Evaluating the Frequency of Vital Sign Monitoring During Blood Transfusion: An Evidence-Based Practice Initiative

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Blood component transfusion is a lifesaving therapy that may be associated with adverse events. Surveillance data indicate that 20,933,000 blood components were transfused in the United States during 2011, with an adverse event rate of 0.24% (U.S. Department of Health and Human Services, 2011). During 2011, the U.S. Food and Drug Administration ([FDA], 2011) received reports of 69 transfusion recipient fatalities, 30 of which were transfusion related, denoting 1 fatality per 697,767 blood components transfused.

Patients with cancer often rely on transfusion because of chemotherapy-induced anemia, which affects as many as 90% of all patients with cancer (Shreay, Desrosiers, Corey-Lisle, & Payne, 2013). The University of Texas MD Anderson Cancer Center (MDACC), a National Cancer Institute (NCI)-designated comprehensive cancer center in Houston, Texas, consists of 656 inpatient beds, including 240 for hematology patients, who accounted for 8,388 admissions in fiscal year 2014 (FY14). These individuals account for a large proportion of the 194,012 blood products transfused at this institution in FY14. Of those, 57,283 were packed red blood cells, and 124,917 were platelets (MDACC, 2015). The rate of transfusion reactions was 0.14% (n = 266), with no fatalities reported (MDACC, 2015). Data from 128 transfusion reactions included hives or itch (46%), chills (25%), fever (9%), shortness of breath (5%), chest pain (3%), facial edema (2%), and other symptoms (9%). Review indicated that 51% of the reactions were identified through patient self-report of symptoms. Of those patients, 40% had vital sign changes noted after the patient reported symptoms. Only 9% of the transfusion reactions were discovered by routine vital sign monitoring alone.

Because blood components have different antigenic characteristics and may carry infectious agents, contributing to clinically adverse events, the monitoring and documentation of the clinical status of patients during transfusions is essential to safe practice. Accreditation and regulatory bodies, as well as healthcare institutions, have policies and standards to ensure the safe administration of blood components (American Association of Blood Banks [AABB], 2014). Nurses’ assessment and management is critical to provide safe transfusion therapy for...
patients (Popovsky, 2012). The aim of this evidence-based project was to examine the evidence regarding the optimum frequency of vital sign monitoring for hematology patients receiving blood products and to ensure current institutional practice was aligned with the evidence.

**TABLE 1. Literature Review of Studies on Vital Sign Monitoring During Blood Transfusions: Levels of Evidence IV and V**

