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Nursing Strategies for Improving Patient Safety During Blood Transfusion Administration

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ABSTRACT: Patient safety during blood transfusion depends heavily on rigorous nursing practices that begin well before the blood product ever reaches the bedside. The cornerstone is strict adherence to patient identification and verification protocols: confirming the patient's identity using two independent identifiers, matching the blood

unit to the patient's records, and verifying blood type, crossmatch compatibility, and expiration date at the bedside with a second qualified staff member. Proper informed consent, thorough pre-transfusion assessment of vital signs and baseline status, and accurate documentation establish a safety foundation that reduces the risk of error. Nurses must also screen for potential transfusion reactions by reviewing the patient's history of prior reactions and allergies, ensuring the appropriate product is selected, and clearly communicating any concerns to the prescribing provider before administration begins.

During and after administration, vigilant monitoring and rapid response are essential to preventing harm. Nurses should initiate transfusions slowly during the first 15 minutes—when most acute reactions occur—and observe the patient closely for signs of febrile, allergic, hemolytic, or circulatory overload reactions such as fever, chills, rash, dyspnea, or changes in vital signs. Vital signs should be monitored at regular intervals according to protocol, and the patient should be educated to report any new symptoms immediately. If a reaction is suspected, the transfusion must be stopped at once, the line kept patent with normal saline, the provider notified, and appropriate specimens and documentation completed. Additionally, nurses play a critical role in preventing transfusion-associated circulatory overload (TACO) through careful fluid balance assessment, proper transfusion rates for at-risk patients, and ongoing evaluation of respiratory status. Together, these strategies—meticulous verification, vigilant monitoring, and prompt intervention—form an integrated approach that safeguards patients throughout the transfusion process

INTRODUCTION

Blood transfusion is one of the most frequently performed high-risk clinical procedures in modern healthcare, and it remains indispensable for correcting symptomatic anaemia, replenishing coagulation factors, and sustaining patients through acute haemorrhage or intensive chemotherapy [1]. The nursing role spans the entire transfusion chain, from pre-transfusion sampling and bedside verification to initiation, monitoring, recognition of adverse reactions, documentation, and patient education [2]. Even well-designed protocols depend on education and consistent protocol compliance, because the safety of transfusion is determined less by the existence of rules than by whether those rules are reliably enacted at the bedside [3]. Structured checklists and standardised transfusion documentation are therefore central to nursing strategy, since they make critical steps visible, auditable, and less dependent on memory [4]. Clinical guidance such as the Using Blood Wisely recommendations reinforces the importance of appropriate indication, single-unit transfusion where possible, and careful patient selection, all of which require nursing participation in decision support and monitoring [5]. Haemovigilance reports further show that serious transfusion incidents often involve workload pressure, delegation to staff who do not know the patient, and abbreviated verification, which underlines the need for system-level nursing safeguards rather than individual vigilance alone [6].

The Pre-Transfusion Phase: Establishing the Conditions for Safety

The pre-transfusion phase is where the majority of catastrophic errors originate, and it is therefore where nursing vigilance must begin. Wrong blood in tube events, in which the sample is drawn from or labelled for the wrong patient, remain a leading cause of ABO-incompatible transfusion, and procedure documents for ABO-incompatibility prevention emphasise strict patient identification, bedside labelling, and independent verification at every transfer point [7]. Nursing care of patients with haematological alterations requires particular attention to the risks of anaemia, thrombocytopenia, coagulation disturbance, and infection, all of which shape the decision to transfuse and the monitoring required afterwards [8]. The pre-transfusion assessment must therefore be understood not as a single check but as a sequence of clinical judgements that begin before the blood component is requested and continue until the unit is safely completed.

Informed consent and patient education form a core pre-transfusion pillar. Valid consent requires that the patient understand the purpose of the transfusion, its benefits, its risks, and the alternatives, and that this discussion be documented in the medical record [9]. Nurses frequently encounter patients at the point of care who have not fully absorbed the consent conversation, and they have a responsibility to check that consent is present and valid before proceeding, as well as to reinforce teaching about the signs and symptoms that should be reported during and after the transfusion [9]. Educating the patient to report chills,

itching, dyspnoea, chest pain, or unusual sensations is not a courtesy; it recruits the patient as an additional monitor and can shorten the interval between the onset of a reaction and the nurse's response [9].

