

# A quality improvement project to limit perioperative transfusion during craniofacial surgery in infants and children

Grace Parizek, BS<sup>1</sup>, Annie Drapeau, MD<sup>2</sup>, Joseph Tobias, MD<sup>3</sup>, Jonathan Pindrik, MD<sup>4</sup>, Gregory Pearson, MD<sup>5</sup>, Ashley Smith, MD<sup>3</sup>

<sup>1</sup>Ohio University Heritage College of Osteopathic Medicine, Columbus, OH, USA

<sup>2</sup>Department of Neurosurgery, University of Manitoba Health Sciences Centre, Winnipeg, Manitoba, CA

<sup>3</sup>Department of Anesthesiology & Pain Medicine, Nationwide Children's Hospital, and College of Medicine, The Ohio State University Columbus, OH, USA

<sup>4</sup>Department of Neurosurgery, Nationwide Children's Hospital, and College of Medicine, The Ohio State University Columbus, OH, USA

<sup>5</sup>Center for Complex Craniofacial Disorders, Nationwide Children's Hospital, and College of Medicine, The Ohio State University Columbus, OH, USA

## Introduction

- Craniosynostosis results from premature fusion of one or more suture lines of the skull.<sup>1</sup>
- If left untreated, craniosynostosis can result in developmental delay, increased intracranial pressure, and seizures.<sup>1,2</sup>
- Surgery allows for wider remodeling of the skull, but in infants and children, is associated with blood loss and transfusions.
- Because of large amount of surgical blood loss, transfusion rates have been reported as high as 100%.<sup>3</sup>

**Objective:** Decrease the variability in transfusion practices at Nationwide Children's Hospital during open CVR using an intraoperative transfusion protocol.

**Specific Aim:** Decrease the percentage of intraoperative transfusions given to hemodynamically stable patients with a Hgb >7.5 g/dL from our baseline value of 40% to 0%.

## Methods

- A streamlined intraoperative transfusion algorithm, starting from the moment the patient was evaluated in the pre-operative holding area on the day of surgery to their departure from the post-anesthesia care unit, was implemented during quarter one of 2021 (Figure 1).
- The defined threshold that would necessitate transfusion was a hemoglobin (Hgb) value <7.5 g/dL.