<table>
<thead>
<tr>
<th>Study</th>
<th>Design and Sample</th>
<th>Outcome Measurement</th>
<th>Findings</th>
<th>Quality of Evidence</th>
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</thead>
<tbody>
<tr>
<td><strong>Level of Evidence: IV</strong></td>
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<tr>
<td>Andrzejewski et al., 2012</td>
<td>Retrospective observational cohort study with 16,127 patients who received uncomplicated red blood cell transfusions and reported suspected transfusion reaction cases. Patients were transfused with 51,381 units of red blood cells and observed in three cohorts.</td>
<td>A data abstraction quality improvement worksheet tool was used in gathering various data elements during case reviews.</td>
<td>Vital signs were taken before transfusion, after 15 minutes, and at completion of the transfusion. Clinically and statistically (p ≤ 0.05) significant changes were encountered in all vital sign monitoring in patients experiencing transfusion-associated circulatory overload at the 15-minute time interval or at the end-of-transfusion time points. This study supports taking vital signs at baseline, after 15 minutes, and at completion.</td>
<td>Strengths</td>
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<td><strong>Level of Evidence: V</strong></td>
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<td>Corey-Lisle et al., 2014</td>
<td>A retrospective chart review study conducted in France with 103 patients with nonmyeloid malignancies after receiving red blood cell transfusion as an outpatient for chemotherapy-induced anemia from seven treatment centers randomly selected from medical records.</td>
<td>Site questionnaire that included questions pertaining to study site location, geographic setting, facility type, profit status, number of outpatient transfusion beds or chairs, and maximum number of transfusions performed at one time at the site.</td>
<td>Transfusion reactions included hives, itching, and flushing. One occurrence of fever was reported. Treatment of chemotherapy-induced anemia with red blood cell transfusion is time consuming for patients receiving chemotherapy. Patient burden should be considered in the context of optimizing monitoring and planning for supportive oncology care.</td>
<td>Strengths</td>
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<td>Cottrell &amp; Davidson, 2013</td>
<td>Data were collected on patient identification and the monitoring of patients receiving transfusions. A total of 247 sites participated in the audit.</td>
<td>National audits</td>
<td>Vital signs taken at pre-transfusion, at 15 minutes, and within 60 minutes of completion of the transfusion indicate safe practice. The majority of patients received safe transfusion with adequate identity checks and careful monitoring. Some patients were at risk of misidentification or an unobserved transfusion reaction because of the absence of a patient identity wristband or lack of monitoring during transfusion.</td>
<td>Strengths</td>
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<td>Gammon et al., 2011</td>
<td>An alpha test specifications manual was developed. Measure specifications contained in the manual included measure information forms for each measure, a data dictionary, and International Classification of Diseases (ICD)-9 code tables. For the pilot phase of testing, 76 hospitals volunteered to participate.</td>
<td>A web-based data collection tool was used where two Joint Commission staff blindly reabstracted data elements in a sample of previously abstracted records at 12 pilot hospitals. A total of 194 originally abstracted records were included in the reliability test. Focus group discussions and participant feedback were also used.</td>
<td>One of the areas measured was the blood administration documentation. Vital signs were documented correctly 88% of the time at all three required intervals (i.e., at baseline, after 15 minutes, and at completion).</td>
<td>Strengths</td>
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**Problem Identification**

A team of stem cell transplantation nurses participating in an evidence-based...
practice program at MDACC explored vital sign monitoring frequency during transfusion. Informal feedback from patients indicated that frequent vital sign monitoring was disruptive to patients' sleep and their ability to ambulate and participate in activities. The unit nurses, as part of a Professional Action Coordinating Team (PACT), reviewed the literature and existing institutional transfusion policies to evaluate whether these policies were consistent with the evidence. A PACT is a subgroup of the institutional shared governance body, the Nursing Practice Congress, which supports interprofessional collaboration to address clinical and professional practice issues. This particular PACT consisted of nurses and staff from various departments within the institution, including faculty from the Section of Transfusion Medicine and the Chair of the Nursing Policy and Procedure Committee. The PACT identified opportunities to change institutional practice based on the evidence and made recommendations for policy revisions.

### Finding the Evidence

Evidence sources, including research literature, professional practice guidelines, clinical guidelines from other hospitals, and patient preferences, were
reviewed to make decisions about policy revisions. In collaboration with a medical librarian, the CINAHRL, PubMed, and Scopus databases were searched. The search terms included, but were not limited to, blood product transfusion reactions, vital sign monitoring, frequencies, blood transfusions, administration, nursing, measurement, safety, and adverse reactions. Fifteen articles were retrieved for review, of which 10 were applicable. Four of the 10 articles were blood administration guidelines. Transfusion medicine PACT members also reviewed AABB (2014) Standards for Blood Banks and Transfusion Services documentation guidelines, College of American Pathologists requirements, and FDA guidelines. Area hospitals and other NCI-designated cancer centers were contacted to determine their institutional vital sign procedures during transfusions.

Critique of the Evidence

The evidence contained primarily organizational and institutional clinical practice guidelines, in addition to retrospective cohort studies of patients receiving transfusions. The evidence was ranked using the hierarchy outlined by O’Mathúna and Fineout-Overholt (2015). No systematic reviews or single randomized, controlled trials explored the efficacy of a particular frequency of vital sign monitoring to enhance early identification of reaction during transfusion. Although the evidence largely consisted of what is described as level IV (uncontrolled cohort studies) and level VI (expert opinion) evidence, these sources were supplemented by the clinical experience of colleagues at other hospitals, including NCI-designated cancer centers with similar patient populations. Therefore, the evidence was felt to be reliable in informing a practice change at this institution.

