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Prehospital blood transfusion-experience from a specialized prehospital response vehicle-a retrospective cohort stud

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Introduction

Exsanguination remains one of the leading causes of death after severe trauma. Immediate interventions such as tourniquets, REBOA, or thoracotomies may be necessary, but intravascular replacement with blood products is essential. Prehospital transfusion of packed red blood cells (pRBCs) can improve stabilization before getting to the hospital. However, its availability in Europe is not homogeneous, and guidelines do not include it in the standard of care.

Study goal

Evaluating the experience of a specialized team (Medical Intervention Car, MIC) in Germany, with pRBC, fibrinogen, and prothrombin complex available for prehospital use since 2019. Analyzing cases treated between August 2019 and September 2024, both trauma and non-trauma patients.

Methods

Retrospective, single-centered study. Patients were included who received at least one unit of pRBC in the prehospital phase. Clinical variables were analyzed, as well as additional interventions, lab parameters, and in-hospital evolution. A modified Blood Transfusion Need Score (mBTNS) was retrospectively applied to assess the appropriateness of transfusion.

The publication includes an algorithm used to make decisions on the need of prehospital blood transfusion (see picture)

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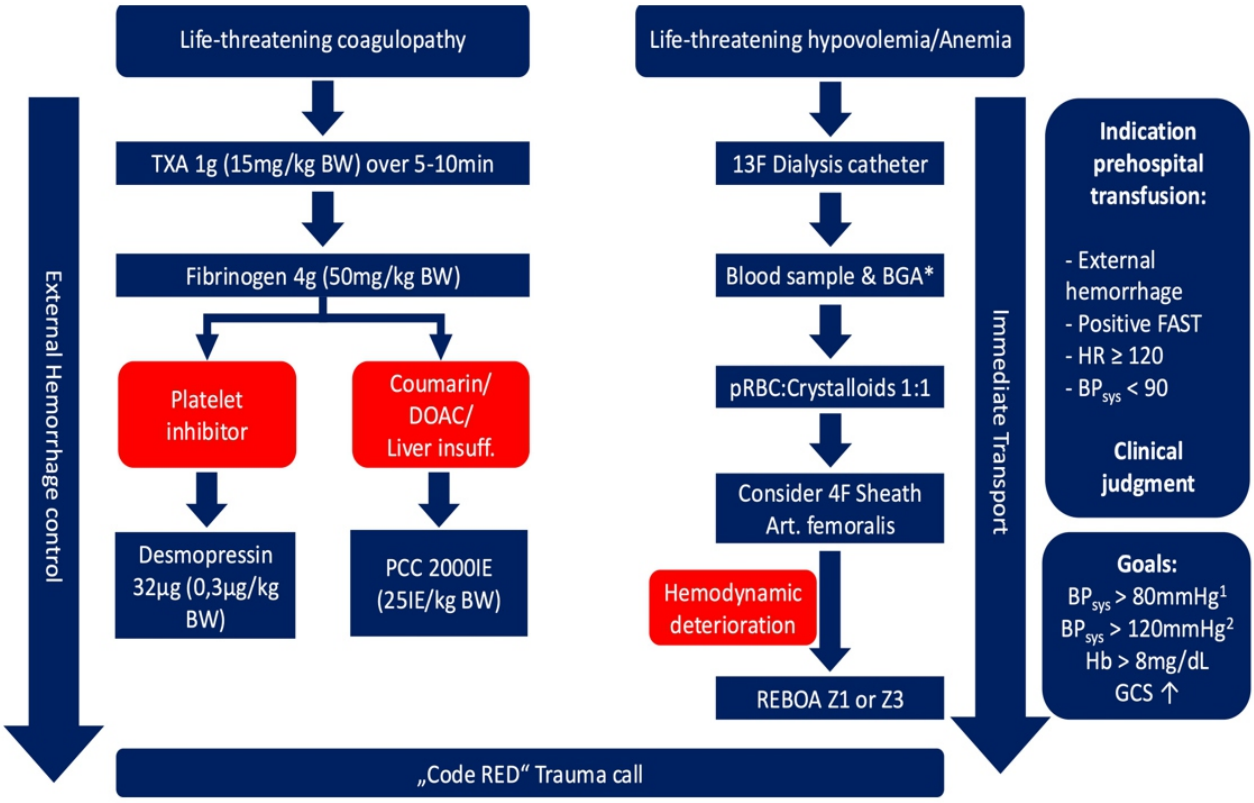

Results

Total patients: 57 (45 traumatic, 12 non-traumatic).

- **Trauma cohort:**
  - Average age, 44, 78% male.
  - 49% penetrating trauma.
  - 56% in trauma-induced cardiac arrest.
  - 4 pRBCs on average in the prehospital field.
  - 64% survived until hospital admission with spontaneous circulation.
  - Survival at discharge after trauma-induced arrest: 18%.
  - Increased use of fibrinogen (90%), tranexamic acid (93%), and calcium (67%) in the survivors.

- **Non-trauma cohort:**
  - Main cause: gastrointestinal hemorrhage (54%).
  - 83% required cardiopulmonary resuscitation.
  - Three patients survived at discharge with good neurological function.

- **Other findings:**
  - Patients requiring additional in-hospital transfusion had lower pH, higher glucose, and higher base deficit.
  - The hemoglobin value on its own was not a reliable predictor for severe bleeding.
  - No transfusion complications were observed.

Discussion

Prehospital transfusion is associated with a high complexity of care and frequent invasive interventions, and it involves logistic and availability limitations. Hyperglycemia was correlated with more severity.

The modified BTNS score confirmed the appropriateness of the transfusion indication in most cases, although the vital emergency situation may lead to rushed decisions.

Conclusions

1. Prehospital transfusion of pRBCs by specialized teams improves initial survival in cases of severe hemorrhage.
2. In trauma-induced cardiac arrest, survival at discharge was 18%, higher than historic data.
3. Early administration of fibrinogen, tranexamic acid, and calcium was associated with improved outcomes.
4. Trained teams and robust logistics are required; use is still not widespread.
5. No serious transfusion complication were observed.
6. It is advisable to move toward standardized protocols and multi-centered prospective studies.

Such a level of prehospital care, with so advanced techniques, is not yet developed in our environment.