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Case Reports

ANEMIA GRAVIS IN CHRONIC DISEASE. IS IT SAFE TO TRANSFUSION IN THE EMERGENCY DEPARTMENT?

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ABSTRACT

Background. Anemia gravis, a severe anemia with hemoglobin below 8 g/dL, often prompts transfusion. In the emergency department (ED), benefit and risk must be weighed because transfusion-associated circulatory overload (TACO) can be life-threatening. ED data on TACO in chronic severe anemia without known heart disease are scarce. This report describes TACO after packed red cell (PRC) transfusion in a patient with chronic anemia gravis and no obvious active bleeding.
Case. A 47-year-old man arrived at the ED in shock with one week of abdominal pain and weakness and one day of dyspnea. Hemoglobin was 4.5 g/dL; he had no prior transfusion and was on norepinephrine. About 35 minutes into PRC transfusion (roughly 75 cc given, with 250 cc saline loading).
Findings. He developed dyspnea, agitation, heart rate 154 bpm, and bilateral basal rales, followed by gasping and bradycardia requiring bag-valve-mask ventilation. Transfusion and fluids were stopped; he received furosemide 20 mg IV, diphenhydramine 10 mg IV, and BiPAP. Urine output was 800 mL in one hour. Chest X-ray showed worsening bilateral opacities. He was alert with SpO2 98% within 30 minutes. Probable TACO was diagnosed. He was admitted to the ICU and died on day 3.
Conclusion. Transfusion decisions in the ED should rest on clinical assessment and benefit-risk balance, not on hemoglobin alone. In chronic severe anemia without obvious bleeding, even without known heart disease, assess TACO risk first, transfuse one unit slowly, avoid concurrent crystalloid loading, and reassess; consider bedside ultrasound.

Keywords: Anemia Gravis, Blood, Blood Transfusion in Emergency Department, Chronic Disease, Transfusion-Associated Circulatory Overload, Transfusion Reaction.

BACKGROUND

Anemia frequently presents with nonspecific complaints in the emergency department, necessitating careful consideration. At times, the condition requires immediate blood product transfusion, a procedure carrying both immediate and delayed risks. Therefore, the assessment of risks versus benefits to the patient is crucial [1,2]. The expected clinical improvement after transfusion can vary; some patients experience rapid relief of symptoms such as fatigue and breathlessness, while others see gradual or less noticeable changes. Monitoring the patient's condition after transfusion is essential for healthcare

providers to evaluate the effectiveness of the procedure and determine further interventions. Ultimately, the decision to transfuse involves a delicate balance, weighing the potential risks against the anticipated benefits based on individual patient factors, hemoglobin levels, symptoms, and underlying health conditions.

In the emergency room, it is crucial to differentiate between acute and chronic anemia. This distinction helps in proper handling. Additionally, it is essential to identify and address potential risk factors that could complicate the transfusion process early on, to prevent or reduce complications. Transfusion reactions carry various risks, ranging from mild to severe, and in severe cases they can be life-threatening. Anaphylactic reactions, transfusion-associated circulatory overload (TACO), and transfusion-related acute lung injury (TRALI) are examples of potentially life-threatening reactions linked to transfusion [1,3]. These reactions can increase both morbidity and mortality, which emphasizes the need for careful monitoring and proactive steps to minimize such risks during emergency transfusions. The widespread use of blood transfusion has prompted reconsideration because of concerns about overuse, and as a result there is a shift towards more cautious and restrictive transfusion practices [4].

TACO is a transfusion complication in which fluid accumulates in the lungs because the heart cannot accommodate the added volume, and it was the leading cause of transfusion-related death in 2017–2021 [25]. Earlier studies found TACO in about 6% of transfused ICU patients, with cardiac dysfunction, renal failure, positive fluid balance, and rapid transfusion as risk factors [17,18], and in surgical patients the risk rose with transfused volume, age, and fluid balance [19]. ED data remain scarce, although an audit in an emergency unit found TACO in 3.2% of transfused patients [20], and the reaction is often under-reported. Data from Indonesia are scarcer still. Patients with severe chronic anemia and no bleeding are now recognized as highly vulnerable even without comorbidity, so minimal transfusion, usually a single unit, is advised [22,24]. Even so, pre-transfusion risk assessment still depends on known heart disease [24], so patients without such a history may be considered low risk. Most reports also involve elderly patients or large transfused volumes [13,14,16,25] the role of bedside ultrasound before transfusion is not established, and the Indonesian report we found involved a child with chronic kidney disease [27]