Positive patient identification is the most consequential nursing action in the pre-transfusion phase. Safe practice requires that the patient be asked to state their full name and date of birth rather than being prompted with a yes-or-no question, because a confused or cognitively impaired patient may simply agree to an incorrect identity. The sample tube must be labelled at the bedside, immediately after the blood is drawn, and never pre-labelled or labelled away from the patient. Only one patient should be bled at a time, and the staff member who performs the venepuncture must be the person who applies the label, using barcode or electronic labelling systems where available [10]. These measures are not bureaucratic formalities; they are the procedural embodiment of the principle that the blood in the tube must be provably linked to the patient from whom it was taken [10].

Verification of the medical prescription and the blood component itself constitutes a further pre-transfusion safeguard. The nurse must confirm that the order specifies the correct component, dose, rate, and any special requirements such as irradiation, washing, or CMV-negative status. The blood bag must be inspected for clots, discolouration, leaks, or an expired date, and the compatibility label must be checked against the patient's identifiers and the unit's donation number. Electronic pre-transfusion check systems at the bedside can add a further layer of protection by requiring scanning of the patient's wristband and the blood unit before release of the infusion, although such systems must be configured and used consistently to be effective [11]. Practical nursing guides reinforce that bedside verification should be performed by two qualified individuals, at least one of whom is a registered nurse or physician, and that the check must involve visual and verbal confirmation of the patient's identity, the unit number, the ABO and Rh group of both patient and unit, and the expiry date and time [12].

Table 1. Core Elements of the Pre-Transfusion Nursing Safety Checklist

Domain	Required nursing action	Safety rationale
Patient identification	Ask patient to state full name and date of birth; match to wristband; label sample at bedside [10]	Prevents wrong-blood-in-tube and misidentification errors
Consent and education	Confirm valid documented consent; explain reaction symptoms to report [9]	Supports autonomous decision-making and early reaction detection
Prescription and component	Verify component, dose, rate, special requirements; inspect bag [7]	Ensures correct product and excludes visibly unsuitable units
Bedside verification	Perform two-person check of patient, unit, group, expiry, and compatibility label [12]	Creates a final defence before infusion begins

The Intra-Transfusion Phase: Verification, Initiation, and Close Monitoring

At the patient's bedside, the decisive safety act is the formal verification of the patient and the blood component immediately before the transfusion is started. International guidance is consistent that this check should be performed by two qualified individuals, at least one of whom is a registered nurse or physician, and that it must involve visual and verbal confirmation of the patient's identity, the unit number, the ABO and Rh group of both patient and unit, and the expiry date and time [10][11][12]. Barcode-based electronic verification systems add a further layer of protection: the nurse scans their own identification badge, the patient's wristband, and the blood component, and the system blocks the infusion if the data do not match [11]. Where such technology is available, it should be regarded as an adjunct to, rather than a replacement for, the verbal and visual check, because technology can fail or be bypassed. The bedside check must not be interrupted, and it must not be delegated to someone who does not know the patient or who is not trained in the procedure [12].

Once the infusion begins, the first fifteen minutes constitute the period of greatest danger. Most acute haemolytic and severe febrile reactions manifest within this window, and the nurse must therefore remain with the patient, initiate the transfusion slowly, and monitor closely. Simulation-based education has been shown to improve both technical and non-technical transfusion competencies, including communication, decision-making, and safety performance, and it reinforces the behaviours required during this critical early period [13]. Structured online education can also enhance nurses' self-efficacy in safe

transfusion, particularly when it is tailored to the clinical context and repeated regularly [14]. These educational approaches matter because the first fifteen minutes require not only knowledge of protocol but also the confidence to stop the transfusion, escalate concerns, and act decisively when a patient's condition changes [14].

Infusion rate and volume require active nursing judgement throughout the transfusion. A unit of blood should be completed within four hours of leaving controlled storage, and administration sets should be changed according to policy to reduce bacterial contamination risk. For patients at risk of circulatory overload, single-unit transfusion, weight-adjusted dosing, slower rates, and close attention to fluid balance are the principal nursing countermeasures, and prophylactic diuretics may be considered where prescribed [15]. Transfusion-associated circulatory overload has become one of the most common causes of transfusion-related death and is strongly associated with avoidable practice patterns such as multi-unit transfusion and excessive infusion rates in vulnerable patients [15]. National patient safety guidance therefore emphasises risk assessment, slower infusion, and careful monitoring of patients with cardiac or renal impairment, and nursing documentation should reflect these considerations [16]. Only 0.9% sodium chloride should be used as the primary solution for transfusion, because dextrose-containing solutions cause red cell haemolysis and lactated Ringer's contains calcium that can precipitate with citrate anticoagulant in the blood component [12]. The nurse must also monitor the intravenous access site for infiltration, phlebitis, or dislodgement, since these complications can interrupt therapy and cause local injury [12].

