Incidents Related to Prothrombin Complex Concentrates (PCC) n=35

14

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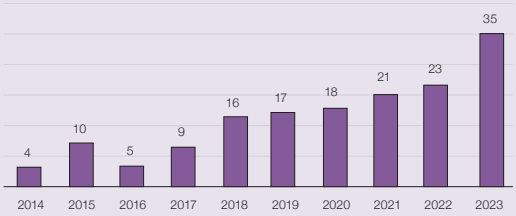
Headline data 2024

Number of reports n=35
Deaths n=1
Major morbidity n=1

PCC reports by year



Demographic data

Male n=15
Female n=20
Adults n=35
Paediatric n=0

Blood product data

Prothrombin complex concentrates (PCC) n=35

Key findings:

- PCC administration in emergencies, particularly with intracranial haemorrhage (ICH), is often delayed
- Patients are often elderly with multiple pathologies
- Most patients presented in the emergency department (ED) and needed urgent treatment
- Use of trade names can cause confusion resulting in incorrect treatment

Gaps identified:

- Lack of knowledge of PCC and how it is administered
- Communication problems between clinicians and haematologists
- PCC not easily accessible near the ED resulting in delays
- Contributory human factors, particularly very busy ED

Good practice:

- PCC is used infrequently; in one hospital difficulty locating the standard operating procedure (SOP) on the computer system resulted in revision of the title making it easier to find using key words – 'PCC SOP' instead of 'Management of Bleeding and Management of Anticoagulation'

Next steps:

- Introduce fixed dose PCC in ED with audit of use
- Where possible, automated dispensing with appropriate SOP should be set up
- Instructions about using PCC should be clear and easy to locate; the product should be easily accessible

For all abbreviations and references used, please see the **Glossary** and **Reference list** at the end of the full Annual SHOT Report. Please see the supplementary information on the SHOT website (https://www.shotuk.org/shot-reports/annual-shot-report-2024/).

Definition:

Hospitals are asked to report incidents related to PCC infusion where there was delay or inappropriate transfusion. Allergic reactions should be reported to the Medicines and Healthcare products Regulatory Agency (MHRA) through the Yellow Card scheme, https://yellowcard.mhra.gov.uk/.

Introduction

Delays were the most common reason for PCC case reports, occurring in 22/35 (62.9%). Avoidable use of PCC was reported in 5 cases. Problems with administration were noted in 8 cases, mostly wrong rates of infusion, and confusion over the prescription in 7. The patient age range was 32 to 97 years with the majority, 26/35 (74.3%) >70 years of age. The median age was 81 years. There were 8 cases with ICH.

Most cases, 31/35 (88.6%) originated from clinical areas, and 4 were attributed to the laboratory. In 2 laboratory cases, wrong lot numbers were allocated, and the other 2 cases reported delays in issuing PCC. In all 22 cases of delay the need was urgent and 14/22 (63.6%) patients were in the ED. Communication failure was reported in 8/22 (36.4%). Four patients experienced delays of more than 10 hours. Several reports noted lack of knowledge of PCC and how to administer it. Overall, 19/35 (54.3%) incidents were reported from the ED.

Death related to transfusion n=1

Case 14.1: Slow reversal of warfarin with PCC associated with increased ICH and death (imputability 1 – possible)

A patient who was on warfarin for a previous deep vein thrombosis suffered an assault resulting in head injury. A computed tomography (CT) scan of the head was done within an hour of admission when the patient was fully alert. This showed ICH and vitamin K was given 3 hours after the CT report. The patient sneezed just after this with a rapid deterioration in Glasgow Coma Scale. PCC was prescribed 30 minutes later and given an hour after the sneeze. This was 4 hours after the CT report. Repeat CT confirmed extension of the ICH and 9 hours after admission, the patient became unresponsive. They were transferred to a neurosurgery unit but died from the ICH. The delay in treatment with PCC was considered to have possibly led to the patient death.

PCC and vitamin K should be administered to reverse warfarin as soon as ICH is suspected or diagnosed (before imaging or transfer to another department) and certainly within an hour.

Major morbidity n=1

Case 14:2: Delayed treatment with PCC after injury resulted in a prolonged stay in the intensive care unit (ICU)

An elderly patient on warfarin attended a very busy ED after a fall in the shower sustaining a head injury. Blood tests showed a high international normalised ratio of 12.0 and vitamin K was given. Imaging showed peritoneal haematoma related to a fractured vertebra with a damaged blood vessel. Interventional radiology (IR) was planned to treat this. However, due to confusion, lack of understanding among staff and poor communication, there was a delay of at least 15 hours before PCC was requested, delaying the IR procedure. Had the PCC been given sooner, this delay may not have occurred, and it is possible that admission to ICU would not have been required. The patient was in ICU then the high dependency unit for a total of 2 weeks.

Wrong blood component or blood product n=3

Three patients failed to receive the correct blood component and/or blood product. A patient with metallic heart valves and acute-on-chronic subdural haemorrhage (SDH) was prescribed PCC for anticoagulant reversal which is contraindicated because of an increased risk of thrombosis. The haematologist was not told of the metallic valves. However, this contraindication is relative rather than absolute (Uncu, et al., 2024) and the balance of risks for the individual patient should be considered.

The 2nd patient had suspected thrombotic thrombocytopenia purpura (TTP) and received PCC (Octaplex®) instead of fresh frozen plasma (Octaplas®). These components should always be prescribed using proper names (prothrombin complex concentrate, fresh frozen plasma) and not trade names to avoid this confusion which has been reported to SHOT before. The identification and treatment of TTP is a medical emergency requiring discussion with and transfer to a specialist centre, and the patient should start plasma exchange within 4 to 8 hours of diagnosis (Scully, et al., 2023).

The 3rd patient received PCC when cryoprecipitate was required following thrombolysis for a cerebrovascular event.

Learning points

- Using similar sounding trade names leads to errors in treatment. Proper names should be used to identify blood products and components
- Providing all key information when seeking clinical input supports safe decision-making

Near miss n=1

An elderly patient had PCC issued with the wrong hospital number. The product was returned to the laboratory and reissued with the correct number.

Conclusion

Delayed administration could be avoided by better recognition of bleeding, having a simple accessible protocol and a supply of PCC in the ED. Hospitals have variable arrangements for PCC release. Storage in the transfusion laboratory is not ideal (biomedical scientists may be unfamiliar with the indications), and it may be difficult to locate an on-call pharmacist. An optimal route might be via an automated dispensing system set up with correct governance via the pharmacy.

In the 2023 Annual SHOT Report, the evidence for using a single fixed dose for emergency administration was reviewed and this approach was recommended (Narayan, et al., 2024). In 2024, two systematic reviews also supported this approach (Alwakeal, et al., 2024; Condeni, et al., 2024). Alwakeal, et al. (2024) reported a total of 323 participants in randomised controlled trials, 161 fixed dose and 162 variable dose; there were also 1912 patients in cohort studies (858 fixed dose and 1054 variable dose). These authors concluded that using a fixed dose results in dose reduction, faster administration time, improved clinical haemostasis, reduced mortality, and reduced thromboembolic events.

Data from a United Kingdom-wide audit of reversal agents for direct acting oral anticoagulant-associated bleeding included 2477 patients, median age 80 years, 1010 with ICH (Buka, et al., 2024). PCC was used in 2037 cases and further conclusions about timing, effectiveness and side effects will be available when the full data are published.

Recommended resource

SHOT Bite No. 16: Errors with Prothrombin Complex Concentrate
https://www.shotuk.org/resources/shot-bite-no-16/