While numerous guidelines offer recommendations for transfusion, it is crucial to tailor them to the facilities and infrastructure available at each hospital [3)]. Adherence to guidelines helps avoid unnecessary transfusions and aligns practice with evidence-based standards. Factors such as the availability of blood products, laboratory support, and the

expertise of medical personnel must be considered so that the guidelines are not only followed but also practical and feasible within the hospital's operational framework. Blood transfusion is one of the medical practices that is quite widely overused, so recommendations have been suggested on when transfusion should not be done, and restrictive transfusion has begun to be proclaimed [5].

CASE PRESENTATION

This report describes TACO in a 47-year-old man without known heart disease, with Hb 4.5 g/dL and shock in the ED, who reacted after a very small transfused volume (about 75 cc) given together with saline loading and with low albumin. We document the timeline, chest X-rays before and after the reaction, and laboratory results. We propose safer ED practice: assess TACO risk before transfusion, give one unit then reassess, record fluid balance, and consider bedside ultrasound. This report aims to describe a TACO event after packed red cell (PRC) transfusion in a patient with chronic anemia gravis and no obvious active bleeding, and to discuss safe transfusion practice in the ED.

A 47-year old male was referred from another hospital to the emergency room in RSSA with complaining of abdominal pain and overall weakness persisting for a week. These symptoms have progressively worsened over the last two days, particularly experiencing pain on the left side of the stomach, notably after meals and drinks. The patient's intake of food and fluids has significantly reduced due to this discomfort. Accompanying symptoms include nausea, intermittent vomiting, fluctuating fever, and headaches. No signs of black patches or black vomit are noted. The patient denies any recent history of coughing but has begun experiencing shortness of breath since yesterday. There's also been a noticeable weight loss of 5 kg over the past month. Medical history includes an allergy to seafood and eggs dating back five years, with no current medication or previous transfusions. An earlier endoscopy at RSSA revealed erosive gastritis relating to similar complaints. The patient previously noticed "black stool" a few months ago but didn't seek medical attention. Additionally, there was an incident of falling in a supine position around five months ago, after which the patient opted for bed rest without seeking treatment. There's no reported history of other chronic diseases.

Prehospital data is Airway: Patent, Breathing: Symmetric, regular, spontaneous, respiratory rate: 22x/m, SpO2 95% (Room Air), Circulation: cold and dry acral, CRT > 2 sec, BP: 79/50 mmHg, HR: 111 bpm, regularly regular, D: GCS E4V5M6, Temp: 37.6 C,

RBS 160 mg/dl. The reason for referring is for the purpose of pro-endoscopic diagnosis and further therapy.

When arrived in ER RSSA, primary survey data is Airway: Patent, Breathing : Symmetric, regular, spontaneous, RR: 30x/m, SpO2 95% (NC 5 lpm), Circulation : Cold and dry acral, CRT > 2 sec, BP : 115/74 mmHg on NE 0,5 mcg/kgbb/mnt, HR : 140 bpm, regularly regular, thready pulse , Disability : GCS E4V5M6, Temp: 36.6 C, NGT attached. Patient placed in P1, attached monitor, give O2 NRBM 15 lpm, maintenance IVFD NS 0,9% at 20 dpm; RBS 170 mg/dl. On physical examination general appearance is very ill, compos mentis (GCS 456), conjungtiva anemis, JVP flat, lymph node enlargement, clear lung examination, abdominal distended without mass palpable, cold and dry acral, thready pulse.

Laboratory findings in the ER of RSSA are shown in Table 1. Two units of PRC were planned for transfusion in the ED, started at 02.40. About 35 minutes later (about 75 cc transfused, with 250 cc NS loading running), the patient's shortness of breath worsened and he became agitated, with HR 154 bpm, no rales at that time, increased work of breathing (WOB), and positive suprasternal retraction. The patient was repositioned; bilateral basal rales were then present. Loading fluid and the transfusion were stopped. Within about 15 minutes (around 03.30) the patient became gasping with hypoxic bradycardia, HR falling to 70 and then 40 bpm. Bag-valve-mask (BVM) ventilation was given, together with diphenhydramine 10 mg IV and furosemide 20 mg IV. After furosemide (about 03.30), urine output reached 800 mL within 1 hour (03.30–04.30) (Figure 1). Urinalysis was not performed; the urine in the photograph appears dark brown and concentrated, and hemolysis is possible but could not be proven. Spontaneous breathing returned and was assisted with noninvasive ventilation (BiPAP).

