Noticing errors in blood transfusion prevents harm to patients

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Abstract

Errors in blood transfusion can lead to serious patient harm, including death or major morbidity, especially as a result of ABO incompatibility. The transfusion process is a complex sociotechnical system and relies on multidisciplinary teams (MDT) of healthcare professionals, hence there are many opportunities for error. Serious Hazards of Transfusion (SHOT) is the United Kingdom (UK) independent, professionally-led haemovigilance scheme, which has collected and analysed anonymised information on adverse events and reactions in blood transfusion since 1996. The emphasis has been to learn from what goes wrong in these incidents, but the recent development of the safety II concept helped to see the importance of learning from what goes right. Investigation of near miss errors (what eventually goes right) can show where resilience/recovery within the transfusion process could be enhanced. Therefore, SHOT near miss incidents in calendar years 2014 and 2015 were analysed for how noticing actions prevented harm to patients, including what was noticed, by whom and what action they took. To do this, the near miss reports were searched for the words notice/noticed/noticing and various synonyms of these words. A total of 778/2410 (32.3%) near miss incident reports showed noticing actions had prevented patent harm. Of these, 552/778 (71.0%) were noticed by clinical staff and 226/778 (29.0%) by laboratory staff. Clinical staff performing the final 'bedside check' before administering the transfusion are the largest group to notice errors 327/552 (59.2%), showing the final check is crucial to patient safety. Noticing actions can prevent transfusion-related patient harm and demonstrate the value of situation awareness throughout the complex transfusion process.

Keywords: blood, transfusion, noticing, situation, awareness

1. Introduction

Errors in the transfusion process can lead to serious patient harm, including haemolysis or death caused by ABO incompatibility. Serious Hazards of Transfusion (SHOT), which is the United Kingdom (UK) independent, professionally-led haemovigilance scheme, is beginning to incorporate human factors and ergonomics (HFE) as tools to investigate incidents or to understand the complex sociotechnical systems involved with the transfusion process. Since 1996 SHOT has been collecting and analysing anonymised information on adverse events and reactions in blood transfusion from all healthcare organisations where transfusion of blood and blood components occurs . SHOT recommends changes which can improve patient safety which are published in an annual report and circulated to all relevant organisations including the four UK Blood Services, the Departments of Health in England, Wales, Scotland and Northern Ireland and all relevant professional bodies. The report is also sent to all the

reporting hospitals. As haemovigilance is continuous, SHOT also monitors the effect of implementation of its recommendations.

SHOT receives reports of over 2,500 error-related incidents every year of which approximately half are near miss events, defined as "any error which if undetected, could result in the determination of a wrong blood group or transfusion of an incorrect component, but was recognised before the transfusion took place" (Bolton-Maggs, Poles, Watt et al., 2014). The emphasis has been to learn from what goes wrong in the incidents, but the recent development of the Safety II concept tells us that it is equally important to learn from what goes right. Investigation of near miss errors can show where the transfusion process could be made more resilient (Wears, Hollnagel & Braithwaite 2015). Near miss errors are detected before transfusion often as a result of the noticing actions of staff and therefore avoid patient harm. The ability to notice and respond to signals indicating potential threats are key elements of resilient systems, but little is known about it.

3. Objectives and Methods

The aim of this study is to introduce the Safety II approach into the transfusion process by investigating how errors in near misses were noticed/responded. This study of SHOT near miss reports in calendar years 2014 and 2015, investigates how the noticing actions prevented harm to patients, including what was noticed, by whom and what action they took. To investigate how noticing actions prevented patient harm, a total of 2410 SHOT near miss reports from calendar years 2014 and 2015 were analysed for evidence of which of these errors were detected by noticing actions and then these incidents were reviewed to discover who noticed the error and what action they took to prevent harm. Incident reports are made to SHOT via a bespoke online database, which has an interactive dataset. The questionnaires are designed to help categorise incidents and to elicit an understanding of what went wrong, including how the incident was detected and resolved. The reports are put into Excel spreadsheets for analysis. All near miss reports from 2014 and 2015 (n=2410) were searched for synonyms of the word 'noticing'. The limitations of this method include that spelling errors in these words would not be found and the observation that some words were not always synonymous, so some searches found unrelated references, e.g.:

- 'Notic' – notice as a noun, e.g. a notice being displayed.
- 'Detec' – scientific tests, such as an antibody or a different group was detected by the testing, rather than detected as in 'noticed'
- 'Note' - patient notes, or a note being made related to the incident investigation

When searching the initial word found was sometimes in a negative context, e.g. "Did not 'notice' X was incorrect…". All those returning a negative use of the search term were searched for the other synonyms, so a further positive aspect of noticing would sometimes be found e.g. "…but another staff member 'realised' X was incorrect".

