

Impact of Patient Blood Management (PBM) on the reduction of transfusion requirements and length of hospital stay in patients undergoing major planned orthopedic in Germany

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INTRODUCTION

Patient blood management (PBM) is a multidisciplinary, patient-centered approach aiming at addressing risk factors for adverse clinical outcomes (such as iron deficiency, anemia, coagulopathy and blood loss) (1, 2). Recent studies underline the success of PBM programs in reducing transfusion utilization, the burden of anemia in patients, and improving patient outcomes including shortened length of hospital stay (LOHS), less frequency of complications and lower risk of mortality (3, 4).

The objective of this study was to assess the impact of PBM implementation on red blood cells (RBC) transfusion rate and LOHS in one German hospital.

METHODS

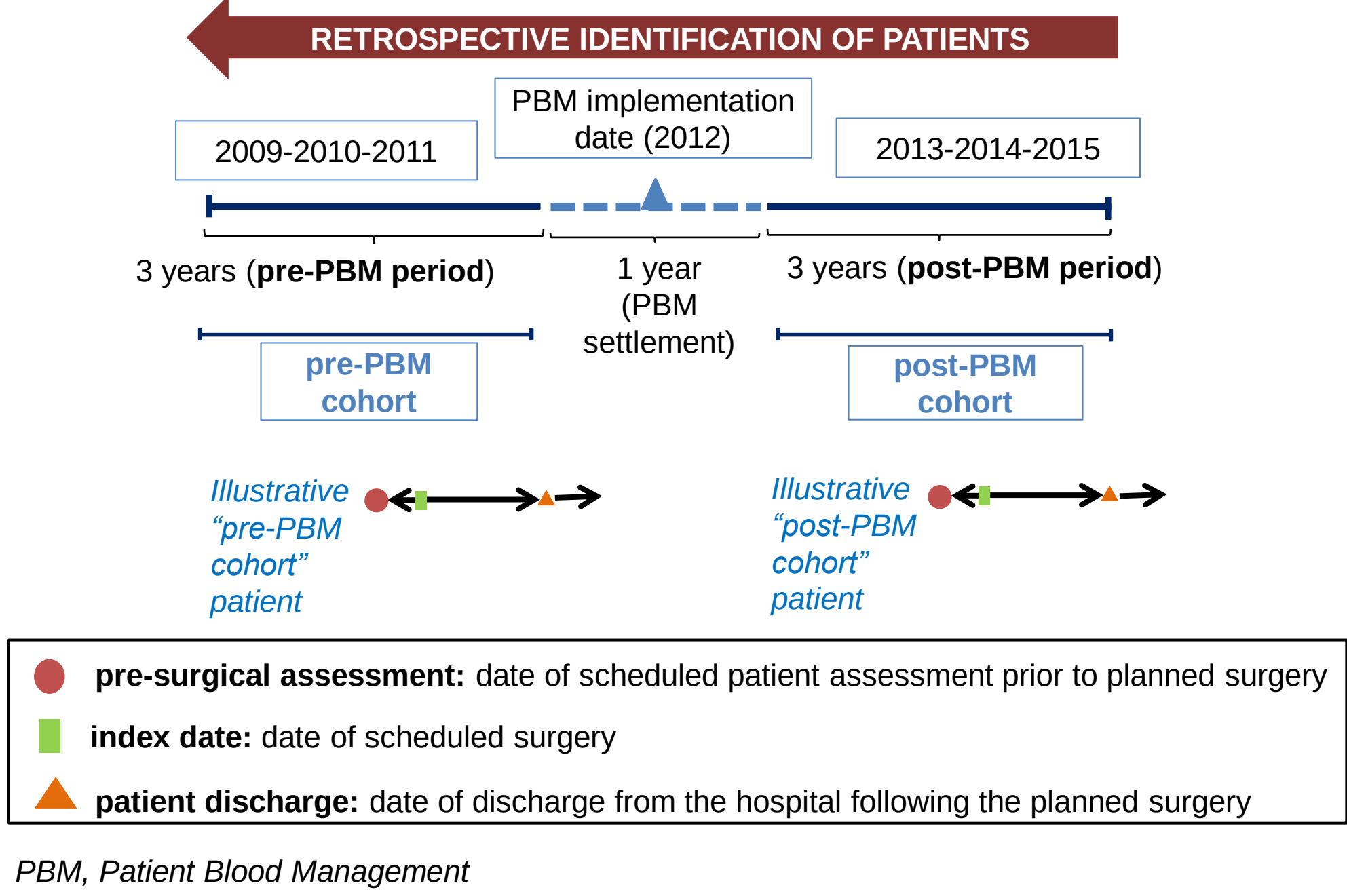
STUDY DESIGN. This is an observational retrospective study among adult patients who underwent major planned orthopedic surgeries (hip or knee replacement) in St Vincentius Kliniken, Karlsruhe, Germany.