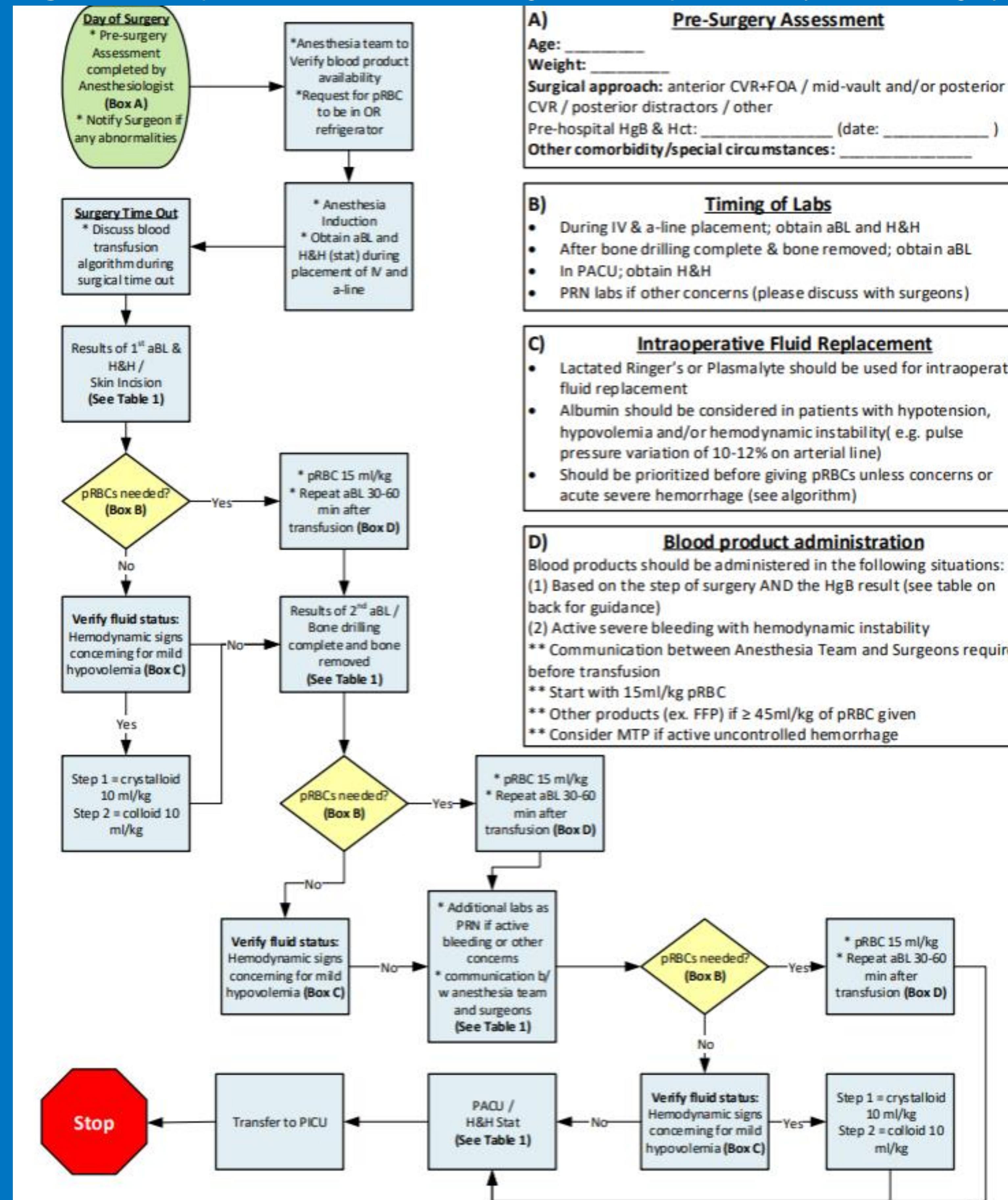
## Results

**Table 1.** Comparison of transfusion rates per year

Year/ Intervention	2018 (n=9)	2019 (n=16)	2020 (n=16)	2021 (n=16)	2022 (n=10)	2023 (n=12)	P (2018 vs 2023)
<b>Intraoperative transfusion</b>							<0.01
Transfusion ≤ 7.5	3 (33.3%)	9 (60.0%)	9 (60.0%)	10 (100.0%)	5 (71.4%)	10 (90.9%)	
Transfusion > 7.5	6 (66.7%)	6 (40.0%)	6 (40.0%)	0 (0.0%)	2 (28.6%)	1 (00.1%)	
<b>Postoperative transfusion</b>							<0.01
Transfusion ≤ 7.5	0 (0.0%)	1 (100.0%)	1 (100.0%)	7 (100.0%)	3 (100.0%)	1 (100.0%)	
Transfusion > 7.5	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	
<b>Total* transfusion</b>							<0.01
Transfusion ≤ 7.5	3 (33.3%)	10 (62.5%)	10 (62.5%)	16 (100.0%)	8 (80.0%)	11 (91.7%)	
Transfusion > 7.5	6 (66.7%)	6 (37.5%)	6 (37.5%)	0 (0%)	2 (20.0%)	1 (8.3%)	