Table 1. Laboratory finding

Parameter	Result	Normal Value
Hb	4.5 g/dL	0,62
Leukocytes	14.780 /mcL	0,51
Hematocrit	5.9 %	
Thrombocytes	103.000/mcL	0,40
Na/K/Cl	129/5.2/100 mmol/L	0,40
CRP Quantitative	7.04 mg/dl	<0.5
Albumin	2.62 g/dl	3.5-5.2



Figure 1. Urine output after resuscitation: 800 mL within 1 hour after furosemide 20 mg IV (about 03.30–04.30).

FINDINGS

Indication and Plan

The patient had no previous transfusion and was assessed as chronic anemia gravis with no obvious active bleeding. He arrived in shock, already receiving norepinephrine, oxygen, and maintenance fluid. Laboratory re-examination in the ED showed Hb 4.5 g/dL. He looked weak and pale, with dyspnea and rapid pulse, so a transfusion plan of two units of PRC was made.

Intervention and Course in the ED

Therapy followed this order: (1) PRC transfusion started at 02.40 with maintenance NS. (2) After about 35 minutes (about 75 cc transfused, with 250 cc NS loading), he became dyspneic and agitated, HR rose to 154 bpm, and bilateral basal rales appeared. (3) The patient was repositioned, and transfusion and loading fluid were stopped. (4) While gasping with HR falling to 70 and then 40 bpm, he received BVM ventilation. (5) Diphenhydramine 10 mg IV and furosemide 20 mg IV were given, followed by BiPAP. (6) Urine output was 800 mL within 1 hour of furosemide.

Evaluation and Outcome

Within 30 minutes the patient was compos mentis and SpO2 rose to 98%. The norepinephrine dose was reduced from 0.75 to 0.3 mcg/kg/min with dobutamine added. Chest X-ray after the reaction (Figure 3) showed worsening bilateral opacities compared with the prehospital film (Figure 2). Laboratory re-evaluation showed Hb 7.1 g/dL and lactate 10.6 mmol/L, with respiratory and hemodynamic improvement but persistent severe acidosis.

The patient was transferred to the ICU on 5 November 2023 at about 06.00 and treated for 3 days. The remaining PRC was not given. Repeat Hb was 6.3 g/dL; no further transfusion was planned while bleeding was monitored. Endoscopy was planned once stable but was not performed. The patient died on day 3 of ICU care.

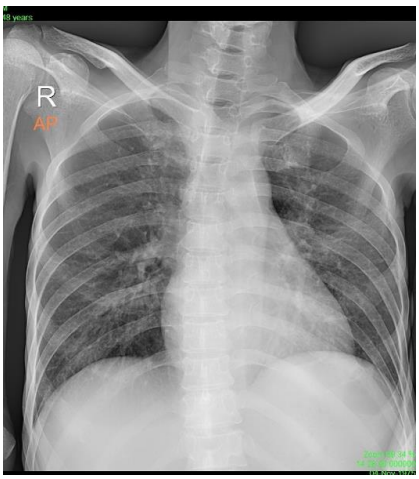


Figure 2. Prehospital Xray

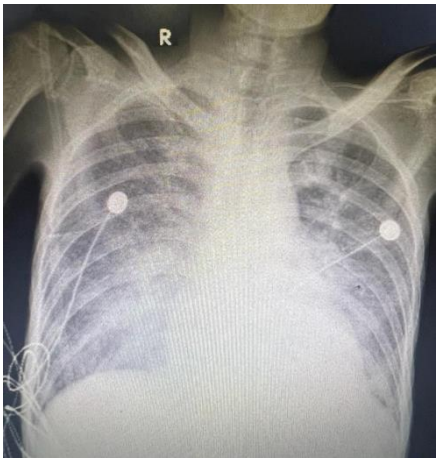


Figure 3. Xray after Resuscitation

DISCUSSIONS

Anemia ranks as the most prevalent hematological issue among older patients, affecting up to 60% of those admitted to acute geriatric wards. Individuals aged 65 and older also receive more than half of all blood transfusions [6)]. The tolerance and symptoms of anemia in older patients vary substantially, depending on factors such as aging and the presence of other medical conditions. There is no clear consensus on the exact definition of symptomatic anemia, but symptoms such as fatigue, shortness of breath, increased

respiratory rate, and increased pulse rate are common parameters. The cause of anemia should be identified early, and it is better to treat the cause before starting transfusion.(2,7)

