

Blood Ordering Pathway v7.0: Table of Contents



Inclusion Criteria

- Blood Ordered.

Exclusion Criteria

- None.

Blood Ordering Care

Place Orders

Pre-Admit for Surgery

Transfusion Reaction

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Bibliography

Blood Ordering Pathway v7.0: Place Orders

Stop and Review

Inclusion Criteria

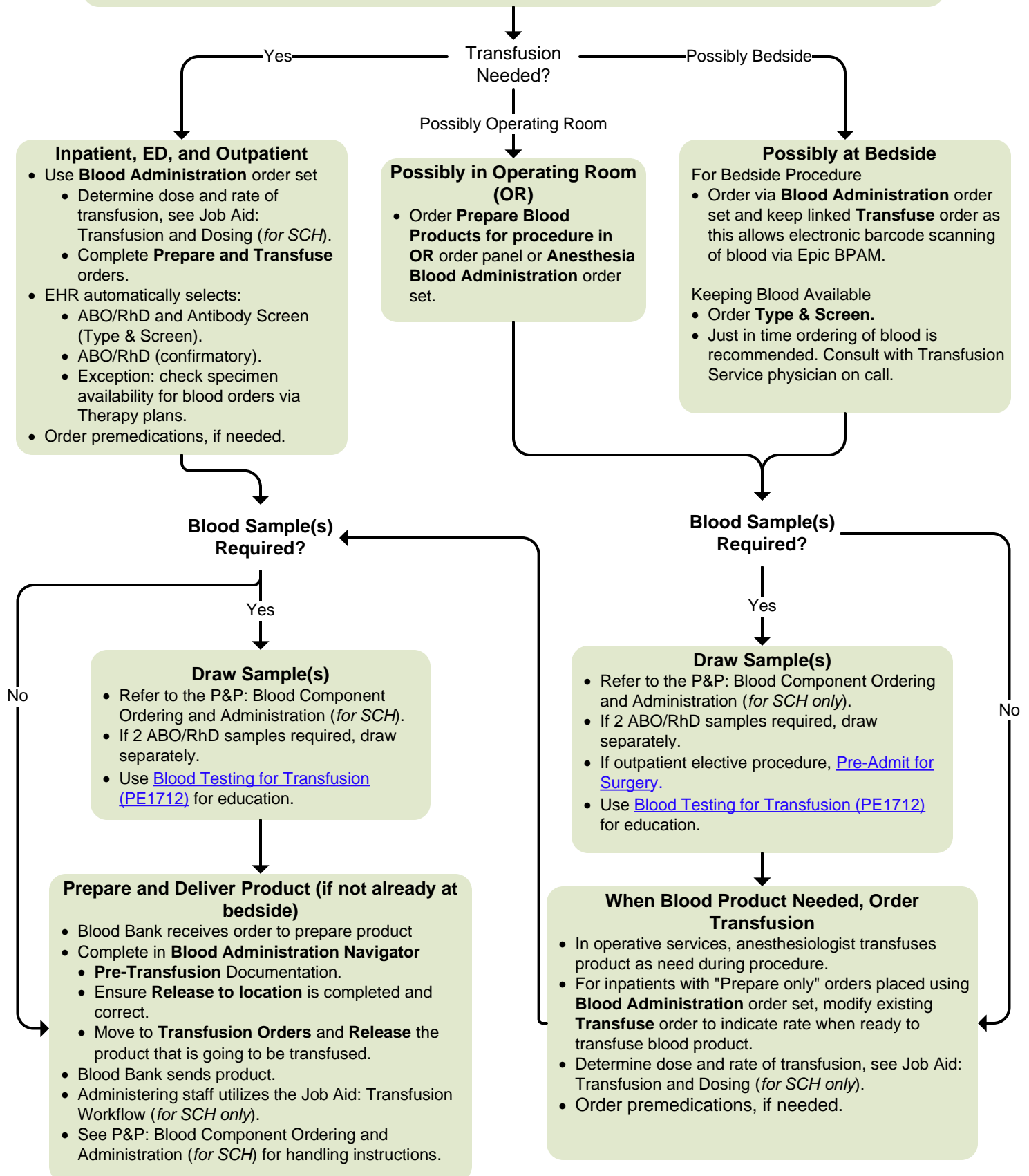
- Blood ordered.

