

Blood utilization practices at a tertiary care hospital- A Retrospective study**B. Latha**^{1*}, **M.Chitra**², **J.Ravishankar**³¹*Department of Transfusion Medicine, Kilpauk Medical College and Hospital, Chennai, India*²*Department of Transfusion Medicine, Government Royapettah Hospital, Chennai, India*³*Department of Transfusion Medicine, Government Villupuram Medical College, Villupuram, India***ABSTRACT**

Aim: The aim of the study is to investigate the blood ordering pattern and transfusion practices thereby incorporating a blood ordering schedule which streamlines the use of blood and blood products for elective surgical procedures in future, which can decrease the over ordering of blood. **Materials & methods:** This study was conducted for a period of one year from January 2016 to December 2016 in those patients, who were scheduled for elective surgical procedures in our Govt. Royapettah Hospital. Total number of units reserved and cross matched and units issued were estimated for the calculation of C/T Ratio, Transfusion probability and Transfusion Index. **Results:** During the study, the hospital blood bank was requested to prepare 6013 units of Red blood cells for 2756 patients who underwent elective procedures. Blood crossmatched and transfusion patterns for surgeries performed in various departments. The overall C/T Ratio was 10.5, Transfusion Index was 0.2 and Transfusion Probability was 15.1% among various departments. Distribution of patients among Orthopedic department had the highest number of patients [30.4%(838)] Distribution of C/T Ratio among dental department had highest C/T Ratio of 12.8 and neurosurgery had lowest C/T Ratio of 5 **conclusion:** Before the implementation of an evidence-based blood ordering schedule at our hospital, we observed that a lot of blood was reserved for elective surgeries which were not being utilized. This ends up in burdening the blood bank personnel and also wasting the resources. The results showed that the C/T ratio for elective surgeries were very high.

Keywords: Msbos cross match to Transfusion ratio, Transfusion probability, Transfusion index.

Introduction

Blood is a precious resource which is dependent upon public donations. It is very necessary that this scarce and expensive commodity to be used accurately and logically [1]. In developing countries, blood is ordered by treating physicians and blood banks have no authority of overriding their requests which results in unnecessary ordering of blood products. In elective surgeries, risk of procedure associated bleeding can be anticipated and therefore red cell requirement can be easily calculated [2]. Data from developing countries shows that only 40–70 % of the red cells units arranged for the patients are actually transfused [3]. Blood transfusion laboratories have experienced gradually increasing workloads without any corresponding increase in trained staff and this scenario has become

more acute during the recent years. A reappraisal and rationalization of compatibility procedures and the introduction of maximum surgical blood order schedules are important developments in this respect. The maximum surgical blood order schedule is a table of elective surgical procedures which lists the number of units of blood to be crossmatched for the procedure preoperatively. This schedule is based on a retrospective analysis of actual blood usage associated with the individual surgical procedure. It correlates closely the volume of blood crossmatched to the volume of blood transfused [4]

MSBOS has many advantages [4]:

1. Reduction in crossmatching workload for the blood transfusion laboratory which allows more time to respond to emergency requests, and also to investigate complex serological problems.
2. A reduction in the level of stress for lab technicians and medical officers.
3. More efficient use of blood stocks and a reduction in wastage due to out-dating.

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The data should be analysed for each surgical procedure to indicate the number of blood units crossmatched, the number of units transfused, the percentage used the C/T ratio and the average number of units transfused, the percentage used, the C/T ratio for each procedure. The ideal value for the C/T ratio is 1.0. The higher the value the more blood is being crossmatched unnecessarily. The objective for surgical procedures is a C/T ratio of between the 2 and 3:1, which corresponds to a blood usage between 30 and 50%[4]. There are no uniform guidelines regarding the appropriate volume of blood that should be ordered prior to procedures. This results in the discarding or waste of cross matched but unutilized blood, thus incurring increased operative costs while depleting a vital resource. The blood bank at Government Royapettah Hospital conducted an audit during 2014-2015, and observed transfusion practices during elective surgeries. The number of red cell units crossmatched (C) were compared to those which were actually transfused (T). The ratio was unacceptable for all planned surgeries in our observation. So the present study was performed with the aim of evaluating preoperative blood cross-matching in our hospital. The main purpose of the study was to address the problem of blood-over-ordering and to develop a policy for rational use of blood and blood products using MSBOS for planned surgeries. The gold standard C/T Ratio was set as 2.5 or less according to the guidelines laid by the British Committee for standards in Haematology Blood Transfusion Task Force [4].