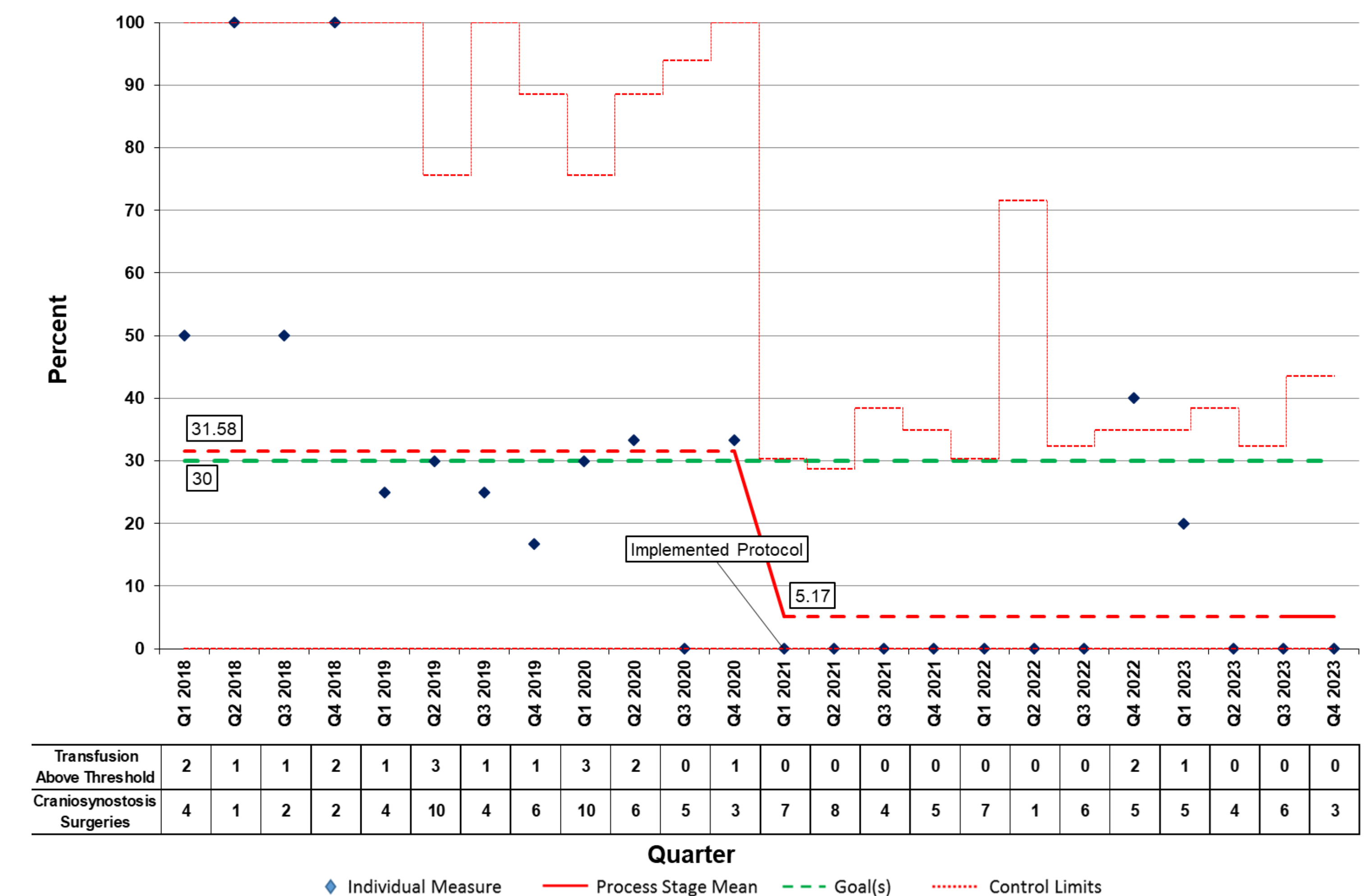
\*Total transfusion is defined as the combination of intraoperative and postoperative transfusion.

**Figure 1.** Intraoperative blood transfusion algorithm for open craniosynostosis surgery



## Results

**Figure 2.** Percent transfusions with hemoglobin above 7.5 g/dL threshold for open craniosynostosis surgeries



## Discussion

- There was a statistically significant decrease in the number of intraoperative transfusions given to hemodynamically stable patients (Hgb >7.5 g/dL).
- We have successfully created and implemented an intraoperative blood transfusion algorithm that is generalizable and does not require significant human and material resources.

1. D'Amore AL, Rasmussen M, Christensen L, et al. Intra- and postoperative blood loss and transfusion requirements in children undergoing craniofacial surgery. J Craniofac Surg. 2019;30(6):1798-1801.
2. Gault DT, Renier D, Marchac D, Jones BM. Intracranial pressure and intracranial volume in children with craniosynostosis. Plast Reconstr Surg. 1992;90(3):377-381.
3. Abbott MM, Rogers GF, Proctor MR, Busa K, Meara JG. Cost of treating sagittal synostosis in the first year of life. J Craniofac Surg. 2012;23(1):88-93.