Table 2. Suggested Monitoring Schedule During Blood Transfusion

Time point	Vital signs and observations	Additional nursing actions
Within 30 minutes before start	Temperature, pulse, blood pressure, respiratory rate, oxygen saturation, lung sounds, fluid status	Confirm consent, verify unit and patient, inspect bag [9][10][12]
First 15 minutes	Remain with patient; observe for chills, rash, dyspnoea, pain; repeat vital signs at 15 minutes	Start slowly; do not leave patient unattended [13]
Hourly thereafter	Temperature, pulse, blood pressure, respiratory rate, oxygen saturation	Assess urine output and fluid balance where relevant; inspect IV site [15][16]
At completion	Full vital signs; clinical assessment of response	Document volume infused, patient tolerance, and any adverse events [16]
Post-transfusion	Monitor for delayed reactions, especially in patients discharged or in day-care settings	Provide written and verbal instructions on symptoms requiring urgent review [25]

Documentation, Audit, and Hemovigilance as Nursing Safeguards

The post-transfusion phase also encompasses documentation and surveillance that extend beyond the immediate infusion period. The nurse must record the start and end times, the volume and type of component, the patient's response, and all vital signs and observations in a manner that allows retrospective audit and, where necessary, investigation of an adverse event. Haemovigilance depends on the nursing role in identification, management, and prevention of adverse transfusion events, because nurses are usually the first professionals to observe a reaction and the ones who document the clinical sequence that follows [17]. Clinical audit of transfusion safety has demonstrated measurable improvements in documentation of the fifteen-minute observation period, completeness of request forms, and adherence to monitoring protocols following targeted interventions [18]. Bedside audits of blood administration can evaluate whether two-person verification, patient identification, and vital signs monitoring are actually being performed as intended, rather than merely being known about [19]. Documentation quality is itself a safety issue: audits of blood transfusion request forms have shown that incomplete or inaccurate documentation can delay component selection and obscure accountability [20]. Electronic medical records and computerised provider order entry can reduce some documentation errors, but they also introduce new risks if users bypass alerts, copy forward outdated information, or assume that the electronic record guarantees patient identity [21]. The nurse's role in this cycle is both as a subject of audit and as a participant in interpreting findings and designing remedies [21].

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Recognition and Management of Transfusion Reactions

Despite every precaution, reactions occur, and the nurse's ability to recognise and respond promptly is a decisive determinant of outcome. When a reaction is suspected, the first action is to stop the transfusion immediately and maintain venous access with normal saline through new tubing, so that no further blood in the existing line can enter the circulation. The patient must be reassessed rapidly, vital signs obtained, and the blood bank and responsible physician notified without delay. The unit and administration set should be retained and sent for investigation, together with repeat blood samples and, where indicated, a urine sample for haemoglobinuria. Clinical guidance on adverse transfusion reactions emphasises that the differential diagnosis includes acute haemolytic, febrile non-haemolytic, allergic, anaphylactic, septic, and circulatory overload reactions, each of which requires a distinct but overlapping nursing response [22]. Reaction recognition tools and transfusion guidelines reinforce that the nurse should re-verify the patient's identity and the compatibility label at this point, because misidentification remains a possible cause even after a bedside check [23].

Table 3. Common Transfusion Reactions and Immediate Nursing Actions

Reaction type	Typical onset and features	Immediate nursing actions
Acute haemolytic	Early, often within minutes; fever, chills, back pain, hypotension, dark urine	Stop transfusion; maintain IV access with normal saline via new tubing; notify blood bank and physician; send unit and samples for investigation [22]
Febrile non-haemolytic	During or shortly after transfusion; rigors, temperature rise	Stop or slow transfusion; assess for haemolysis; administer antipyretics as prescribed; report according to policy [23]
Allergic	Itching, urticaria, flushing; may progress to anaphylaxis	Stop transfusion for severe symptoms; administer antihistamine or adrenaline as prescribed; monitor airway [22]
Transfusion-associated circulatory overload	Dyspnoea, orthopnoea, hypertension, pulmonary oedema, falling oxygen saturation	Stop or slow transfusion; sit patient upright; administer oxygen and diuretics as prescribed; monitor fluid balance [15][16]

Clinical management thereafter depends on the type of reaction: acute haemolytic reactions require aggressive fluid resuscitation, maintenance of renal perfusion, and treatment of hypotension; allergic reactions may require antihistamines and corticosteroids; and transfusion-associated circulatory overload requires oxygen, diuretics, and cessation or slowing of the infusion [22]. The nurse must also communicate clearly with the patient and family during a reaction, because fear and uncertainty can worsen symptoms and because the patient's subjective experience is itself a source of clinical information [23]. After the immediate crisis, the nurse should document the timeline of the reaction, the interventions performed, the patient's response, and the specimens and units sent for investigation, since this record underpins both clinical follow-up and system learning [23].

