhere to them should be allowed to collect patient samples or perform tests. Failure to concentrate completely and use of careless techniques in performing laboratory tests directly endanger the life of the patient. The purpose of cross matching is to prevent the transfusion of incompatible cells. Testing of the recipient's (patient) serum with donor cells ("major cross match") is required because it is the best available way to detect antibodies in the patient serum that might damage transfused red cells and cause hemolytic transfusion reactions.

When performed properly, a compatible cross match will: (1) verify, in most instances, that donor's red cells are ABO compatible with the patient; and (2) detect most antibodies in the recipient's serum directed against antigens on the donor red cells.

The cross match has many limitations. A compatible cross match will not:

1. guarantee normal survival of transfused RC;
2. prevent immunization of the recipient;
3. detect all unexpected red blood cell antibodies in the recipient serum;
4. prevent delayed hemolysis due to an allo antibody response to antigens against which the patient has previous but undetectable immunization;
5. detect all ABO grouping errors either in donor or recipient; and
6. detect most D grouping errors in the donor or recipient.



The summary of major cross match or red cells matching was showed in figure 1.

Figure 1: Flow chart for red cells matching.

All blood products and source and valuable expensive resource. Therefore, inappropriate blood transfusion should be avoided. Srinagarind hospital, faculty of Medicine, Khon Kaen University, Thailand is the tertiary hospital in north eastern part of Thailand. The hospital has complicated therapeutics and for medical study and research. Also, the hospital support for healthy of population whole northeast parts. The capacity of the hospital can admit with 1,400 patients' bed and 52 wards for curing.

In part of blood transfusion service, the hospital have own Blood Transfusion Centre, to support and maintain blood products. In 2015, the cross match to transfuse ratio (C/T ratio) was 1.6, from 33,508 red cells units requesting; only 22,951 units were transfused. Amount of the red cells return was 10,557 units, these units were critical and need to re-check the qualify. This imposes storage problems for blood centre, loss of shelf life and wastage of blood viability. Therefore, the hospital and faculty and blood centre re-considered to implement the type and screen protocol for un-risk surgical patients. So the blood logistics services were starts in late of 2015, for delivered and transferred blood components in patients who need transfused. Blood bank personnel are responsible for providing serologically compatible blood within an appropriate in time. A cross match (compatibility test) is performed for patients who need replacement of their blood volume due to anemia or active, massive bleeding.

Objective

To evaluate the T/T ratio in patient's diagnosis, count on transfused units and the result will lead to reduce blood inventory and decrease blood wastage and budget for blood stocking.

To understand the diagnosis scope of RC cross matching and issuing practices and measure efficiency using a novel quality

indicator

Methods

The retrospective study collected data from September 2016 to May 2018 (21 months), the red cells units transferred to wards classified by patients diagnosis by logistics services. The data was defined into diagnosis and monitoring transferred and transfused ratio (T/T ratio), from the list, the following cross match were consider:

The patients grouping by diagnosis for 10 types;

- (1) Abdominal surgery, labour room, pre and post operation.
- (2) Orthopedic and stenosis
- (3) Eye disease
- (4) Emergency injury and trauma
- (5) General operative,medicine
- (6) General obstetrics, surgery, pediatrics
- (7) Organ transplant
- (8) Intensive Care Unit
- (9) Chemotherapy
- (10) Radiotherapy

Results

C/T ratio found 1.72 (51,382/29,908), 1.72 (49,764/28,970), 1.68 (43,439/25,808) and 1.68 (17,053/10,145) in 2015 to 2018. And T/T ratio at these four years found 1.3, 1.2, 1.4 and 1.4.