Transfusion is just one part of managing patients. When evaluating anemia in emergency situations, the main goal is to determine whether it is acute or chronic. Acute anemia commonly arises from blood loss and usually comes with noticeable symptoms. Chronic anemia, on the other hand, is typically well tolerated and often discovered by chance. In cases of blood loss, the focus is on minimizing ongoing loss and stabilizing the patient while assessing whether transfusion is necessary.(1,2,4). The transfusion decision should not be based on hemoglobin level alone but on the benefit-risk balance, taking into account the patient's symptoms due to anemia, the benefit and expected efficacy, and the risk of transfusion in this comorbid population. The decision should rest on clinical assessment of the patient, the response to any previous transfusion, and the hemoglobin level. The severity of anemia affects clinical outcomes, particularly in critically ill patients; however, the specific threshold to transfuse is uncertain [1,2,6] The clinician should record the reason for transfusion, and the transfusion should be monitored by a team or trained person [3].

A restrictive transfusion strategy (hemoglobin below 6–8 g/dL) is associated with outcomes at least as good as a more liberal strategy (9–10 g/dL). For most patient populations, moderate-quality evidence shows that restrictive thresholds did not adversely affect patient-important outcomes[5]. Some of the recommendations presented in 2023 for restrictive transfusion are as follows:

Recommendation 1: for hospitalized adult patients who are hemodynamically stable, the international panel recommends a restrictive transfusion strategy, considering transfusion when the hemoglobin concentration is less than 7 g/dL.

Recommendation 2: for hospitalized adult patients with hematologic and oncologic disorders, the panel suggests a restrictive transfusion strategy, considering transfusion when the hemoglobin concentration is less than 7 g/dL.

Recommendation 3: for critically ill children and those at risk of critical illness who are hemodynamically stable and without a hemoglobinopathy, cyanotic cardiac condition, or severe hypoxemia, the international panel recommends a restrictive transfusion strategy, considering transfusion when the hemoglobin concentration is less than 7 g/dL.

Recommendation 4: for hemodynamically stable children with congenital heart disease, the international panel suggests a transfusion threshold based on the cardiac abnormality and stage of surgical repair: 7 g/dL (biventricular repair), 9 g/dL (single-ventricle palliation), or 7 to 9 g/dL (uncorrected congenital heart disease).(5,8)

This patient did not clearly fit any category. He had no established hematologic or oncologic diagnosis (Recommendation 2) but was suspected of malignancy (5 kg weight loss, lymph node enlargement, RDW 30, cytopenia), and he was hemodynamically unstable, needing norepinephrine on arrival (Recommendation 1). We therefore placed him closer to Recommendation 2. His Hb of 4.5 g/dL was below the 7 g/dL threshold of both, so the threshold served only as a reference and the transfusion decision was individualized to his symptoms and shock. Patients less tolerant of increased blood volume should be transfused more slowly with careful hemodynamic monitoring. For some patients it may be appropriate to give a diuretic (furosemide 20 to 40 mg orally), although this is not necessary as a routine.

Patients can tolerate very low hemoglobin levels in chronic anemia; however, the literature shows that hemoglobin levels below 6 g/dL (especially in acute anemia) are associated with worse outcomes than levels above this value. On the other hand, the literature has also shown that transfusion itself is associated with poor outcomes.(9) Another recommendation suggests a restrictive threshold (7 g/dL) rather than a liberal threshold (9 g/dL) in critically ill adults with sepsis and septic shock (conditional recommendation, moderate certainty)[1,3,5,6]

Transfusion reactions are adverse events associated with the transfusion of whole blood or one of its components. They range in severity from minor to life-threatening and can occur during a transfusion (acute transfusion reactions) or days to weeks later (delayed transfusion reactions). They may be difficult to diagnose because they can present with nonspecific, often overlapping symptoms. Severity and incidence vary with the type of reaction, the prevalence of disease in the donor population, and the extent of follow-up care [4,7,9] A transfusion reaction is an undesirable, unintended, adverse response to the administration of blood, blood components, or derivatives that is definitely, probably, or possibly related to the product; about 0.5–3% of all transfusions result in a reaction[4] Multiple complications are possible, including infections, hemolytic reactions, allergic reactions, TRALI, TACO, and electrolyte imbalance [9,10,11].

