# IS PATIENT BLOOD MANAGEMENT FOR THE EMERGENCY DEPARTMENT?

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OneBlood

Patient blood management (PBM) has become an increasingly important part of optimal patient care in a hospital's transfusion medicine department. Many patients are treated with blood transfusions in the emergency department (ED). Should PBM factor in more importantly here too? Answering this question may provide a better understanding of the number of patients with anemia, and how this condition affects patient outcomes.

Anemia is a widespread medical condition in the general population.[1] However, reliable studies on the general prevalence of anemia at presentation to the ED and the consequent transfusion policy applied are lacking.[2] The primary aim of the study reviewed in this paper was to assess the prevalence of anemia in patients presenting to the ED and to evaluate the associated consequent transfusion policy.[2]

In 2015, the results of complete blood cell counts (CBC) from 22,329 patients admitted for any cause to the ED of a tertiary care hospital in northern Italy were recorded.[2] Patients admitted with severe trauma and/or massive bleeding were excluded from the study.[2] The medical records of the patients who received transfusions were reviewed for the presence of acute bleeding, comorbidities (including cardiovascular diseases, diabetes and chronic obstructive pulmonary disease), symptoms attributable to anemia, pre- and post-transfusion hemoglobin (Hb) levels, mean corpuscular volume (MCV) at presentation and subsequent patient's outcome or mortality.[2] For chronically anemic patients without acute bleeding, the retrospective evaluation of the appropriateness of transfusion was made according to the algorithm (Figure 1) from the analysis.[2,3]

The researchers classified the patient's grade of anemia at presentation, considered the patient's age, the symptoms, the presence of comorbidities and the likelihood of iron deficiency; this information was used for the algorithm.[2] At every administration of red blood cells (RBC), a post-transfusion Hb level was obtained and the case re-entered the analysis loop using the algorithm until an end of the process was met.[2] For each resulting condition, the decision to transfuse was then classified as appropriate or inappropriate.[2]

The presence and severity of anemia were classified according to the World Health Organization definitions, considering patients' gender and age.[4] The classical symptoms and signs correlating to anemia were considered when noted in the patient's medical records.[2]

The cases classified as “appropriately transfused” were further submitted to a second-step analysis that examined the adequacy of the RBC volume administered, using the same criteria.[2] In such cases, a judgement of inappropriateness was made when the posttransfusion Hb level was more than 1 g/dL above the target level, indicating over-transfusion.[2]

Lastly, the study recorded the iron balance data, when present, and the prescription of iron by the attending physicians in cases of clear-cut suspicion of iron deficiency (i.e., microcytosis with RBC MCV<80.0 fL).[2] In the presence of active bleeding and acute anemia in hemodynamically unstable patients, the transfusion was always considered appropriate.[2]

## ANEMIA PREVALENCE

The overall prevalence of anemia was 27.5%. Mild and moderate anemia were more frequent in males, while severe anemia was more frequent in females. As expected, review of the hemoglobin values at admission showed that males had an overall higher mean Hb value than females: 13.6 ± SD 2.0 g/dL vs. 12.6 ± 1.7 g/dL, respectively ($p < 0.000$).[2] Not surprisingly, females of childbearing age were more frequently anemic than males; conversely, in the male group, the prevalence of anemia was higher than in females of older ages.[2] In this high-income geographical area, anemia prevalence was considerable: 13.3% in children aged younger than 10 years.[2] Microcytosis was significantly more frequent in anemic than in non-anemic patients (19.8% vs. 5.4%, respectively - $p < 0.000$), suggesting iron deficiency as a major cause of anemia in this patient group.[2]

## BLOOD TRANSFUSION

Of a total of 6,144 patients with anemia, at least one blood transfusion was administered to 281 patients (4.6%).[2] Two hundred and thirty-eight patients (84.7%) were transfused at Hb equal to or below 8.0 g/dL, and only 9 patients (3.2%) received allogeneic red cells with Hb>9.0 g/dL.[2]

In patients with chronic anemia, the level of transfusion appropriateness evaluated by the algorithm depicted was high (74.5% - 114 cases out of 153).[2] Among appropriately transfused patients, the RBC volume transfused was considered inappropriate as over-transfusion occurred in the majority of cases (104 patients out of 114; 91.2%) (Figure 2)[2]

