Does time matter? An investigation of knowledge and attitudes following blood transfusion training

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Abstract

The Scottish National Blood Transfusion service have developed an educational programme aimed at ensuring a high standard of care for blood transfusions to minimise risk to patients and healthcare practitioners. This paper investigates whether knowledge and understanding of, and attitudes towards, safe practice declined over time following completion of module 1 of the programme. An online survey was administered to a range of healthcare practitioners who had completed the module. The survey tool tested knowledge and ascertained views on blood transfusion practice and perceptions of the module's importance. Comparisons were made between participants 6–8 weeks, 12–14 months and 22–24 months since module completion. In-depth interviews were conducted with a sub-sample of survey respondents to explore attitudes in more detail. Findings indicate evidence of a slight though statistically significant reduction in the degree of emphasis respondents placed on the importance of understanding aspects of transfusions as time lapsed, but no difference was found in knowledge between those who took the course more recently and those who were up to two years post-module. The study's findings indicate that recognition of the importance of safe practice declines over time and thus also suggests that frequent refresher courses are important to maintain safe practice.

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Introduction

Blood transfusions are one of the most commonly performed procedures in hospitals. Each year over 2 million units of blood and blood components are collected, processed and distributed by United Kingdom (UK) blood establishments to both National Health Service (NHS) and private hospital blood banks (Medicines and Healthcare products Regulatory Agency (MHRA) 2010). In NHS Scotland (NHSS) approximately 260,000 transfusion samples are processed in a year resulting in over 200,000 blood components being issued to patients (Scottish National Blood Transfusion Service (SNBTS), 2011). Considering the scale of blood transfusion activity it may not therefore be surprising that international haemovigilance data and clinical studies continue to report errors at all stages of the transfusion process. Errors include, sampling processing errors, pre-transfusion testing errors, incorrect component collected or component for another patient and blood component issued before expiry but out of date (National Haemovigilance Office (NHO) 2009; Medicines and Healthcare products Regulatory Agency (MHRA), 2010; Bolton-Maggs and Cohen, 2011). In the UK 7048 Serious Adverse Blood Reactions and Events (SABRE) reports were submitted between 2005 and 2010 (MHRA, 2010).

Since its inception in 1996, the Serious Hazards of Transfusion (SHOT) system, a national confidential haemovigilance reporting scheme in the UK, has analysed over 2800 serious adverse events related to incorrect blood component transfusions. In total, 27 deaths occurred where transfusion was the contributory cause and 596 patients have experienced major morbidity (Knowles and Cohen, 2011). Although a continued decline in the proportion of deaths and major morbidity is attributed to successful haemovigilance (Bolton-Maggs and Cohen, 2011), of the 3054 reports submitted to SHOT in 2011, half of all events related to errors in the basic transfusion process, such as incorrect patient identification. Evidence also highlights problems with nurses' transfusion practice and adherence to recommendations (Hijji et al., 2010). The rate of transfusion errors and near misses is therefore of considerable concern.

Blood transfusions thus involve risk and hence safe practice is paramount. Deficiencies in transfusion knowledge can adversely affect patient safety (Gallagher-Swann et al., 2011) and education...
and training has been highlighted as one way of reducing incidence of adverse events (NHO, 2009; National Blood Authority Australia, 2010; Bolton-Maggs and Cohen, 2011). In the UK, SHOT recommended that every staff member involved in the transfusion process should have access to training and education relevant to their role (Stainsby et al., 2006). In this light, the Scottish National Blood Transfusion Service (SNBTS) developed an educational package aimed at all healthcare practitioners, namely the Learnblood-transfusion (LBT) education programme. The programme is available to NHS organisations across the UK and Ireland and has also attracted international interest (Smith et al., 2010).

This study sought to establish how knowledge and understanding of and attitudes towards safe practice changed in the months and years after module completion. The knowledge, attitudes, and experiences of a range of hospital staff including nurses, midwives, doctors, porters, and bio-medical scientists were sought. The inclusion of different practitioners contrasts with previous studies that have focused on qualified nursing and nursing students (for example Hogg et al., 2006; Mole et al., 2007; Smith et al., 2010). A range of people are involved in the different aspects of transfusion process and consequently complete the LBT programme, therefore the study reported here, was designed to be inclusive of the multidisciplinary team.