Exclusion Criteria

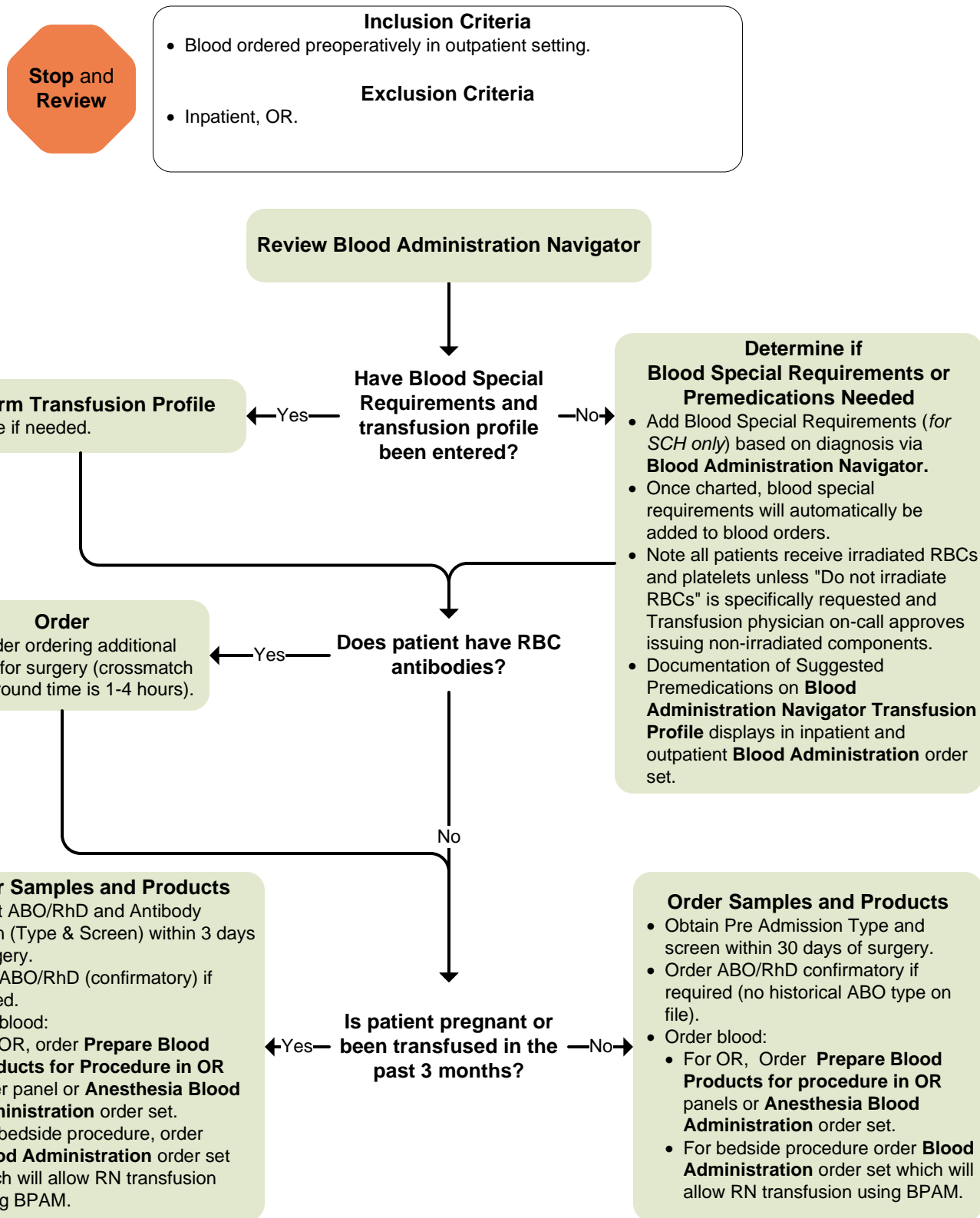
- [Outpatient preadmission for surgery \(see next phase\)](#).