TACO and TRALI are acute respiratory distress syndromes that occur within 6 hours of a blood transfusion and are associated with high mortality [11], They are often difficult to distinguish. Unifying features are acute respiratory distress, new-onset hypoxemia, and bilateral pulmonary infiltrates on chest X-ray within 6 hours of transfusion. TACO is characterized by pulmonary hydrostatic (cardiogenic) edema, whereas TRALI presents as pulmonary permeability (noncardiogenic) edema. The clinical presentation of TACO includes dyspnea, tachypnea, jugular venous distension, and elevated systolic blood

pressure. B-type natriuretic peptide (BNP) may be a distinguishing biomarker, because increased myocardial stretching in TACO can be assessed by an increase from pre-transfusion to post-transfusion BNP. When any transfusion lung injury is suspected, the transfusion should be stopped immediately. When TACO is suspected, treatment includes supplemental oxygen, diuresis, and assisted ventilation when indicated. Strategies to prevent TACO include screening transfusion recipients for occult cardiac insufficiency and reducing the volume and rate of transfusion. Clinicians should be aware of TRALI and TACO, and of strategies to avoid them, before ordering blood transfusions [9,10,11,12].

TACO versus TRALI. This patient most likely had TACO rather than TRALI. Dyspnea began during transfusion with concurrent saline loading, new bilateral basal rales appeared after repositioning, and the deterioration improved quickly after transfusion was stopped and furosemide and BiPAP were given, with urine output of about 800 mL. He also had TACO risk factors: severe chronic anemia, hypoalbuminemia, and running intravenous fluid. Age was not the basis of this judgment, because TACO occurs in all age groups. TRALI and sepsis-related lung injury could not be fully excluded, so the most accurate diagnosis is probable TACO. Although he denied heart disease, prolonged bed rest means an undisclosed cardiac condition was possible. The anemia was attributed to erosive gastritis without active bleeding. Given alarm symptoms (weight loss, past gastrointestinal bleeding, unexplained anemia), repeat endoscopy was considered urgent but was not performed.

Surveillance definition and mechanism. The patient met the 2018 ISBT/IHN surveillance definition of TACO: onset within 12 hours of transfusion [29], with acute respiratory distress (A); clinical and radiological pulmonary edema, shown by bilateral basal rales and worsening bilateral opacities (B); and fluid overload, shown by positive fluid balance and clinical improvement after diuretic (D)[29]. Cardiovascular change (C) was not counted because tachycardia was already present before transfusion owing to shock, and BNP (E) was not measured. The definition serves surveillance, and the role of transfusion as the cause is judged separately [29] TACO is hydrostatic whereas TRALI is permeability edema, and the two are hard to distinguish.(10) Because the patient was already in shock, TRALI could not be fully excluded.

TACO is understood as a two-hit model: the patient's condition (first hit) leaves the circulation unable to accommodate extra volume, and transfusion (second hit) triggers hydrostatic pulmonary edema.(28) Here the first hit was probably severe chronic anemia in shock, saline loading, and hypoalbuminemia (albumin 2.62, then 2.18 g/dL), which explains why very little PRC caused decompensation. This fits the finding that up to 50% of TACO

cases occur after one unit, so factors beyond volume (oncotic pressure, viscosity, blood-product mediators) contribute [28].