Background/literature

A number of initiatives were endorsed by the Department of Health in the UK with the explicit intention of improving care and reducing the incidence of adverse events (Scottish Executive Health Department (SEHD), 1999, 2003, Gray et al., 2004; NHS QIS, 2006). One of the main recommendations to emerge from these initiatives was the importance of providing relevant and accessible training and education for all staff involved in the transfusion process. The NHS in Scotland mandated that only staff who had completed the LBT education programme and demonstrated competence appropriate to their role should participate in the clinical transfusion process (NHS QIS, 2006). Module 1: Safe Transfusion Practice was the foundation module with content covering haemovigilance, blood group serology, requesting, sampling, collection, administration procedures and management of adverse events. The module was aimed at medical and nursing staff, operating department practitioners, clinical support workers, phlebotomists and porters and was set up to be accessed either face-to-face or via elearning (Department of Health (DH), 2011).

The module can be viewed within a context in which education has been seen as a key component of achieving safe practice (Scottish Government, 2007). Specifically, training, competency assessments and continuing professional development have all been identified as an integral part of the quality system in all organisations involved in blood transfusion (NHO, 2009; MHRA, 2010; Knowles and Cohen, 2011). Hogg et al. (2006) have highlighted how educators use education and training to try to minimise risk at all stages of the transfusion process. They evaluated the effects of a simulated ward exercise with six registered nurses who had attended a theoretical education session on safe practice. Outcomes from the exercise demonstrated that the simulation raised awareness of error detection and safe practice in the simulated environment; however how long this awareness remained heightened was not ascertained.

Studies which have investigated the impact of time on nursing knowledge following transfusion education report mixed findings. Smith et al. (2010) evaluated undergraduate adult nursing student knowledge and retention of transfusion practice following a teaching programme at three different time points post education programme. The study demonstrated an apparent degradation in knowledge from the 31 students who completed the knowledge questionnaire on the day of the session, 4–6 months and at 11–12 months. Mole et al. (2007) also evaluated nursing students’ knowledge over time, specific time points analysed being pre-course, and at four weeks and one year post course. Results from the study were varied and actually showed some knowledge improvement over time for some aspects, for example knowledge of blood groupings and blood compatibility, but knowledge regression in other aspects, such as with respect to blood collection procedures and checking errors.

Studies that have explored knowledge retention and attitudes following education intervention mostly indicate increased knowledge and greater recognition of self efficacy (Eustacia et al., 2000; Barber et al., 2003; Schneiderman et al., 2009; Young et al., 2008). However, few studies have looked at how this knowledge or attitudinal perspective changes over time. Those studies that have investigated the implications of time for educational initiatives in healthcare report mixed results. Eustacia et al. (2000) assessed acquired knowledge in paramedics completing a paediatric resuscitation course and reported a return to baseline levels of knowledge within 6 months. A similar result was shown in a study monitoring Advance Life Support skills in anaesthetists (Semeraro et al., 2005) and, notably in view of the subject matter of the study reported here, in transfusion knowledge among physicians (Gharehbaghian and Javadzadeh Shahshahani, 2009). However, some studies have demonstrated more sustained impact on knowledge retention following education participation (Shanley et al., 1998; Wilkes et al., 2003). While evidence about the sustaining impact of education participation remains mixed, there is a consensus that educational programmes should lead to measurable and sustained improvements in healthcare practice.

The implications of elapsed time for educational initiatives aimed at improving safety are notable. If either knowledge or attitudes are declined in the weeks, months and years following completion then the need to invest in on-going refresher courses would be clear, hence the rationale behind the study reported here which set out to investigate how knowledge and attitudes changed after completion of the LBT module.