AIM: The aim of the study was to investigate the blood ordering pattern and transfusion practices, thereby incorporating a blood ordering schedule which streamlines the use of blood and blood products for elective surgical procedures in future, and which can decrease the over ordering of blood.

Materials & methods

Results

During the study, the hospital blood bank was requested to prepare 6013 units of Red blood cells for 2756 patients who underwent elective procedures (Table-1).

Table 1: Blood units crossmatched and transfusion patterns for surgeries performed in various departments

Parameter	Surgical Oncology	General Surgery	Orthopedics	Urology	SGE	Neuro Surgery	Dental	Plastic Surgery
No. of Patients	690	781	838	230	95	16	28	78
No. of Patients Crossmatched	690	781	838	230	95	16	28	78
No. of blood Units	2555	1191	1424	461	207	25	51	99

This study was conducted for a period of one year from January 2016 to December 2016 in those patients, who were scheduled for elective surgical procedures at our Government Royapettah Hospital, Chennai, Tamilnadu, India. The blood ordering requests for the various departments like General Surgery, Urology, Plastic surgery, Neurosurgery, Dental, Orthopedics, Surgical gastroenterology and Surgical oncology cases were compiled and reviewed. Total number of Blood units reserved and cross matched and total number of Blood units issued were estimated for the calculation of C/T Ratio, Transfusion probability and Transfusion Index. A ratio of units cross matched to the actual units transfused was calculated to review the transfusion policy. The utilization of blood was calculated using the following standardized indices.

1. Cross match to transfusion ratio (C/T Ratio) = Number of Blood units cross matched/ Number of blood units transfused.
2. Transfusion Probability (%T) = Number of patients transfused/ Number of patients crossmatched X 100
3. Transfusion Index(TI) = Number of units transfused/ Number of patients cross matched. A value of 0.5 or more was considered indicative of significant blood utilization.
4. Maximum surgical blood order schedule =1.5 X TI.

Based on the above parameters, MSBOS will be developed for different elective surgeries in future for various departments.

EXCLUSION CRITERIA: Blood transfusions Emergency cases were excluded in this study.

STATISTICAL ANALYSIS: All the data were entered in Microsoft excel and analyzed using SPSS software version 19.

Crossmatched								
No. of Patients Transfused	138	86	125	38	15	3	3	7
Units Transfused								
No. of blood Units Transfused	205	107	165	54	18	5	4	12
No. of Patients not Transfused								
No. of Patients not Transfused	552	695	713	192	80	13	25	71
C/T Ratio								
C/T Ratio	12.5	11.1	8.6	8.5	11.5	5.0	12.8	8.3
Transfusion Index (TI)								
Transfusion Index (TI)	0.3	0.1	0.2	0.2	0.2	0.3	0.1	0.2
Transfusion Probability(%T)								
Transfusion Probability(%T)	20%	11%	15%	17%	16%	19%	11%	9%