## IRON ASSESSMENT AND PRESCRIPTION

The baseline data was evaluated for patients who received at least one transfusion with a focus on patients with likely iron deficiency (MCV < 80.0 fL).[2] In this category, iron balance assessment and iron prescription were evaluated.[2] Overall, more than one-third of transfused patients were microcytic (mean MCV 69.0 ± SD 9.1 fL), with a MCV nadir in severely anemic patients (66.1 ± SD 9.1).[2] However, the attending physicians ordered tests for transferrin saturation and/or ferritin level in only 22% of these patients and prescribed intravenous iron in only 9.1% of cases.[2]

## DISCUSSION

In this geographical area, about half of patients admitted through the ED had chronic anemia that was linked to their underlying diseases (e.g., hematological malignancies, chemotherapy for cancer, liver and renal diseases, other chronic or inflammatory diseases). The other half had anemia linked to an easily detectable and curable condition, such as iron-deficiency anemia (IDA).[2] Blood transfusion (BT) is the simplest and fastest way to increase hemoglobin in response to symptomatic anemia. However, BT does not always lead to an increase in oxygen delivery to tissue.[5] BT is correlated to a series of risks like infectious diseases, potentially fatal hemolytic reactions, other acute or delayed transfusion reactions, volume overload, transfusion-related immunomodulation (TRIM) and other adverse events.[6]

In recent years, various studies and meta-analyses were published to assess the safety of a restrictive approach to RBC transfusion in contrast with a liberal one in several medical settings.[2] The results of such studies led to a decrease in consensus Hb values triggering BT, especially in hospitalized patients with chronic anemia and stable hemodynamics.[7] The focus of this study looked at application of PBM to non-bleeding patients in the ED.

Intravenous iron therapy as an alternative to RBC transfusion in cases of IDA is included in PBM principles[2] and seems to be an effective, safe and cost-sparing strategy, especially since newer preparations have become available.[8,9]

Despite the evidence, another recent article[10] recorded an over-usage of transfusion, both as the number of transfused units and in terms of general inappropriateness, with a low rate of iron prescription for patients with IDA in the ED. In this study, the prevalence of IDA in more than 14,000 admissions was very low (0.3%) in comparison with the proportion of patients with microcytosis (9.4% in the entire series and 34.9% among the transfused patients).[2] This discrepancy might be explained by the different access criteria to ED in different countries.[2] In Italy, the access to the ED is generally free and not filtered by medical practitioners.[2] This may explain the relatively high rate of anemia in such a patient cohort.[2] Management of IDA, transfusion appropriateness and costs of treatment for anemia in ED were extensively studied in a series of recent articles.[2] The results demonstrated the feasibility and efficacy of a "fast track" approach to the IDA patients admitted to the ED.[11] The same authors found that treatment of IDA in ED with intravenous iron was a cost-sparing strategy in comparison with blood transfusion.[12]

The authors concluded that this study provided for the first time the evidence that the population admitted to ED roughly reflects the same anemia prevalence of the general population, at least in one country, and that in a sizable fraction of such patients a moderate (10.6%) or severe (1.6%) chronic anemic state is present.[2] Despite the overall appropriateness of BT administration in one institution, a remarkable rate of improper red cell mass dosage was registered in the transfused patients and at least a part of the issued RBC could have been replaced by intravenous iron administration.[2] This could have simplified and sped up the clinical workup in the ED, reducing the costs and the overall transfusion-related risks, in particular transfusion-associated circulatory overload (TACO).[2]

These findings prompted the introduction of iron balance tests in the ED testing panel whenever the CBC at first access displays a low MCV or in cases of a positive history of GI tract blood losses.[2] The algorithm is now part of the current practice at the hospital and orientates the ED physicians in establishing a more rational and appropriate decision about the replacement policy in chronically anemic patients.[2] It is hoped that the evidence provided by the present study could favor the diffusion of a more appropriate and up-to-date clinical approach to anemia in the ED setting.[2]

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**FIGURE 1.*** Decision Tree algorithm in chronic anemias.[2]

