

# Cost Effectiveness and Budget Impact of Patient Blood Management in a Turkish State Hospital

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## INTRODUCTION

- Patient blood management (PBM) is a patient-centered, evidence-based multidisciplinary approach that aims to optimize hemoglobin concentration, maintain hemostasis and minimize blood loss in patients undergoing surgery.<sup>1-3</sup>
- The available evidence indicates that anemia, bleeding and exposure to allogeneic products are risk factors for morbidity and mortality in elective surgery.<sup>4-8</sup>
- These risk factors account for an economic burden on healthcare systems through prolonged length of stay in hospital (LOS), re-hospitalizations and increased risk of adverse events and complications.
- The Ministry of Health (MoH) of Turkey embarked on a project titled ‘*Technical Assistance for Improving Blood Transfusion Management in Turkey*’ in March 2019 with assistance from the European Union.<sup>9</sup>

## OBJECTIVES

- The aim of this study is to explore the cost-effectiveness and budget impact of implementing PBM in the cardiovascular surgery department of a state hospital in Turkey.

## METHODS

- Cost-effectiveness (decision tree analysis) and budget impact models, based on the numbers of avoided transfusions and avoided complications after implementation of the PBM program, were compared between pre- and post-PBM periods in the cardiovascular surgery department of Ankara Bilkent City Hospital.
- The endpoints of the decision tree model were avoided transfusion-related complications (sepsis, renal failure, myocardial infarction and stroke), and results were presented as incremental cost per incremental avoided complication. (**Figure 1**)
- Results from two published meta-analyses were used for probabilities of transfusion and for probabilities of transfusion-related complications.<sup>10,11</sup> (**Table 1**)
- Blood usage data were obtained from the transfusion centre of the hospital from February 2019 to October 2020 (pre-PBM) and December 2020 to July 2022 (post-PBM).
- Preoperative iron deficiency anemia treatment was made with intravenous (IV) ferric carboxymaltose (FCM) (two 500 mg per 10 mL vials before surgery).
- Sensitivity analysis for both CEA and BIM were conducted to check the robustness of results.

## RESULTS

- Implementation of PBM was associated with a decrease in the number of blood products used per patient (except for apheresis and cryoprecipitate). PBM decreased the per patient usage of RBCs by 21% and whole blood products by 23.7%. (**Table 2**)
- The number of transfusions and expected complications were decreased in the post-PBM period. (**Table 3**)
- The post-PBM period dominated the pre-PBM period in the cost-effectiveness analysis. With PBM, 68 complications were avoided resulting in the reduction of 11,765 TRY in incremental costs. Findings were robust to scenario changes in sensitivity analyses. (**Table 4**)
- In 20 months, Ankara Bilkent City Hospital has saved **6,596,934 TRY (€324,302)** by implementing PBM in one department. (**Table 5**)