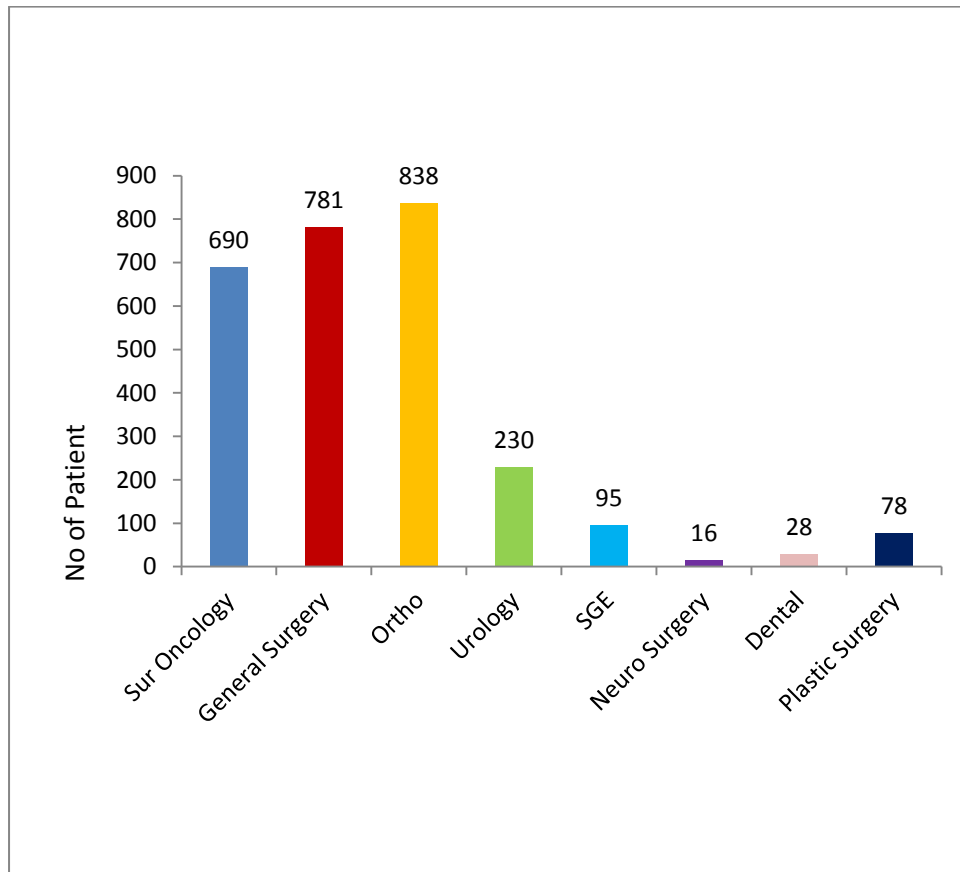


Fig 1: Distribution of patients among various departments

Distribution of patients among various departments showed that the department of Orthopedics had ordered blood units for more patients [30.4%(838)] and department of Neurosurgery had ordered blood units for lowest number of patients[0.5%(16)] As given in fig-1

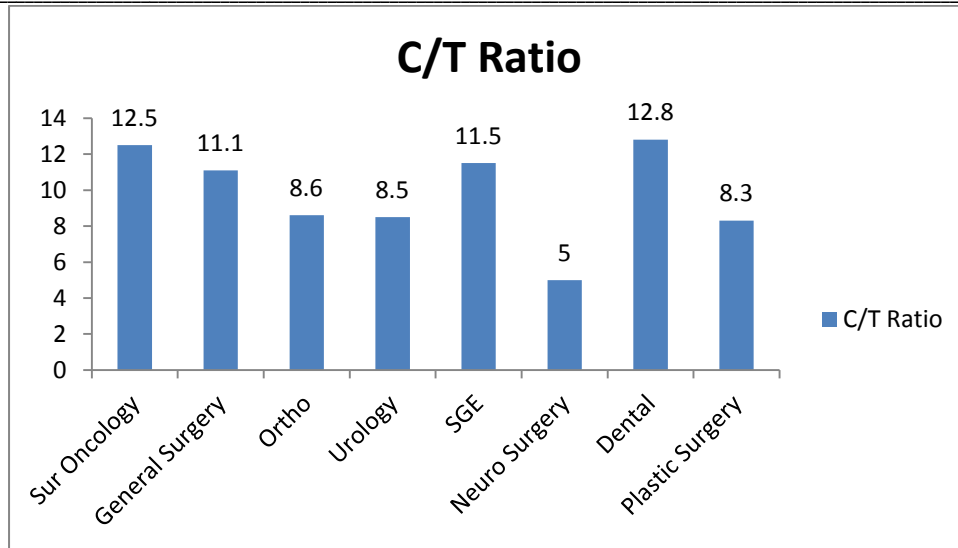


Fig 2: Distribution of C/T Ratio among various departments

Distribution of C/T Ratio among various departments showed dental department had highest C/T Ratio of 12.8 and department of neurosurgery had lowest C/T Ratio of 5 as shown in fig-2