Methods

The primary objective of the study was to evaluate the module on behalf of the Scottish National Blood Transfusion Service. However, the evaluation also provided an opportunity to investigate retention of knowledge and attitudes after module completion and attitudes towards module revalidation. We utilised both quantitative and qualitative methods, the former providing an objective measure of knowledge and attitudes whilst the latter providing a more in-depth insight from the perspective of participants themselves (Clark, 1999). Qualitative techniques can supplement the findings of a quantitative study, and as used in the context of this study, can use exploratory questions for additional clarification of findings (Polit and Beck, 2012). Findings from the two separate analyses were drawn together to develop an overall interpretation of findings.

Recruitment

Participants were invited to take part through an email sent by the Scottish National Blood Transfusion Service to those who had completed the module. To maximise response rate, emails were specifically sent to those who were at particular points in time post completion: (1) 6–8 weeks, (2) 12–14 months, and (3) 22–24 months following module completion. These time points were arbitrary but were chosen to indicate short, medium and longer
term time periods after finishing the module. In total, a sample of 2719 healthcare staff was invited to participate. The invitation to take part included a link that provided information about the study which, if selected, took the participant to the web based survey. Of these, 538 (20%) responded and agreed to participate in the survey.

Survey instrument

The online survey included questions to ascertain information on participants socio-demographics, role within the health service and place of work. Questions were also included to test knowledge and to ascertain attitudes towards the practice of blood transfusion. Knowledge was tested using 5 multiple choice questions based on material included in the module and that were considered to be important aspects which the module designers felt it not unreasonable to expect participants to be able to answer correctly.

Attitudes were assessed by asking a range of questions relating to different aspects of the transfusion process in which participants were asked to indicate their perception of importance to their practice. A Likert type scale was provided enabling responses ranging from 1 (very important) to 5 (not important at all).

The survey was piloted by being sent to over 100 healthcare professionals with minor amendments made in response to feedback.

Analysis of survey results

All quantitative data was imported into SPSS version 19 for data analysis. Scores for the knowledge test were totalled and then each of the three different time periods were compared to one another using a Kruskal–Wallis test. This test was chosen as the outcome variable (total knowledge score) was not normally distributed and hence a non-parametric test was required. The Likert scores from each of the attitude questions were similarly totalled up and the responses from the three groups being compared and contrasted using a Kruskal–Wallis test.

Qualitative study

The survey also included a question that asked respondents whether they would be willing to participate in an in-depth telephone interview. The semi-structured interviews also expanded on the information from the survey and provided depth of context and clarification of issues as necessary. In particular, the interviews sought to illicit views about the modules relevance to practice and the impact of time since module completion. A purposive sample was selected from the responses to ensure representation of different staff groups involved in the transfusion process (n = 8). Interviews were also undertaken with NHSScotland Hospital Transfusion Committee (HTC) Chairs (n = 3). In-depth telephone interviews were audio-recorded, transcribed verbatim and anonymised. Analysis was facilitated by use of NVivo™. Analysis was guided by the study aims but open coding also allowed for new themes to emerge.

Ethical approval

The evaluation received ethical approval from the School of Nursing, Midwifery & Ethics Committee. As this was an evaluation study, advice was sought and approval gained from the NHS South East Scotland Research Ethics Service. Embedded in the electronic survey was consent form which responders had to complete before filling in the survey. Verbal consent was given for telephone interviews. Confidentiality and anonymity was maintained throughout the study. For the survey, all data was anonymised. For the qualitative interviews, any quotes used in reports and publications were not attributable to any individual participant.

Results

Table 1 shows numbers of emails that were sent and those who agreed to participate in the survey. In total, 538 people completed the survey, representing a 20% response rate. The largest response came from those who had most recently completed the module (55.9%), and fewest from those who had completed the module 22–24 months previously (15.4%).

Responses were drawn from a range of registered and non-registered staff, specialities and Health Boards (Table 2). Nearly two-thirds of respondents were nurses (62.8%) but also included doctors (5.4%), midwives (7.4%), operating department practitioners (1.9%), and healthcare assistants (2.4%). Scrutiny of responses in the ‘other’ category indicated that many of these were undergraduate nurses, who complete the module during their pre-registration programme. Areas worked in also encompassed a cross-section of NHS specialities, with medical (11.2%), theatre (13.8%) and surgical (8.7%) being particularly well represented.