- Abdominal surgery refers to any operation on organs including the stomach, gallbladder, small or large intestine, liver, pancreas, spleen and appendix. It may be performed as an open or laparoscopic procedure. And the labor room is one of the most versatile rooms in a hospital. It is called a labor, delivery, and recovery room (LDR). This is the type of room that some hospitals and almost all birth centers use for their care. Also with pre and post operation patients; found T/T Ratio was 3.33.
- Orthopedic surgery or orthopedics, is the branch of surgery concerned with conditions involving the musculoskeletal system and spinal stenosis is a narrowing of the spaces within the spine, which can put pressure on the nerves that travel through the spine. Spinal stenosis occurs most often in the lower back and the neck; found T/T Ratio was 1.51
- Eye diseases like macular degeneration, glaucoma, and cataracts, can cause vision problems. Symptoms vary a lot among these disorders found T/T Ratio was 1.63
- Emergency injury and trauma There are two main definitions – firstly, that trauma relates to a distressing or disturbing psychological experience. Trauma also means physical injury which may result in wounds, broken bones or internal organ damage. Often people that experience a physical trauma may also experience psychological difficulty due to the shock of the unexpected injury. Traumatic injury is caused by various forces from outside of the body, which can either be blunt or penetrating (sharp). Blunt trauma includes falls, road traffic crashes; crush injuries, assaults (punches, kicks) and burns. Penetrating trauma involves shooting, stabbing or falling onto

a sharp object. These group were found T/T Ratio 1.65.

- In the medical profession, a general practitioner (GP) is a medical doctor who treats acute and chronic illnesses and provides preventive care and health education to patients. The T/T Ratio found 1.85.
- General surgery is a surgical specialty that focuses on abdominal contents including esophagus, stomach, small intestine, large intestine, liver, pancreas, gallbladder, appendix and bile ducts, and often the thyroid gland (depending on local referral patterns). They also deal with diseases involving the skin, breast, soft tissue, trauma, peripheral vascular surgery and hernias and perform endoscopic procedures such as gastroscopy and colonoscopy. This found T/T Ratio 2.38.
- Organ transplant (liver,kidney) or stem cells; including with patients' anemia by kidney failure, found 1.69
- Intensive Care Unit(ICU); patients with severe or life-threatening illness and injuries, which require constant care,close supervision from life support equipment and medication in order to ensure normal body functions. Common conditions that are treated within ICUs include acute respiratory distress syndrome,hypertension,metastases and other life-threatening conditions; fond T/T ratio 1.27
- Chemotherapy is a type of cancer treatment that uses one or more anti-cancer drugs. Most chemotherapy drugs affect cells in the bone marrow.This commonly leads to low blood cell counts and put a person at risk for bleeding and anemia. The use of drugs constitutes systemic therapy for cancer in that they are introduced into the blood stream these include rheumatoid arthritis;found T/T ratio 1.17
- Radiation therapy is a type of cancer treatment that uses beams of intense energy to kill cancer cells and shrink tumors. Radiation may come from a machine outside the body or it may come from radioactive material placed in the body near cancer cells. It can affect the bone marrow and lead to low blood cell counts;found T/T ratio 1.17

The summary table of T/T ratio was shown in table 1.

| Diagnosis types | T/T Ratio |
|---|-----------|
| Abdominal surgery, labour room, pre and post operation. | 3.33 |
| Orthopedic and stenosis | 1.51 |
| Eye disease | 1.63 |
| Emergency injury and trauma | 1.65 |
| General practice | 1.85 |
| General surgery | 2.38 |
| Organ transplant and stem cell | 1.69 |
| Intensive Care Units | 1.27 |
| Chemotherapy | 1.17 |
| Radiotherapy | 1.17 |

Table 1: The summary table of T/T ratio classified by diagnosis.

Conclusion

Between differences diagnosis, the results was shown in diagnosis types 1 and 6 have highest T/T Ratio, 3.33 and 2.38, respectively. Therefore in these diagnoses we can consider to request red blood

cells in type and screen protocol. In other diagnosis especially in diagnosis type 9 and 10; chemotherapy and radiotherapy patients were suggested to be indicative of significant blood usage; the T/T ratio was accepted. The most common use of blood transfusion in cancer patients is to treat anemia. The data warning to manage blood inventory and stock. Because many times of transportation, the returned blood units may be deteriorated quality. Also the cost effectiveness should be aware. The basic assumption behind any order for cross matching of blood is that the patient needs or has a reasonable possibility of requiring blood transfusion. In addition to this the practice of ordering was probably because of the uncertainty if blood will not be available; excessive blood ordering was considered.

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