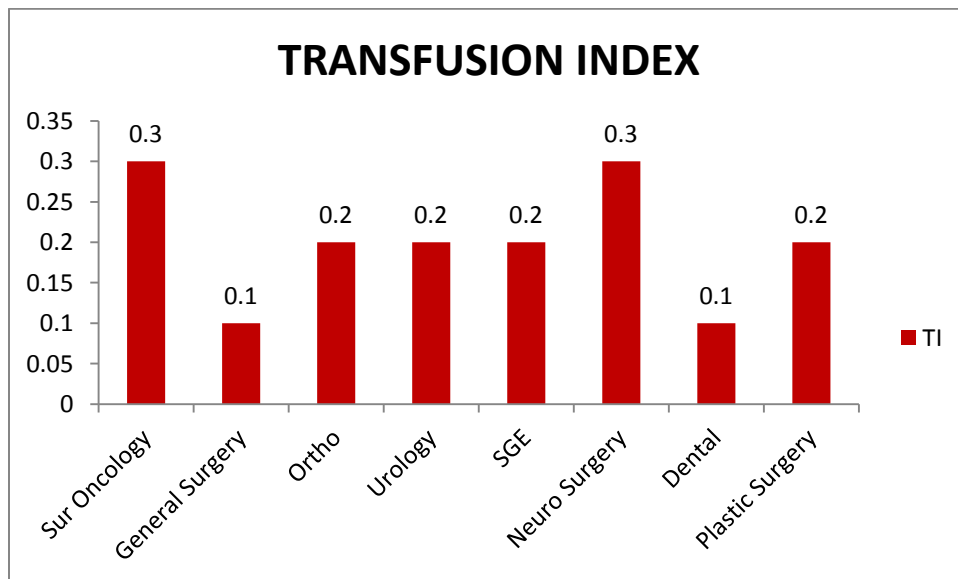


Fig 3: Distribution of Transfusion Index(TI) among various departments

Distribution of Transfusion Index (TI) among various departments showed none of the department had a value of 0.5 or more, which was indicative of significant blood utilization as shown in fig-3.