The results are presented in the three main sections including; knowledge and attitudes to blood transfusion over time; participants perception of module relevance; and attitudes to revalidation.

Knowledge and attitudes to blood transfusion over time

Analysis of answers to the knowledge questions indicated no statistical difference in responses based on time since completing

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Participants by time since module completion.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mode of delivery</td>
<td>Sampled</td>
</tr>
<tr>
<td>eLearning</td>
<td>6–8 weeks post-module</td>
</tr>
<tr>
<td></td>
<td>12–14 months post-module</td>
</tr>
<tr>
<td></td>
<td>22–24 months post-module</td>
</tr>
<tr>
<td></td>
<td>Total</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 2</th>
<th>Participants by role and area of work.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Role</td>
<td>No.</td>
</tr>
<tr>
<td>Biomedical scientist</td>
<td>25</td>
</tr>
<tr>
<td>Biomedical support worker</td>
<td>3</td>
</tr>
<tr>
<td>Qualified doctor</td>
<td>29</td>
</tr>
<tr>
<td>Foundation year 1 trainee</td>
<td>2</td>
</tr>
<tr>
<td>Foundation year 2 trainee</td>
<td>3</td>
</tr>
<tr>
<td>Porter</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>538</td>
</tr>
</tbody>
</table>

| Main area of work/department | No. | % |
| A/E | 18 | 3.3 |
| Agency/bank | 5 | 0.9 |
| Children and young people | 5 | 0.9 |
| Community based | 26 | 4.8 |
| Critical care | 41 | 7.6 |
| Medical | 60 | 11.2 |
| Neonatal | 17 | 3.2 |
| Surgical | 47 | 8.7 |
| Missing | 11 | 2.0 |
| Total | 538 | 100 |

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the module; the majority of respondents answered questions correctly regardless of length of time lapsed since completing the module. Perhaps more importantly, proportions answering incorrectly were very small. Some respondents recognised they did not know the answer and indicated this by ticking the ‘don’t know’ option. A little over 40% of respondents in each time period answered all questions correctly with over 75% answering at least 4 out of 5 correctly. Furthermore, there was no statistical difference in total scores between groups (p = 0.92) (Table 3).

Attitudes to blood transfusion knowledge over time

Table 4 shows respondents’ attitudes regarding the importance of different aspects of blood transfusion that were addressed in the module. There was a very slight reduction in perceived significance given to certain aspects of transfusion. The reduction was observable for all aspects although only to a statistically significant degree for three of them. Respondents were more likely to rate knowledge of blood testing procedures and procedures for pre-transfusion blood sample testing higher if they had completed the module within the previous 6–8 weeks; in other words, those that had completed the module recently.

Relevance of module to practice over time

To assess if respondents reported practicing safely when involved in the transfusion process, specific questions were administered to ascertain if the module had influenced their practice (Table 5). As with analysis of knowledge and attitude, the

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cohorts were compared to determine if increased time after completing the module was associated with any indication of reduced diligence. Responses ranged from 1 (no difference) to 5 (significant difference). The modal response, regardless of time since module completion was 4. That respondents tended towards the ‘Significant difference’ end of the scale indicates a perception that the module made a notable difference to practice. Statistically, no significant difference was evident between the three cohorts. Even after two years had passed, respondents still viewed module 1 as having made a considerable difference to their practice.

Findings from the interviews provided insight into reasons why the module may have had continued practice relevance. For example, module participation was said to encourage a more informed and questioning approach to transfusion practice. One manager described how ward staff who had completed the module demonstrated this attitude change,

‘They [the staff] make reference to information that was in module 1 and are more questioning about practice. They also question other peoples’ practice’

Interviewees were not aware of changes in practice resulting from module participation. This finding may not be surprising as they had confirmed in both the survey and interviews that transfusion practice did reflect established protocols. However, it is important to note that data from the qualitative interviews highlighted how the module had helped to emphasise the concepts of safety and risk reduction with transfusion practice suggesting heightened awareness after module completion. For example, interviewees suggested that module participation reduced the risk of complacency and emphasised the importance of checking procedures, blood group compatibility and patient observations. A midwife suggested,

‘I am more aware of the risks and not so easily distracted when looking after someone with [a] transfusion.’