Summary of the Evidence

The articles are summarized in Tables 1 and 2. Several clinical practice standards provided compelling evidence for suggested vital sign monitoring frequency. The United Kingdom blood transfusion services states that vital signs are to be recorded at baseline before starting the transfusion, 15 minutes after the initiation of transfusion, and at transfusion completion (Norfolk, 2013). Similarly, the Joint Commission (2011) recommends that vital signs must be recorded before the transfusion, within 15 minutes of initiation of the transfusion, and within one hour of transfusion completion. The New York State Department of Health (2012) recommends taking vital signs shortly before the transfusion begins, 15 minutes after the initiation of transfusion, and at transfusion completion, and that a patient should be observed frequently during the transfusion, particularly during the first 10–15 minutes. Although not as specific, the AABB (2014) Standards for Blood Banks and Transfusion Services support taking pre- and post-transfusion vital signs. The transfusion checklist from the College of American Pathologists (2011) advocates monitoring patients before, during, and after the transfusion, as well as upon observation of any adverse effects.

The recommendations of these clinical practice guidelines are echoed by practice at individual institutions. The Cleveland Clinic (2014) requires vital sign monitoring before, 15 minutes after initiation, and at completion of transfusion. This was also the stated practice of three of the seven hospitals contacted by PACT members. The other four hospitals documented vital signs more frequently during transfusions, specifically, within 30 minutes prior to the start of transfusion, 15 minutes after transfusion initiation, every hour until transfusion completion, and within 30 minutes of transfusion completion.

The articles reviewed provided similar evidence for vital sign monitoring frequency. A continuing education article about transfusion in nursing practice recommend taking vital signs before blood administration, 15 minutes after transfusion initiation, and at transfusion completion (Watson & Hearnshaw, 2010). A national audit of bedside transfusion practices supported monitoring the transfused patient within 60 minutes before the start of the transfusion, 15 minutes after the start of the transfusion, and within 60 minutes of completion of the transfusion (Cottrell & Davidson, 2013). In a retrospective observational cohort study monitoring vital signs during transfusions and transfusion-associated circulatory overload, vital signs were monitored at 15 minutes after the transfusion started and at completion (Andrzejewski et al., 2012). A study on transfusion for chemotherapy-induced anemia noted that the lapse between pre- and post-transfusion vital signs was four hours (Corey-Lisle et al., 2014). Two studies included frequencies for monitoring that did not provide specific time frames (Gammon, Waters, Watt, Loeb, & Donini-Lenhoff, 2011), of which one (Anyagbua, 2011) emphasized the importance of documenting pre-transfusion vital signs and monitoring and documenting recipient vital signs, as well as any adverse reaction during and after the transfusion.

Although no controlled trials exist to show that a particular frequency of monitoring is most effective at detecting adverse events during transfusion, the evidence suggests that more frequent monitoring is not necessarily more effective in detecting transfusion reactions, particularly if not accompanied by thorough physiologic assessment for signs and symptoms of transfusion reaction (Gordon-Smith, 2008). The evidence found in the literature, as well as transfusion reaction data gathered from the institution in 2012 and 2014, justified modification of vital sign monitoring frequency (see Figure 1). Ensuring that patients and families are provided with education and engaged as partners in identification of signs and symptoms of transfusion reaction is imperative to early identification and management of reactions.
Implications for Practice and Conclusion

Although the evidence does not exclusively or conclusively indicate a preferred frequency of vital sign monitoring to detect adverse events during transfusion, it suggests that monitoring at three time points (i.e., at baseline, within 15 minutes of transfusion initiation, and at transfusion completion) may be effective in identifying signs and symptoms of transfusion reaction. The evidence supports an integrative approach of vital sign monitoring, as well as a thorough physiologic assessment by the nurse and patient to promote the early identification and management of transfusion reactions. At the authors’ institution, the evidence resulted in a policy revision to the Blood Component Administration and Transfusion Reaction Policy, which was amended in April 2015. This practice change contributes to efficiency of practice and enhanced patient satisfaction, and it sustains patient safety and quality outcomes. This initiative highlights the importance of engaging patients and caregivers as active participants in monitoring treatment outcomes.

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References


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