Similarities with previous studies. The clinical picture matches reported TACO: dyspnea, tachycardia, rales, and bilateral opacities improving quickly with diuretics.(10,11) Risk factors are also similar: intravenous fluid with positive balance in ICU and surgical patients,(18,19) hypoalbuminemia, and severe anemia, which is considered highly vulnerable even without comorbidity.(22) The 2011 SHOT report described an 82-year-old woman with chronic iron-deficiency anemia (Hb 4.5 g/dL) who developed pulmonary edema with saturation 54% after four PRC units, needed two days of mechanical ventilation, and recovered fully.(13) She matches our patient in Hb 4.5 g/dL, chronic anemia, and treatment with furosemide and vasopressor. She differed in being much older, receiving a far larger volume, onset 12–24 hours after transfusion, and being hypertensive (200/99 mmHg) rather than in shock. Shimizu et al. reported a 43-year-old woman with folate-deficiency anemia (Hb 5.6 g/dL) who received four PRC units 3 and 6 days before surgery and had intraoperative pulmonary congestion that improved rapidly with furosemide.(14) Like our patient she was middle-aged without known heart disease and responded quickly to diuresis, but her transfusion was elective and larger, onset was delayed so the authors doubted TACO, and she was not in shock. Albalooshi and Al Madani reported a 59-year-old man (Hb 6.4 g/dL) with acute pulmonary edema a few mL after the second PRC unit began, then cardiac arrest with ROSC, discharged on day 10 [17] This matches ours in very rapid onset at small volume and need for resuscitation, but he was hypertensive (192/90 mmHg) with left ventricular dysfunction (EF 45%) and prior PCI, whereas ours had no known heart disease and was hypotensive on norepinephrine. Like all three, our patient improved with diuretic and respiratory support (within 30 minutes). In the ED, an audit found TACO in 3.2% of transfused patients,(20) so such cases should be anticipated.

Differences. First, ICU studies found left ventricular dysfunction or heart failure as predictors [7,18] whereas our patient had no heart disease. Second, renal failure and acute kidney injury, pre-transfusion diuretic use, and plasma transfusion were independent predictors [21] whereas his creatinine was normal (0.5 mg/dL) and he received no plasma. Third, risk in surgical studies rose with volume [19] and Huang's case followed massive transfusion [25] whereas his reaction followed a very small PRC volume. Fourth, TACO occurs mostly in the elderly (SHOT median age 75.5 years) [30].

whereas he was middle-aged and in shock. Fifth, guidelines advise minimal transfusion, usually one unit, after risk assessment [22,24], whereas he was planned for two

units without formal assessment or ultrasound. Finally, other studies used BNP or imaging [10,11], whereas our diagnosis was clinical. The distinctive feature is the combination of shock on vasopressor, saline loading, and a very small PRC volume at Hb 4.5 g/dL without known heart disease.

ED transfusion decisions and implications. In chronic anemic ED patients, 139 of 344 transfusions (40.4%) did not meet AABB 2016 criteria [30]. but that study excluded bleeding and acute illness. In our patient transfusion was indicated (Hb 4.5 g/dL and shock), so the question was not whether but how: one unit, slowly, reassessed, and without concurrent crystalloid bolus. Management (stopping transfusion, oxygen, furosemide, NIV) matches recommended TACO treatment [28] and an Indonesian-language review on TACO prevention and management is available [31]. We propose for the ED: assess TACO risk before transfusion even without cardiac history, record fluid balance, consider bedside ultrasound, and avoid additional fluid during transfusion.

One modality that can easily assess a patient's cardiac condition before transfusion is bedside ultrasound, primarily evaluating cardiac contractility. Therefore, bedside ultrasound is strongly recommended as a tool for evaluating the patient's condition before, during, or after transfusion.

Research limitations

This report has several limitations. First, it describes a single patient, so findings cannot be generalized. Second, TACO was diagnosed clinically; BNP/NT-proBNP, echocardiography, and bedside ultrasound could not be performed in our ED, so TRALI could not be fully excluded by biomarker or cardiac imaging. Third, the transfused volume (about 75 cc) is an estimate, and urinalysis was not performed. Fourth, the cause of the severe anemia was not confirmed because repeat endoscopy was not performed before the patient died on day 3 of ICU care. Future studies should include more cases of transfusion reactions in chronic severe anemia, with cardiac assessment before transfusion.

CONCLUSION

The decision to transfuse the blood should be based on clinical assessment of the patient and his or her response to any previous transfusion as well as the haemoglobin level. But if there is no previous history of transfusion, the assessment must be sharper and more careful. The incidence of TRALI can be reduced with increased donor screening. The incidence of TACO can be reduced with increased recipient screening.

The transfusion decision should not be based on haemoglobin levels but should be based on the benefit/risk balance taking into account patients symptoms due to anaemia, benefit and expected efficacy as well as risk of the transfusion in this comorbid population.