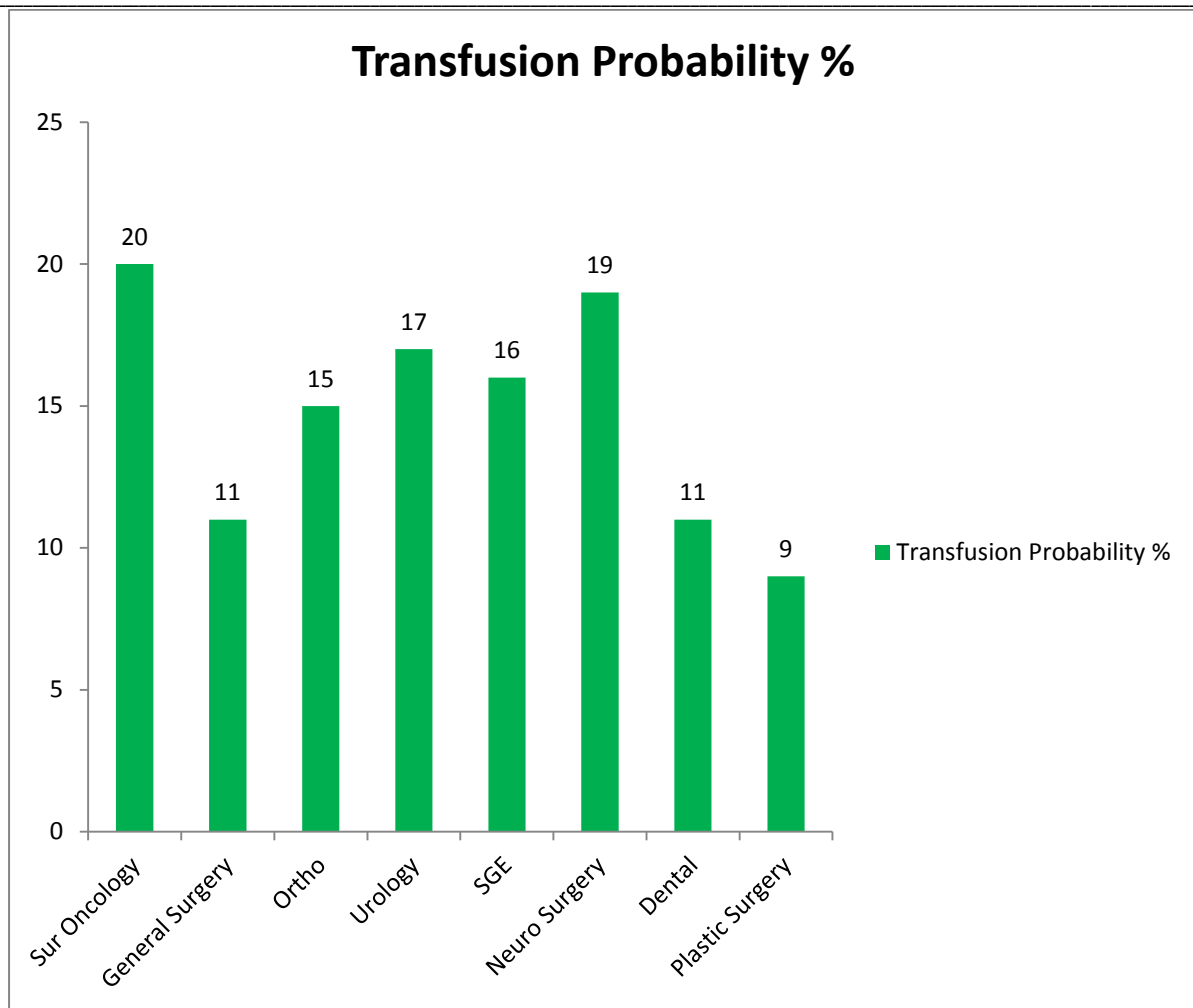


Fig 4: Percentage of Transfusion Probability among various departments

Percentage of Transfusion Probability among various departments showed that none of the department had a value of >30%, which is indicative of significant blood usage as shown in fig- 4.

The overall C/T Ratio was 10.5, Transfusion Index was 0.2 and Transfusion Probability was 15.1% among various departments.

Orthopedic Department had the highest number of patients cross matched, 838(30.4%) and department of Surgical Oncology had the highest number of units cross matched as well as reserved 2555 (42.5%), but most of the blood units were not transfused, 2350 (39.1%).

The department of Orthopedic was the next Department to order more blood units for crossmatch and reservation number of units cross matched and reserved for transfusion, 1424(23.7%), but not transfused 1259(20.9%).

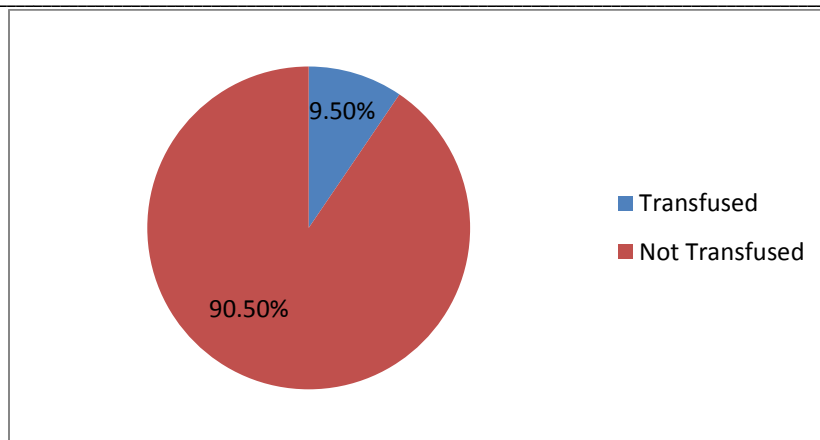


Fig 5: A total of 6013 Red blood units were crossmatched for elective procedures and out of these 570 (9.5%) units were transfused. The 90.5 % of units were crossmatched, but not transfused.

A total of 6013 Red blood units were crossmatched for elective procedures and out of these only 570 (9.5%) units were transfused. The remaining 90.5 % of units were crossmatched, but not transfused. (fig-5).

Discussion

Blood transfusion is an essential component of patient treatment services. The main aim of blood transfusion is to ensure patient recovery as well as safety, at the same time ensuring an appropriate use, thereby avoiding unnecessary use of blood in clinical practice [3]. The utilization of blood and blood components is fundamental for proper functioning of blood banks. There is always a shortage of blood because of an increased demand of blood components for Departments like General surgery, Ortho, Surgical

oncology patients with a limited number of public donations. By reducing the pre transfusion compatibility testing we can decrease the workload and expiry of components [3]. In this study the current transfusion practice for elective surgical procedures were evaluated and MSBOS can be introduced in the near future. Other studies which used transfusion indices to evaluate blood transfusion practices used C/T ratio for evaluating blood transfusion practices (Table 2).