4. Results and Discussion

4.1 Evidence of noticing actions in SHOT near miss reports

A search for the word noticing and appropriate synonyms in SHOT near miss reports from 2014 and 2015 returned 778 occurrences out of a total of 2410 near miss reports submitted to SHOT in that 2-year period (32.3%). Unsurprisingly the search for 'notic' returned the most examples, n=194/778 (24.9%) of the total cases identified. The addition of other synonyms identified the remainder of the 778 reports where some kind of noticing action was apparent.

From the reports it was observed that use of the words realise/realised tended to be a retrospective discovery of an earlier error made by the same person, whilst noticing and the other synonyms tended to be more prospective detections of errors made by others elsewhere in the process.

4.2 Who noticed the error and what did they do about it?

The transfusion process is complex, consisting of nine major steps, as described by SHOT in 2014: 1) Request; 2) Sample, 3) Sample receipt; 4) Testing, 5) Component selection, 6) Labelling, 7) Collection, 8) Prescription, 9) Administration. The full transfusion process occurs in this sequence starting with a request for a patient who needs a transfusion now or might in the future and ending when the transfusion is administered to the patient. Errors can be made at every step of that process and can also be noticed at every step.

Steps 1, 2, 7, 8 and 9 are normally undertaken by clinical staff. Steps 3, 4, 5 and 6 are laboratory (lab) steps carried out by transfusion staff, who control the stocks of blood components and carry out the testing to match the appropriate component to the correct patient. Therefore, the results of who noticed the error and what they did about it splits naturally between errors noticed during the clinical steps (n=552/778, 71.0%) and those noticed within the laboratory environment (n=226/778, 29.0%). Figures 1 and 2 show the outcomes of that analysis.

The largest group of clinical staff to notice errors (n=327/552, 59.2%) are the pre-transfusion checkers, i.e. those at the final stage of the process who perform the final 'bedside check' before administering the transfusion (Figure 1). There are not many noticing actions by porters or equivalent staff who collect blood (n=12). This places added importance on staff undertaking the final check before administering the transfusion to notice errors that could have been detected at the collection stage.