Beside the development of alternative treatment of anaemia, further geriatric specific studies which include geriatric syndromes are needed to guide development of specific guidelines for older patients in surgical and in medical wards.

When it's chronic anemia without an obvious source of bleeding, we should be more careful in considering giving a blood transfusion. Transfusion is not recommended with fast droplets but slower by closely monitoring the patient.

Guidelines must be used as a benchmark when carrying out transfusions, especially in the emergency room, to minimize incidents and side effects. A transfusion team responsible for the process before, during, and after transfusion is needed, so that transfusion reactions, morbidity, and mortality can be reduced.

Ethical statement. This single-patient case report used only routine clinical and digital medical-record data, collected once, with no intervention beyond standard care; no separate ethical committee approval was obtained. The reporting physician practiced at Dr. Saiful Anwar General Hospital under Surat Izin Praktik Dokter No. 440.03/0301/35.73.406/2023, issued 9 March 2023 by the Dinas Tenaga Kerja, Penanaman Modal dan Pelayanan Terpadu Satu Pintu, Malang City. Written informed consent for publication was obtained from the patient’s family.

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Conflict of Interest The authors declare no conflict of interest.

REFERENCES

[1] Raval, Jay S., Joseph R. Griggs, and Anthony Fleg. "Blood Product Transfusion in Adults: Indications, Adverse Reactions, and Modifications." *American Family Physician* 102, no. 1 (2020): 30–38. PubMed PMID: 32603068.

[2] Frietsch T, Shander A, Faraoni D, Hardy JF. Patient blood management is not about blood transfusion: it is about patients' outcomes. Blood Transfus. 2019;17(5):331–333. doi:10.2450/2019.0126-19

[3] World Health Organization. Blood transfusion. June 8, 2022. Accessed February 23, 2023. https://www.who.int/news-room/facts-in-pictures/detail/blood-transfusion.

[4] Knopfelmacher, Adriana Maria. "Transfusion Reactions." Dalam *Oncologic Critical Care*, diedit oleh Joseph L. Nates dan Kristen J. Price. Cham: Springer, 2019. https://doi.org/10.1007/978-3-319-74698-2_107-1.

[5] Carson JL. (2012). Red Blood Cell Transfusion: A Clinical Practice Guideline From the AABB*. *Annals of Internal Medicine*, 157(1), 49. https://doi.org/10.7326/0003-4819-157-1-201206190-00429

[6] Vlaar APJ, Oczkowski S, de Bruin S, et al. Transfusion strategies in non-bleeding critically ill adults: a clinical practice guideline from the European Society of Intensive Care Medicine. Intensive Care Med. 2020;46(4):673–696. doi:10.1007/s00134-019-05884-8

[7] Popovsky MA. (2006). Pulmonary consequences of transfusion: TRALI and TACO. *Transfusion and Apheresis Science*, 34(3), 243–244. https://doi.org/10.1016/j.transci.2006.01.005

[8] British Committee for Standards in Haematology Blood Transfusion Task Force. "Guidelines for the Use of Platelet Transfusions." *British Journal of Haematology* 122, no. 1 (2003): 10–23. https://doi.org/10.1046/j.1365-2141.2003.04468.x.

[9] Leo A, Pedal I. Diagnostic approaches to acute transfusion reaction. Forensic Sci Med Pathol. 2010;6(2):135–145. doi:10.1007/s12024-009-9115-7. PMID: 20140541

[10] Semple JW, Rebetz J, Kapur R. (2019). Transfusion-associated circulatory overload and transfusion-related acute lung injury. *Blood*, 133(17), 1840–1853. https://doi.org/10.1182/blood-2018-10-860809

[11] Murphy CE, Kenny CM, Brown KF. (2020). TACO and TRALI: visualising transfusion lung injury on plain film. *BMJ Case Reports*, 13(4), e230426. https://doi.org/10.1136/bcr-2019-230426

[12] Osterman JL, Arora S. (2014). Blood product transfusions and reactions. *Emergency Medicine Clinics of North America*, 32(3), 727–738. https://doi.org/10.1016/j.emc.2014.04.012