STUDY POPULATION. Two separate cohorts:

- pre-PBM cohort, orthopedic surgeries performed during the 3 years period before PBM program use (2009 to 2011)
- post-PBM cohort, orthopedic surgeries performed during the 3 years period after PBM implementation (2013 to 2015)

STUDY COLLECTION PERIODS. The date of the patient surgery was referred to as **index date**. The data collection period spanned two main stages anchored to the date of index event: **the pre-surgical assessment period** (date of assessment up to three months before the surgery); and the **post-index event period**, starting one day after the index date and ending 30 days after patients being discharged from the hospital or death, whichever occurred first (Figure 1).

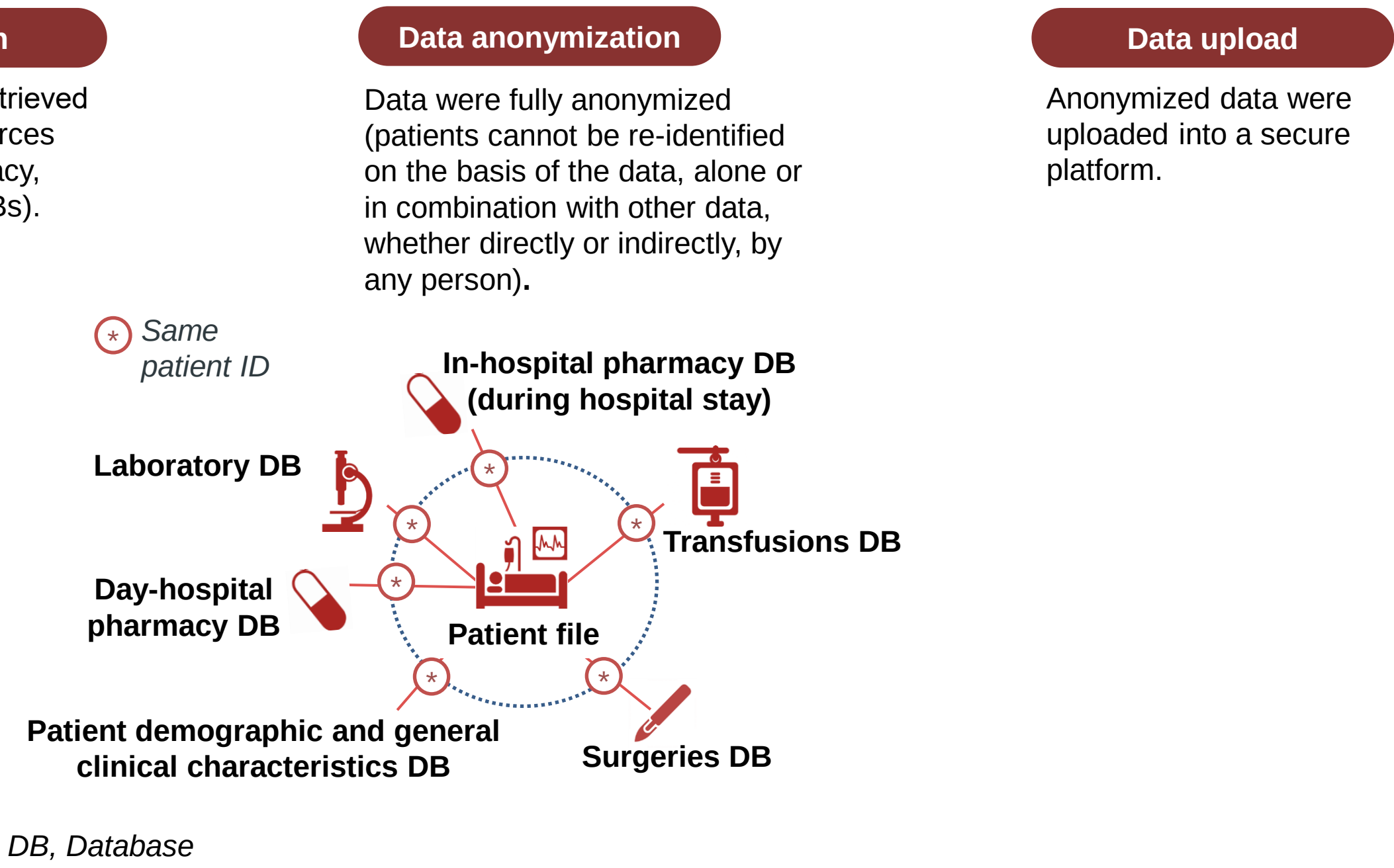
Figure 1. Study design



THE VARIABLES. For all surgeries included in the study, patient's demographics, surgery details, iron deficiency anemia, treatments received, RBC transfusions, LOHS and other clinical outcomes were collected. Transfusion policy applied by the hospital was also collected.