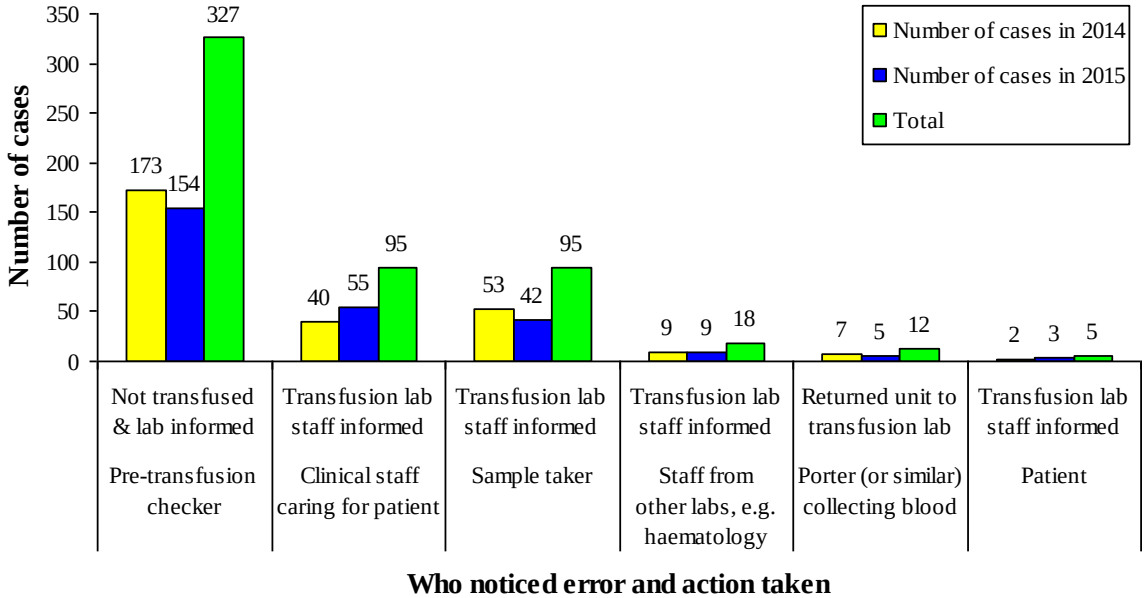

Figure 1. Errors noticed outside transfusion laboratory (lab), n=552

Outside the transfusion laboratory, the actions of those who noticed an error were largely to inform the transfusion laboratory staff that an error had occurred. That may include returning the blood component to the laboratory, which should not be taken to indicate that errors are made more often by laboratory staff. The reason for the key action being to inform transfusion laboratory staff is because these staff can either stop the process, which has been found to be

erroneous, or may repeat their steps in order to issue another suitable component. Very often the error originates in the clinical area at an earlier step in the process, e.g. an error made with the request or when taking a sample from the patient. That error may then be noticed at a later stage in the process, e.g. when the sample taker realises their mistake or the pre-transfusion checker notices an error has occurred at an earlier step. It should be noted that a small number of adverse incidents (n=5) were prevented by the patient themselves noticing something was wrong.

Figure 2 shows the actions taken when laboratory staff noticed an error. The most common action (n=76/226, 33.6%) was to recall the blood component, which would have been necessary if the error was noticed after the component had been issued ready to be transfused to the patient. Often in non-emergency situations the component being recalled will not have actually left the laboratory, because it would be awaiting collection. If the blood has already been collected, then prompt action would be needed to recall the component before any harm comes to the patient.

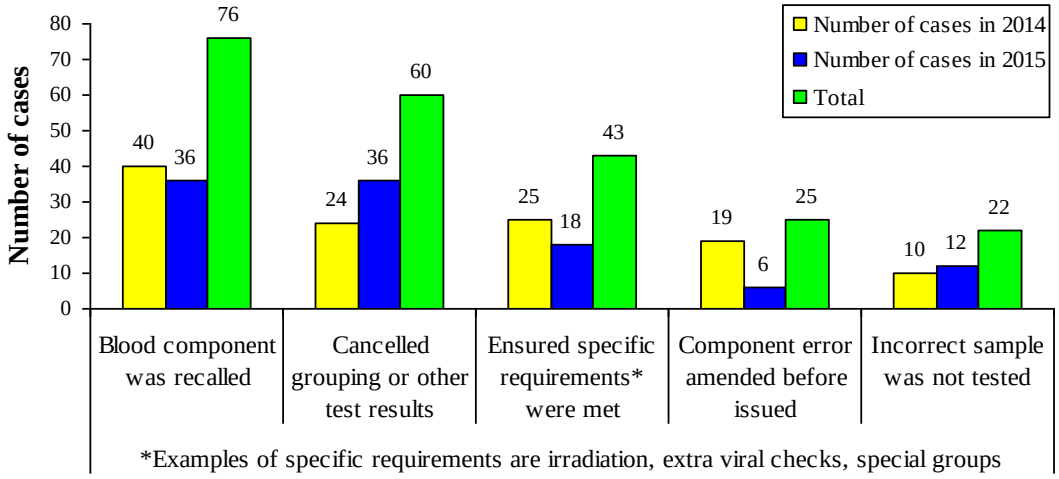

Figure 2. Errors noticed by transfusion laboratory staff, n=226

4.3 What could the outcome have been?

In some cases the noticing actions prevented ABO-incompatible transfusions (n=64/778, 8.2%) and in others prevented an incorrect component being transfused (n=300/778, 38.6%) some of which could have been ABO incompatible, but those case reports do not specify the ABO groups involved. Patient harm could result from other errors, including the patient getting components without their specific requirements (n=103/778, 13.2%), or those stored or handled incorrectly (n=120/778, 15.4%) (Figure 3).