[13] Cohen H. Transfusion-associated circulatory overload (TACO). In: *Annual SHOT Report 2011*, chapter 16, case 1. Serious Hazards of Transfusion; 2012. https://www.shotuk.org/wp-content/uploads/2024/10/16.-Transfusion-Associated-Circulatory-Overload-TACO-2011-1.pdf

[14] Shimizu T, Takahashi H, Tanaka M. Sudden intraoperative pulmonary congestion in a patient with severe anemia transfused 3 days prior to surgery. *Saudi J Anaesth*. 2019;13(1):69–71. doi:10.4103/sja.SJA_468_18

[15] Transfusion-associated circulatory overload risks and mitigation strategies. Serious Transfusion Incident Report (STIR) Bulletin no. 13. Victorian Department of Health; 2025. https://www.health.vic.gov.au/sites/default/files/2025-09/stir-bulletin-13-transfusion-associated-circulatory-overload-taco-mitigation-strategies.pdf

[16] Grey S. Transfusion-associated circulatory overload. In: *Annual SHOT Report 2023*, chapter 18a. Serious Hazards of Transfusion; 2024. https://www.shotuk.org/wp-content/uploads/2024/10/18a.-Transfusion-Associated-Circulatory-Overload-TACO-2023.pdf

[17] Albalooshi S, Al Madani A. Case report of a transfusion-associated circulatory overload leading to cardiac arrest in a COVID-19 positive patient. *Bahrain Med Bull*. 2023;45(1):1372–4.

[18] Bosboom JJ, Klanderman RB, Zijp M, Hollmann MW, Veelo DP, Binnekade JM, et al. Incidence, risk factors, and outcome of TACO in a mixed ICU population. Transfusion. 2018;58(2):498–506. doi:10.1111/trf.14432

[19] Clifford L, Jia Q, Yadav H, et al. Characterizing the epidemiology of perioperative TACO. Anesthesiology. 2015;122(1):21–8.

[20] Gosmann F, Nørgaard A, Rasmussen MB, Rahbek C, Seeberg J, Møller T. TACO in adult, medical emergency patients. Blood Transfus. 2018;16(2):137–44. doi:10.2450/2017.0228-16

[21] Roubinian NH, et al. Contemporary risk factors and outcomes of TACO. Crit Care Med. 2018;46(4).

[22] MHRA. National Patient Safety Alert: Reducing risks for TACO (NatPSA/2024/004/MHRA). 2024. gov.uk

[23] SHOT/NBTC. Transfusion management in non-bleeding adults: avoiding mismanagement in severe chronic anaemia. Dec 2024. shotuk.org

[24] Annual SHOT Report 2024, chapter 20a: TACO. 2025. shotuk.org

[25] Huang JN, Amini SM, Fadumiye C. TACO in a healthy patient following a road traffic accident. Int Med Case Rep J. 2024;17:672.

[26] Beyer A, Rees R, Palmer C, Wessman BT, Fuller BM. Blood product transfusion in emergency department patients. Int J Emerg Med. 2017. doi:10.1186/s12245-017-0133-z

[27] Risanti R, Nurita Dian KSS, Tatang Eka. Penanganan TACO pada pasien anak dengan CKD stage 5 akibat sindroma nefrotik.

[28] Bulle EB, Klanderman RB, Pendergrast J, et al. The recipe for TACO: a narrative review on the pathophysiology and potential mitigation strategies of TACO. Blood Rev. 2022;52:100891.

[29] Wiersum-Osselton JC, Whitaker B, Grey S, et al. Revised international surveillance case definition of TACO: a classification agreement validation study. Lancet Haematol. 2019;6(7). doi:10.1016/S2352-3026(19)30080-8

[30] Paganini M, Rigon F, Rebustello F, Cianci V, Bertozzi I, Randi ML. Appropriateness of PRBC transfusions in chronic anemic patients in the emergency department: the TRANSFUS-ED retrospective analysis. Intern Emerg Med. 2023. doi:10.1007/s11739-023-03277-w

[31] Jayaprawira D. Strategi penatalaksanaan dan pencegahan TACO: tinjauan pustaka. Intisari Sains Medis. 2023;14(2):568–75. doi:10.15562/ism.v14i2.1765

[32] Yamashita S, Matsumiya N, Fujii T, Yamaguchi H. A case of progressive congestive heart failure secondary to severe anemia in a patient presenting with uterine hemorrhage. Resuscitation. 1999;42:69–72.

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