DATA SOURCE. The collection approach consisted of retrieving data of patients who underwent surgery before or after the PBM program implementation from hospital Databases (DB) (Figure 2). Data collected were fully anonymized at hospital-level and uploaded into a platform.

Figure 2. Data collection and management process



DATA ANALYSIS. Descriptive analysis of demographic and clinical characteristics of surgeries performed in both study cohorts was performed. Logistic regression models were performed to assess the impact of PBM program on post-surgery RBC transfusion rate, including age, period, gender, use of Intravenous (IV) iron pre-surgery as potential confounders. LOHS was compared between study cohorts using the Student t test.

CONCLUSIONS

An increasing number of evidences demonstrates how implementation of the PBM program in the hospital practices significantly improves outcomes and safety of patients, also reducing associated healthcare costs. The current study showed how the use of the PBM at the St Vincentius Kliniken in Germany was associated with a reduction of post-surgery RBC transfusion rate and the LOHS after surgery.

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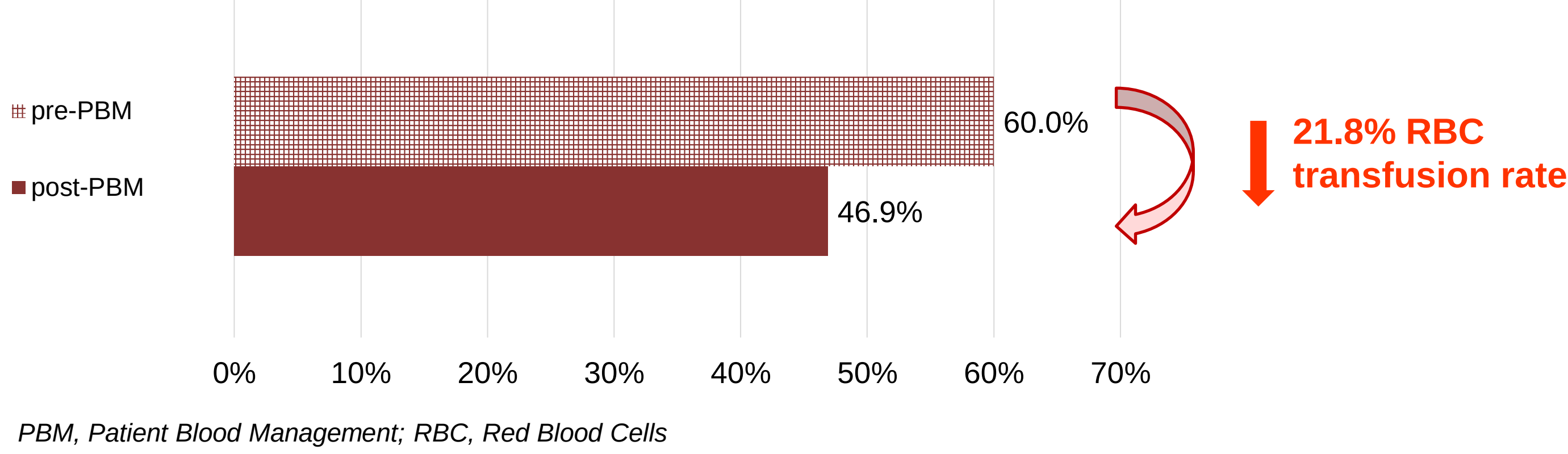
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RESULTS

PBM implementation and impact on the RBC transfusion rates.

- RBC transfusion rate after the surgery was 60.0% (n=1,942) for pre-PBM cohort, decreasing to 46.9% (n=1,511) for post-PBM patients' cohort (p<0.0001), globally showing a reduction of 21.8% in the RBC transfusion rate between pre- and post-PBM (Figure 3).

Figure 3. Post-surgery RBC transfusion rates before and after the implementation of PBM



- The logistic regression model, which included analysis with additional potential confounders (age, period, gender, use of IV iron pre-surgery), showed that PBM implementation at the hospital was associated with a lower need for RBC transfusions [Odds Ratio, OR of 0.543 (Confidence Interval, CI 95%: 0.490-0.601)] (Table 1).