There was perception by participants that following completion of the module their self-confidence improved. Interviewees who had direct patient contact stated that they felt more confident looking after transfused patients on acquiring knowledge from the module. Interviewees also stated that they better understood the rationale which underpinned their practice. The interviews affirmed positive perceptions of the module relevance, with the module being described as being ‘very relevant to practice’ and ‘reflective of the reality of practice’. Notably interviewees stated how the module updated and reinforced existing knowledge for experienced staff and helped to develop knowledge and learning for newer staff groups, as summarised by a nurse,

‘The area I work in has a lot of transfusions and you need to keep up-to-date with current practice. The main advantages of module 1 are that it stays very fresh in your mind and keeps you aware of main issues.’

Table 5
On a scale of 1–5, how much difference do you think the Safe Transfusion Practice Module 1 has made to your practice? Responses by time since module completion.

<table>
<thead>
<tr>
<th>Time period</th>
<th>No difference</th>
<th>Significant difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>6–8 Weeks post course</td>
<td>38</td>
<td>52</td>
</tr>
<tr>
<td>12–14 Months post course</td>
<td>14</td>
<td>23</td>
</tr>
<tr>
<td>22–24 Months post course</td>
<td>14</td>
<td>9</td>
</tr>
<tr>
<td>All</td>
<td>66</td>
<td>84</td>
</tr>
</tbody>
</table>

Time period for module re-validation

Respondents were asked how often they should retake the module. Fifty-nine percent indicated that an annual update to be appropriate, followed by a notable proportion (21.5%) who indicated every two years. The majority of interview participants felt that updating within a 2-year period to revise or be kept informed of practice changes was desirable. Reference was also made to the value of the module for ‘refreshing’ knowledge. The following comment summarises the perceptions of frequency for module update,

‘We should do module 1 every two years, more frequent than that would be a waste of time and further away and people might start to forget things’

Discussion

This paper explored whether knowledge retention and attitudes to blood transfusion changed over time following practitioner participation in the LBT module. This study demonstrates that the benefits of the module continued beyond the immediate post course phase. The survey data indicated that there was no degradation of knowledge over the period surveyed with all the cohorts and knowledge scores remained high regardless of time lapsed post-module. This finding differs from previous studies that found evidence of knowledge regression in student nurses during the 12 month period post transfusion education (Mole et al., 2007; Smith et al., 2010). It could be that the sample of registered practitioners from our study influenced the finding, as arguably registrants are more likely to have sustained encounters with blood transfusion and also have greater accountability than students. A further explanation for the differences in findings may be that students are involved in extensive learning situations about a range of things, and therefore are at more risk of knowledge degradation.

Analysis suggested a slight decline in emphasis for different aspects of the transfusion process and respondents in cohorts 1 and 2 were more likely to place greater importance on knowing particular areas of practice such as sampling procedures. There are several reasons why these findings were credible. Firstly, the decline in importance placed on each aspect of the transfusion process was apparent with respect to all six relevant questions. Furthermore, in two of the questions asked the degree of difference finding differs from previous studies that found statistically significant and included attitudes to procedures for blood requesting and for pre-transfusion blood sample testing. This finding is important because haemovigilance data has identified pre-transfusion testing errors (Knowles and Cohen, 2011; National Blood Authority Australia, 2010).

There is a strong possibility that differences in the respondent’s levels of transfusion responsibility may have influenced the response. For example, student nurses and some non-registered
practitioners are not responsible for pre-transfusion sampling procedures. Additionally, registered practitioners would be more frequently involved in the administration of blood and blood products. Testing errors have been associated with lack of nursing experience and infrequent transfusion activity in the ward (Ingrang et al., 1998). Significantly, frequency of transfusion and training has been identified by nurses as the most important factors for supporting knowledge and practice (Saillour-Glénisson et al., 2002). The finding therefore provides support for the need to have updates on blood transfusion to maintain the importance of different aspects of transfusion practice.

