Perioperative Hemoglobin Dynamics in Surgical Cancer Patients

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BACKGROUND

Perioperative anemia and blood transfusion are currently considered independent risk factors for poor outcome in surgical patients. In addition, in oncologic patients, both may enhance cancer growth and metastasis. Patient Blood Management (PBM) strategies are recommended to minimise these risks. The specific PBM strategies in surgical cancer patients are insufficiently defined.

Primary objective – To evaluate the perioperative hemoglobin (Hb) levels variation,

Secondary objectives – To identify the prevalence of perioperative anemia and transfusion rate in surgical oncologic patients.

METHODS

Study Setting – The Regional Institute of Oncology is the newest of three oncological institutes in Romania, affiliated to Grigore T Popa University of Medicine and Pharmacy, Iași Romania. Surgical services include gastrointestinal, thoracic, urological, gynecological, ENT and plastic procedures.

Patient Sample – After obtaining institutional research Ethics Committees approval, we retrospectively audit all consecutive adult patients submitted to elective oncological surgery from January 2016 to April 2016 (n=848). Following exclusion of urgent cases (n=55) and missing data (n=241), 552 cases were available for analysis (Figure 1).

Data Collection – Patients were initially identified in the Statistical Department database and demographic data, type of surgery and hospital and POCU/ICU LOS were recorded. Hb values at 4 different moments - at hospital admission (Hb1), preoperative (Hb 2), postoperative (Hb 3) and at hospital discharge (Hb 4), were downloaded from the hospital electronic database (Hippocrate Medical Informatics System). Time and amount of red blood cell transfusion given in the perioperative period were retrieved from blood bank database. Data were merged and collated for analysis in a separate electronic database. Anemia was defined using WHO criteria of Hb<12g/dl for women and Hb<13g/dl for men.

Statistical Analysis – Univariable analysis was performed using Student’s t test for continuous data and Chi-square test for nonparametric data. Categorical variables are reported as frequencies and percentages and continuous variables as means and standard deviations. Analysis was performed using SPSS 17.0. A probability value <0.05 was considered statistically significant.

Figure 1. Study flow chart

RESULTS

Perioperative hemoglobin dynamics

Patients demographics and the values of perioperative variables in all patients (n=552) and in different surgical procedures are listed in Table 1. The mean ($\pm$ SD) Hb levels at 4 points throughout the perioperative period were Hb1=12.7($\pm$ 2.1)g/dL, Hb2=12.5($\pm$ 2.2)g/dL, Hb3=11($\pm$ 1.8)g/dL, Hb4=11($\pm$ 1.8)g/dL (Figures 2,3). The Hb1/Hb2/Hb3/Hb4 ratio was 12.9(1.8)/12.8(1.9)/11.1(1.4)/10.9(1.4) in major surgery (n=123), 12.7(1.6)/ 12.5(1.6)/ 10.9(1.4) /10.9(1.4) in intermediate surgery (n=334) and 12.6(1.8)/12.3(2)/11.5(1.9)/11.5(1.7) in minor surgery (n=85). Mean preoperative and postoperative LOS was 3.1($\pm$ 1.9) and 6.8($\pm$ 3) days.

Table 1. Patients Demographics and Perioperative Variables

	All n=552	Superior GI surgery n=79	Inferior GI surgery n=113	Gynecologic surgery n=205	Urologic surgery n=68	Thoracic surgery n=37	Plastic surgery n=50
Age, years (SD)	61.6(10)	64(10)	66(8)	57(10.4)	67(7.7)	61(8)	59(12.7)
Gender, female (%)	328(59.4)	25(31.6)	45(39.8)	205(100)	15(22.1)	16(43.2)	24(48)
Preop Anemia (%)	196(35.5)	40(50.6)	55(48.7)	49(23.9)	26(38.2)	7(18.9)	18(36)
RBC transfusions (%)	109(19.7)	23(29.1)	32(28.3)	30(14.6)	15(22.1)	2(5.4)	7(14)
Hospital LOS, days (SD)	9.8(3.9)	12(4.8)	12(3.4)	9(3)	8(3.2)	9(3.1)	9(5.8)
ICU LOS, days (SD)	1.8(1.2)	3.1(2.5)	2(1.4)	1.4(0.6)	1.8(1.1)	1.2(0.3)	1.6(0.9)

Anemia prevalence

The prevalence of anemia markedly increased from preoperative to postoperative period (40.4% vs 74.6%, p<0.0001) and from admission to discharge (35.5% vs 76.3%, p<0.0001), as shown in Figure 4. The prevalence of preoperative anemia in major/intermediate/minor surgery was 35%(n=43)/34.3%(n=115)/41.2%(n=35).

Table 2. Effects of preoperative anemia

	Total n=552	Anaemic patients n=196	Non anaemic patients n=356	p value
Age (years) (SD)	61.6 (10)	63 (10.3)	61(9.9)	0.09
Gender, female (%)	328 (59.4)	97 (49.5)	231 (70.9)	0.0005
Hb 1, g/dL	12.7 (1.7)	10.5 (1.4)	14 (0.9)	<0.0001
Hb 2, g/dL	12.5 (1.7)	10.6 (1.5)	13.6 (1.2)	<0.0001
Hb 3, g/dL	11 (1.5)	9.8 (1.2)	11.8 (1.3)	<0.0001
Hb 4, g/dL	11 (1.5)	9.9 (1.1)	11.6 (1.3)	<0.0001
RBC transfusion (%)	109 (19.7)	74 (37.8)	35 (9.8)	0.0001
Hospital LOS (days) (SD)	9.8 (3.9)	10 (3.9)	10 (3.8)	0.012
ICU LOS (days) (SD)	1.8 (1.2)	2.2 (1.6)	1.6 (0.9)	0.003

Figure 4. Anemia prevalence

Figure 2. Perioperative dynamics of hemoglobin values

Figure 3. Hemoglobin levels variation in different types of surgical procedures

Transfusion rate analysis

Overall, 19.7% (n=109) of patients received a blood transfusion during their hospitalisation. The transfusion rate in preoperative, intraoperative and postoperative period was 0.7%(n=4) to 10.1%(n=56) to 8.9% (n=49). Patients with major/intermediate/minor surgery had a transfusion rate of 39.8%(n=49)/15.7(n=54)/9.5%(n=8).

CONCLUSION

In oncological surgical patients we found a progressive and significant decrease of the Hb levels during hospitalisation. The high prevalence of anaemia in all phases of the perioperative period urges the application of PBM in surgical cancer patients. In order to better define specific PBM strategies, there is a need for a theranostic approach of anaemia in these patients.