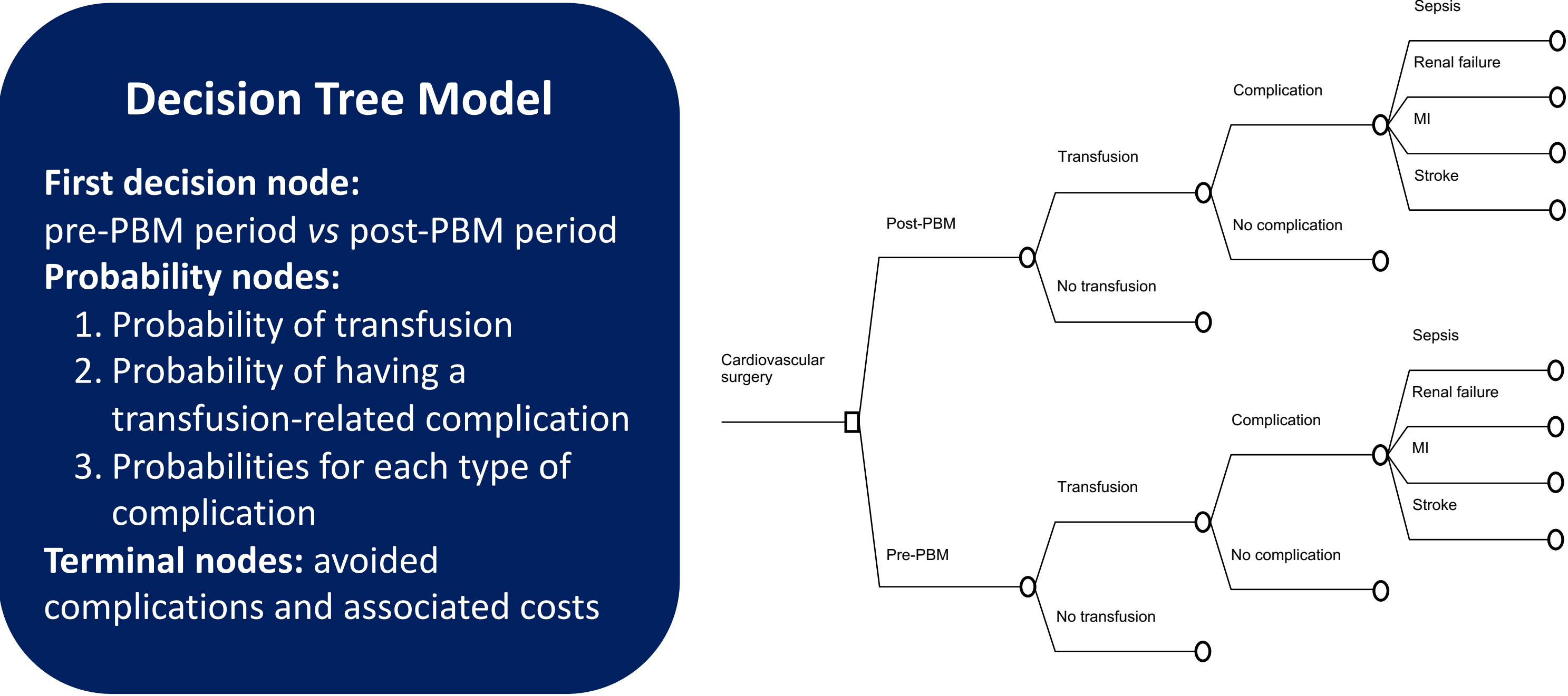
## CONCLUSIONS

- An overall 21% reduction in the use of RBCs and 23.7% reduction in the use of all blood products was observed and 67 complications were avoided with the implementation of PBM resulting in the reduction of 11,765 TRY in incremental costs.
- In 20 months, Ankara Bilkent City Hospital has saved 6,596,934 TRY by implementing PBM in one department and by avoiding treatment costs of transfusions and complications.
- The findings on blood savings and complications are of utmost importance in times of crisis as recently experienced in Turkey.

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**DISCLOSURES.** This study was supported by CSL Vifor

**Figure 1.** Decision tree model comparing PBM versus no PBM implementation



**Table 1.** Transfusion rates and cardiac surgery transfusion-related complications

Parameter	Pre-PBM Period	Post-PBM Period
Transfusion rate <sup>10</sup>	55.32%	39.12%

Complication <sup>11</sup>	Complication with transfusion	N	Complication probability with transfusion
Sepsis	10.8%	1897	0.5455
Renal failure	3.9%	685	0.1970
Myocardial Infarction	3.7%	650	0.1869
Stroke	1.4%	246	0.0707
Total	–	3478	–

**Table 2.** Blood product utilization: Pre-PBM versus Post-PBM period

Blood product	Pre-PBM period (02/11/2019–10/02/2020)		Post-PBM period (12/02/2020–07/24/2022)	
	Number	Per patient (n = 2084)	Number	Per patient (n = 3154)
Erythrocyte suspension	8,822	4.23	10,574	3.35
Fresh frozen plasma	7,319	3.51	6,793	2.15
Apheresis platelets	20	0.001	51	0.0016
Pooled platelets	954	0.46	930	0.29
Cryoprecipitate	1,338	0.64	2,948	0.93
Total	18,453	8.85	21,296	6.75

**Table 3.** Transfusions and complications: Pre-PBM versus Post-PBM period

	Pre-PBM period (n = 2084)	Post-PBM period (n = 2084)
<b>Transfusions</b>		
Number of patients with transfusion	1,153	815
Number of patients without transfusion	931	1,269
<b>Complications</b>		
Sepsis	125	88
Renal failure	45	32
Myocardial Infarction	43	30
Stroke	16	11
Total	228	161

**Table 4.** Cost-effectiveness analysis results

	Cost (TRY)	Incremental cost (TRY)	Avoided adverse events (n)	Incremental avoided events (n)	ICER
Post-PBM	36,296	-11,765	67	67	PBM dominates
Pre-PBM	48,091		0		

**Table 5.** Budget impact of implementing PBM

Treatment costs	Pre-PBM period	Post-PBM period
Sepsis	1,840,418	1,301,467
Renal failure	29,083,032	20,566,309
Myocardial Infarction	1,600,760	1,131,991
Stroke	2,222,050	1,571,341
Total complication costs	34,746,260	24,571,108
Total cost of transfusion	2,989,880	1,691,455
Cost of PBM	0	4,876,643.4
Total costs	37,736,140	31,139,207
Total savings (TRY)		6,596,934
Total savings (€)		324,302