Table 1: Authors with respect to C/T Ratio, Transfusion index, transfusion probability

Authors	C/T Ratio	Transfusion Index	Transfusion Probability(%T)
Kuchhal A et al[5]	1.8	0.5	61.7
Alam MM et al[6]	4.4	-	-
Raghuwanshi et al[7]	6.23	0.66	57.62
KozarzewskaM et al[8]	9	0.15-0.42	2.94-18.8
Present study	10.5	0.2	15.1

The higher C/T Ratio have been reported by Collins et al[9] among the surgical categories, wherein the percentage of cases where none of the crossmatched red blood cells were transfused ranged up to 93%, suggesting that gross over-ordering of crossmatches in certain surgeries which is similar to the study that 90.5% of the cross matched blood was unutilized.

The probability of transfusion for a given procedure (%T), with a value of 30% and above suggests a significant blood usage. It indicates an appropriate transfusion as compared to number of units crossmatched per patient. The results of the present study revealed an overall transfusion probability of 15.1% which were in excess of those transfused. In contrast to our study Kuchhalet al[5] and Raghuwanshi et al[7] showed the transfusion probability of 61.7% and 57.62% respectively. Similar to our study

Kozarzewska et al[8] showed the transfusion probability ranges from 2.94-18.8% in four surgical groups.

The studies done by Alam et al[6] showed (C/T Ratio-4.4), Raghuwanshi et al[7] (C/T Ratio-6.23), Kozarzewska et al[8] (C/T Ratio-9). Which is similar to the present study showed that the overall C/T Ratio of 10.5. In contrast to our study, a study done by Kuchhal A et al[5] a C/T Ratio of 1.8 which was found to be in a desirable range.

Regarding TI, a value of 0.5 or more is indicative of significant blood utilization. The TI reported in the current study was 0.2. This finding is similar to study by Kozarzewska et al[8] showed TI in the range of 0.15 to 0.42 in four surgical groups.

The indiscriminate ordering of blood which is done for elective surgeries results in holding up of blood bank reserve. When a unit is cross- matched for a patient, it is removed from the blood bank inventory and is unavailable for the use of other patients. This results in the wastage of blood bank resources.

In the absence of an explicit MSBOS, ordering for blood transfusion is based on the subjective assessment of blood loss instead of audit based estimates of the requirement in a particular procedure. The current deficiency of explicit MSBOS in our hospital is the major factor responsible for this inappropriate blood utilization. Based on the findings in our study, a Maximum Surgical Blood Order Schedule calculated by the formula $1.5 \times TI$ [10] has been suggested to the hospital transfusion committee. The formulation of data driven MSBOS and adhering to the transfusion guidelines along with educational programme may be effective in modifying clinician's behavior in ordering transfusion which reduce the number of unused units and generate considerable cost savings[11]

Other measures with proven improvement in CT Ratio and %T are type and screen (T and S), save and abbreviated crossmatch. Based on retrospective analysis of actual blood usage for the elective surgical procedures, the MSBOS determines the number of blood units to be routinely crossmatched for each procedure¹¹. The type and screen (T and S), is the determination of patient's ABO grouping, Rh typing and screening for unexpected clinically significant allo-antibodies. If the screening is negative, ABO compatible blood from the local inventory can be used with a quick spin crossmatch. In contrast, if the

antibody screening is Positive, then workup is necessary to determine the target antigen and to identify antigen-negative units for transfusion.

Conclusion

Before the implementation of an evidence-based blood ordering schedule at our hospital, we observed that a lot of blood was reserved for elective surgeries which were not being utilized. This ends up in burdening the blood bank personnel and also wasting the resources. The results showed that the C/T ratio for elective surgeries were very high.

Developing a blood ordering policy will decrease over-ordering of blood, unnecessary compatibility testing and wastage due to outdated. It also allows for a more efficient management of blood inventory. In this regard, the hospital blood transfusion committee has to implement MSBOS for selected surgical procedures and to conduct regular audits for the effectiveness of the blood requesting policy. CT Ratio can be used for periodic feedbacks to improve the blood ordering, handling, distribution and utilization practices of this scarce resource.

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