Table 1. Impact of PBM implementation on RBC transfusion rate after surgery (logistic regression model)

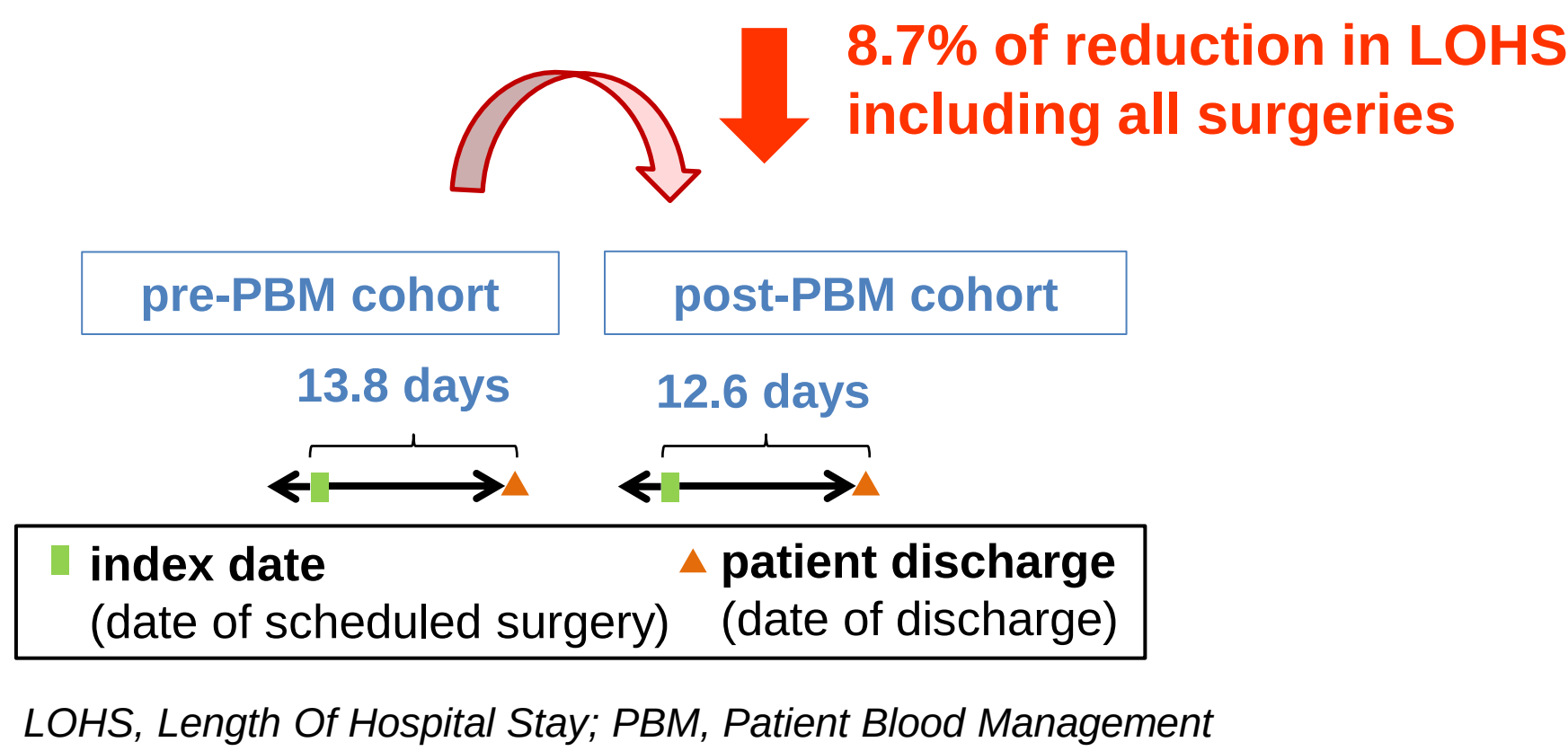
	OR (95% CI)	p-value
Age at index date (years)	1.045 (1.039-1.051)	<0.0001
Post-PBM period	0.543 (0.490-0.601)	<0.0001
Female	0.778 (0.693-0.871)	<0.0001

CI, Confidence Interval; IV, intravenous; OR, Odds Ratio; PBM, Patient Blood Management ; RBC, Red Blood Cells

PBM implementation and impact on the LOHS

- LOHS was also reduced after PBM implementation from a mean (standard deviation, SD) of 13.8 (6.2) days to 12.6 (5.5) (p<0.0001) (Figure 4).

Figure 4. Days (mean) between date of surgery and date of hospital discharge



Hospital characteristics. The site was implementing a restrictive transfusion policy (i.e., when Hemoglobin concentration was <7 g/dL to 8 g/dL) already before PBM implantation, and all surgeries included in the study were managed using this restrictive transfusion policy.

Patient demographics.

- Overall, data from 6,456 surgeries were included (3,236 surgeries included in the pre-PBM cohort and 3,220 in the post-PBM).
- Mean (SD) age at surgery was 71.1 (9.5) years [70.8 (9.4) pre-PBM, 71.4 (9.6) post-PBM]; 71.0% were female (78.0% pre-PBM, 64.0% post-PBM).

Surgery characteristics.

- Out of the 6,456 surgeries, 2,732 patients were operated for knee replacement and 3,724 for hip replacement.
- Mean (SD) time surgery duration was 1.1 (1.4) and 1.1 (0.3) hours in pre- and post-PBM cohorts, respectively.