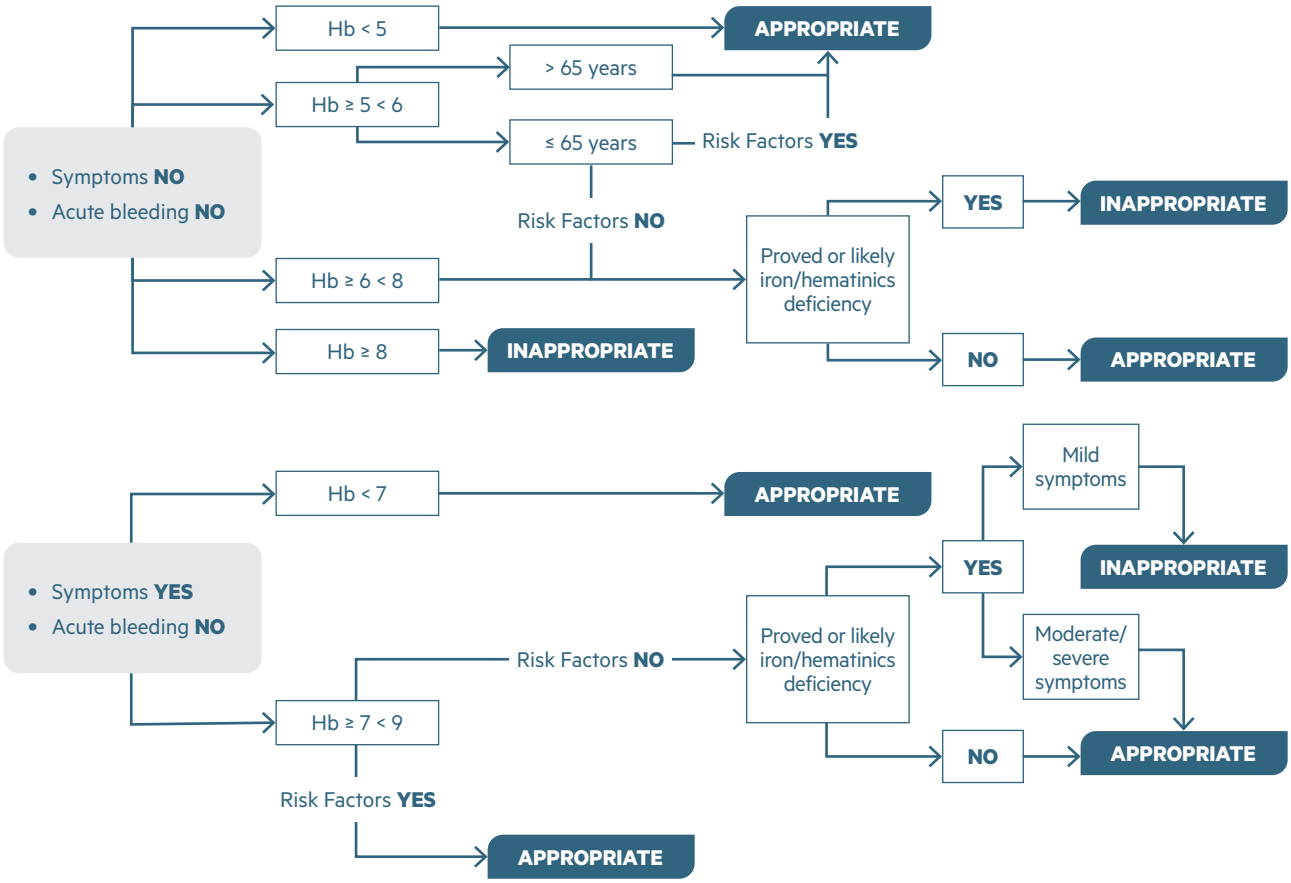


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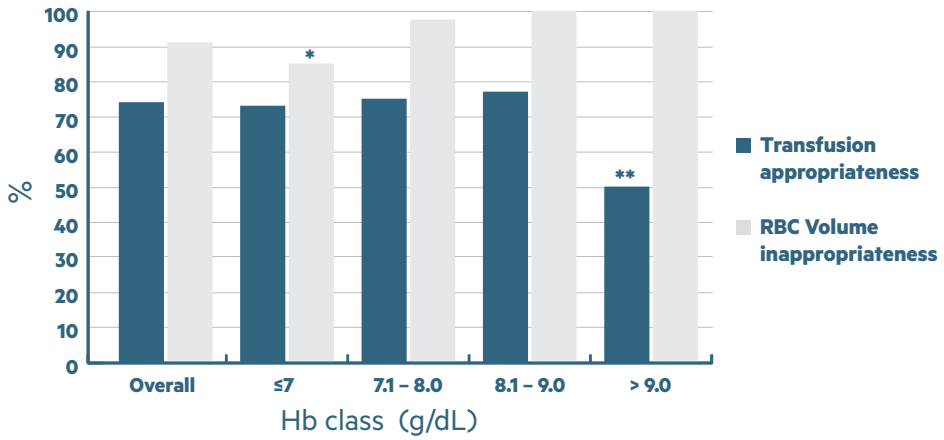
**FIGURE 2.*** Transfusion appropriateness and RBC volume inappropriateness by Hb class.

Note: * p < 0.05 ** p < 0.00 (Fisher exact test).[2]

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