A notable finding was the statistically significant reduction in the perceived importance of some of the transfusion procedures over time. This finding suggests that it is important to sustain awareness of knowledge about blood transfusion. In the qualitative interviews the need to update and refresh knowledge was supported by respondents who identified the preference for regular updates. Although knowledge and understanding of safe practice did not appear to diminish over time since taking the module, the majority of respondents wanted to complete the module on at least a 2 yearly basis. Regular updates are also important when blood transfusion is not encountered every day, this further emphasises the need for robust re-education to ensure knowledge to guide clinical practice (Smith et al., 2010). Studies indicate that the performance of medical students’ knowledge generally declines over time and that this probably varies with ongoing reinforcement learning (D’Eon, 2006). Importantly, the module provides access to current guidelines, ensuring that practitioners remain updated with transfusion practice.

The module was perceived by respondents as being relevant to practice. This may be because module content was recognised as realistic and reflects the relevant protocols that guide transfusion practice. This explanation resonates with Jordan et al.’s (1999) observation that while the gap between theory and practice is multi-functional, the relevance of content and focus of courses to practice is an important consideration. A strength of this module is that all learners undertake the same module, so the results presented in this study were not confounded by variations in content or teaching styles. As safe transfusion is reliant on collaborative teamwork (Hogg et al., 2006) the importance of consistent module content for all practitioners should not be underestimated. Notably, the time since module completion did not influence respondents’ perceived importance of the module to their practice and therefore remained relevant.

Overall, the outcomes of this study were encouraging. The study has shown that the provision of a specialist module for healthcare staff may be associated with positive changes in attitudes, practice and increased awareness of transfusion risk. These findings also support guidance to healthcare organisations to have a commitment to ensure that their staff access relevant training and education to promote a culture of life-long learning and risk reduction (DH, 2000). Importantly, evidence demonstrates that education and audit has been a key factor in raising awareness of transfusion safety issues and promoting better, safer transfusion practice (Gallagher-Swann et al., 2011).

There are acknowledged limitations from the study and its results that may bias the findings. We failed to achieve pre-test participants as we were unable to identify a large enough sample of people who had never undertaken the module. This was mainly due to the reduced availability of healthcare staff who would have completed the module as part of their induction training when the research was being conducted. The response rate of 20% was low, though in general online surveys do not achieve high response rates (Evans and Mathur, 2005; Nulty, 2008). Arguably, what is important is whether responses had a systematic bias between time periods analysed. We see no clear a priori reason why that would necessarily be the case although cannot discount the possibility. That those who responded at the later time point indicated a decline in emphasis about certain aspects of transfusion practice which may suggest that if anything our results might have been conservative if enthusiasm towards the course increased likelihood of responding. Additionally, the response rates for the 12–24 month post-module were lower than for 6–8 week post-module. The results may be biased in that only module participants who were more knowledgeable or confident with the transfusion scores and had more favourable attitudes towards the module may have responded. However, if anything this bias would most likely have biased responses to attitudinal questions upwards. This being the case then attitudinal scores may thus in reality be lower than indicated suggesting a larger decline than suggested by survey findings. Finally, professionals may be reluctant to acknowledge that best practice is not always followed particularly when all aspects of blood transfusion practice are subject to mandatory guidance.

Conclusion

The findings for this study indicate that knowledge and safe practice did not appear to diminish over time for learners taking the module. There is evidence that attitudes to transfusion practice positively changed as a result of the module. One important sequel to this study would be to examine the healthcare staff who have never participated in the module. In future, a longitudinal study which collects data about the same individuals at different points and follows them into practice may provide more informed understanding of the impact of an educational intervention.

It would also be of considerable interest to further explore the emerging finding that the module appears to raise awareness of risk related behaviours linked to blood transfusion.

Acknowledgements

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