Post-Transfusion Patient Education and Discharge Surveillance

Delayed reactions, including allergic reactions and haemolytic reactions, may occur hours or even days after the transfusion, and patients discharged before the twenty-four-hour observation window has elapsed must receive clear written and verbal instructions about when to seek urgent care. Patient information and shared decision-making resources emphasise that patients should know the reason for the transfusion, the symptoms that warrant urgent review, and the contact route for advice after discharge [24]. Discharge guidance for blood transfusion should therefore include specific symptoms such as fever, chills, rash, itching, jaundice, dark urine, breathlessness, and chest pain, together with clear instructions about whom to contact and when to seek emergency care [25]. The nurse should confirm that the patient or carer can restate these instructions and should document that teaching has been provided. This final educational step closes the loop between hospital-based transfusion safety and community-based surveillance, and it recognises that the transfusion episode does not end when the infusion is completed.

Systemic and Educational Strategies for Sustaining Safe Practice

Individual vigilance, however exemplary, cannot by itself sustain safety across an organisation. Nursing strategies must therefore extend to the systems that shape practice. Structured checklists are among the most practical of these tools. A transfusion checklist that spans the pre-transfusion, intra-transfusion, and post-transfusion phases forces the nurse to document each critical step and creates a visible record that can be audited [4]. The use of a bedside checklist has been repeatedly recommended by haemovigilance bodies as a defence against skipped or abbreviated verification, and checklist completion is associated with improved compliance with monitoring requirements [6]. Electronic transfusion management systems that integrate barcode scanning, patient identification, and documentation can further reduce reliance on memory and manual entry, although their effectiveness depends on correct configuration and consistent use [11][21].

Education and training are the foundation on which all other strategies rest. Nurses' transfusion knowledge and adherence to protocol are variable, and traditional one-off training often fails to produce durable changes in practice. Targeted, in-depth team huddle training has been shown to raise transfusion knowledge substantially and to improve compliance with vital signs documentation, particularly hourly temperature checks [3]. Simulation-based education, including hybrid simulation that combines standardised patients with high-fidelity manikins, improves both technical and non-technical competencies, with safety performance scores rising after training and skills transferring to the clinical environment [13]. Structured online training can also enhance nurses' self-efficacy in safe transfusion, particularly when it is tailored to the clinical context and repeated regularly [14]. What these approaches share is an emphasis on active practice and reinforcement rather than passive instruction, and on the recognition that transfusion safety depends as much on communication, teamwork, and decision-making as on technical knowledge.

Audit and feedback close the loop between education and everyday practice. Clinical audits of transfusion safety have demonstrated measurable improvements in documentation of the fifteen-minute observation period, completeness of request forms, and adherence to monitoring protocols following targeted interventions [18]. Bedside audits of blood administration can evaluate whether two-person verification, patient identification, and vital signs monitoring are actually being performed as intended, rather than merely being known about [19]. When audit findings are fed back to teams and linked to further training, they become a mechanism for continuous improvement rather than a retrospective judgement. Hemovigilance systems depend on the same logic: the reporting of errors and near misses, including near misses that were intercepted before reaching the patient, generates the data from which safer systems are built [17]. The nurse's participation in reporting, audit, and education is therefore not an additional burden but an integral part of professional transfusion practice.

CONCLUSION

The safety of a patient receiving a blood transfusion is not secured by a single dramatic intervention but by the accumulation of disciplined nursing actions performed reliably at every stage of the transfusion chain. Positive patient identification, valid consent, meticulous prescription and component verification, formal two-person bedside checking, slow initiation with close observation during the first fifteen minutes, vigilant monitoring thereafter, prompt recognition of reactions, accurate documentation, and effective patient education together form a coherent safety architecture. These actions are most effective when they are embedded in a system that provides checklists, electronic verification tools, ongoing education, simulation, audit, and a functioning hemovigilance programme. Nurses are the professionals who translate policy into practice at the bedside, and the quality of their preparation and the strength of the systems that support them determine whether a transfusion saves a li fe or causes preventable harm. Investing in nursing strategies for transfusion safety is therefore not an adjunct to quality care; it is a direct and necessary expression of it.

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