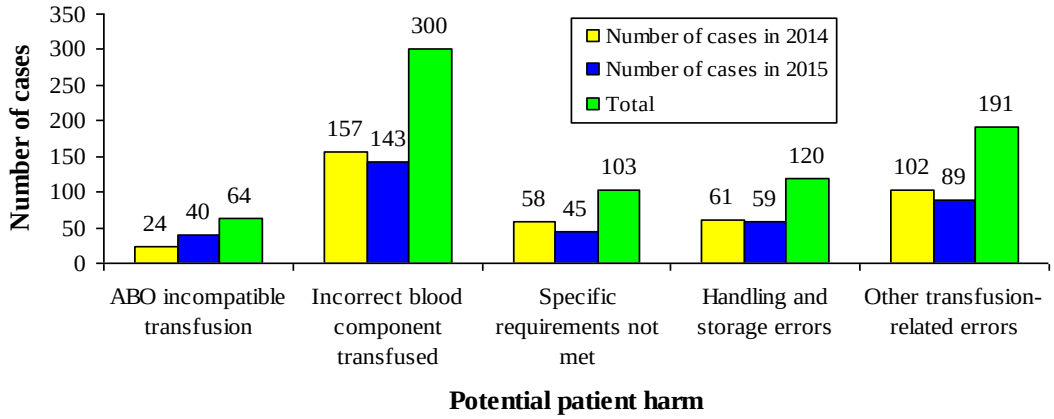

Figure 3. Potential outcomes if noticing actions had not taken place, n=778

A frequent near miss incident that can lead to an ABO incompatible transfusion, is a 'wrong blood in tube' (WBIT) sample, i.e. blood is taken from the wrong patient, but labelled with the intended patient's details, or is taken from the intended patient, but labelled with another patient's details. These errors can lead to serious patient harm. A study in Scotland (Pickup, Atkinson, Hollnagel et al 2015) using the Functional Resonance Analysis Method - FRAM technique (Hollnagel 2012) showed many contributing factors to WBIT errors. Standard transfusion processes will detect WBIT errors where the samples give different results from historical records. Analysis of the 778 near miss incidents that were detected by noticing actions showed 239 were WBIT-related reports (30.7%). Therefore, situation awareness in this study helped to prevent potential patient harm from WBIT errors. These figures compare to only two cases of actual patient harm from WBIT events in 2014 and 2015 (Bolton-Maggs, Poles, Watt et al., 2014).

5. Conclusion and Future Perspectives

The main goal of the current study was to determine and evaluate whether noticing actions contributed to patient safety, by detecting errors before a blood transfusion took place. This study has identified situation awareness in the form of noticing actions was responsible for preventing patient harm in almost a third of the total near miss cases reported to SHOT in a two-year period (778/2410, 32.3%). The research also identified the staff most likely to notice an error were those performing the 'bedside check' prior to transfusion (300/778, 38.6%). This finding highlights the critical importance of the final checking procedure before administering a transfusion.

This is the first study to investigate the importance of situation awareness specifically in blood transfusion and confirms previous research which observed that situation awareness is one aspect of high reliability organisations (HRO) that can be incorporated into healthcare (Goldenhar, Brady, Sutcliffe et al 2013; Wilson, Burke, Priest et al 2005). HROs such as aviation and the nuclear industry provide a template from which healthcare institutions can learn, but there are limitations, because patients are much more diverse than aeroplanes or nuclear reactors. This research will serve as a base for future HFE studies in the field of blood transfusion.

The major limitation of this study is that it was a retrospective analysis of near miss incidents and the SHOT reporting questionnaire does not specifically ask about noticing errors. Many other near miss transfusion errors are likely to have been detected by someone noticing something unusual, but that may not have been recorded as such in the incident report, hence those incidents would not have been found by the search for 'noticing' and its synonyms.

Further studies could be carried out to validate these results, including the possibility of adding questions about noticing into the SHOT near miss questionnaire. An alternative would be to get prospective data by interviewing those involved with incidents to ask questions such as "how do you notice errors?" and "what signals of errors are you most likely to notice?".

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