Update Blood Special Requirements and Transfusion Profile

- Add Blood Special Requirements (*for SCH only*) based on diagnosis via **Blood Administration Navigator**.
- Once charted, blood special requirements will automatically be added to blood orders.
- Note all patients receive irradiated RBCs and platelets unless "Do not irradiate RBCs" is specifically requested and Transfusion physician on-call approves issuing non-irradiated components.
- Documentation of Suggested Premedications on **Blood Administration Navigator Transfusion Profile** displays in inpatient and outpatient **Blood Administration** order sets.



Blood Ordering Pathway v7.0: Pre-Admit for Surgery



Blood Ordering Pathway v7.0: Transfusion Reaction

Stop and Review

Inclusion Criteria

- Blood transfusion in process or completed.

Exclusion Criteria

- None.

For reactions, symptoms, and intervention, go to Job Aid: Transfusion Reaction Decision Tree (*for SCH only*).

For questions regarding transfusion diagnosis or management, call the Transfusion service for the Transfusion Service physician on call, available 24/7.

Immediate Actions

- STOP TRANSFUSION IMMEDIATELY (do not discard).
- Keep IV line open.
- Stay with and assess patient.
- Ask for help if needed.
- Repeat patient/component ID check.
- Call provider to assess patient.
- Document vital signs every 5-10 minutes and actions taken.

Report

- Order **Transfusion Reaction Workup** in EHR and add to **Problem List** if not previously documented.
- Report fatalities, unanticipated reactions, [serious complications](#), or [suspected disease transmission](#) possibly related to transfusion of blood or blood components to the Transfusion Service physician on-call as soon as possible.
- Transfusion Service physician reviews all reported reactions.
- Transfusion service notifies blood supplier and FDA when required.

Definitions

Serious Complications:

- Hemolytic transfusion reaction
- Bacterial contamination
- Transfusion-related acute lung injury
- Transfusion-associated graft versus host disease
- Post-transfusion purpura

Suspected disease transmission (transfusion-transmitted infection) may include:

- Bacterial contamination
- Hepatitis A, B, or C
- Chagas Disease
- HTLV-1 and HTLV-2
- Syphilis
- West Nile Virus
- Human Immunodeficiency Virus (HIV)

[Return to Place Orders](#)

[Return to Transfusion Reaction](#)

Summary of Version Changes

- **Version 1.0 (2/11/2015):** Go live.
- **Version 2.0 (5/27/2015):** Fixed box errors in Preadmit phase.
- **Version 3.0 (7/29/2015):** Implemented electronic process to request and verify receipt of blood products.
- **Version 4.0 (6/28/2016):** Updated dosing guidance for blood products.
- **Version 4.1 (3/11/2019):** Removed erroneous “to bibliography” button.
- **Version 5.0 (10/3/2020):** Updated algorithm to align with Epic.
- **Version 6.0 (4/1/2021):** Updated the Blood Special Requirements page in response to new platelet products being received from the American Red Cross and Bloodworks NW.
- **Version 7.0 (4/29/2022):** Periodic review go live with new formatting style and no changes to recommendations. Removed Blood Special Requirements page.

Approval & Citation

Approved by the CSW Blood Ordering Pathway team for April 29, 2022, go-live

CSW Blood Ordering Pathway Team:

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Retrieval Website: <https://www.seattlechildrens.org/pdf/blood-ordering-pathway.pdf>

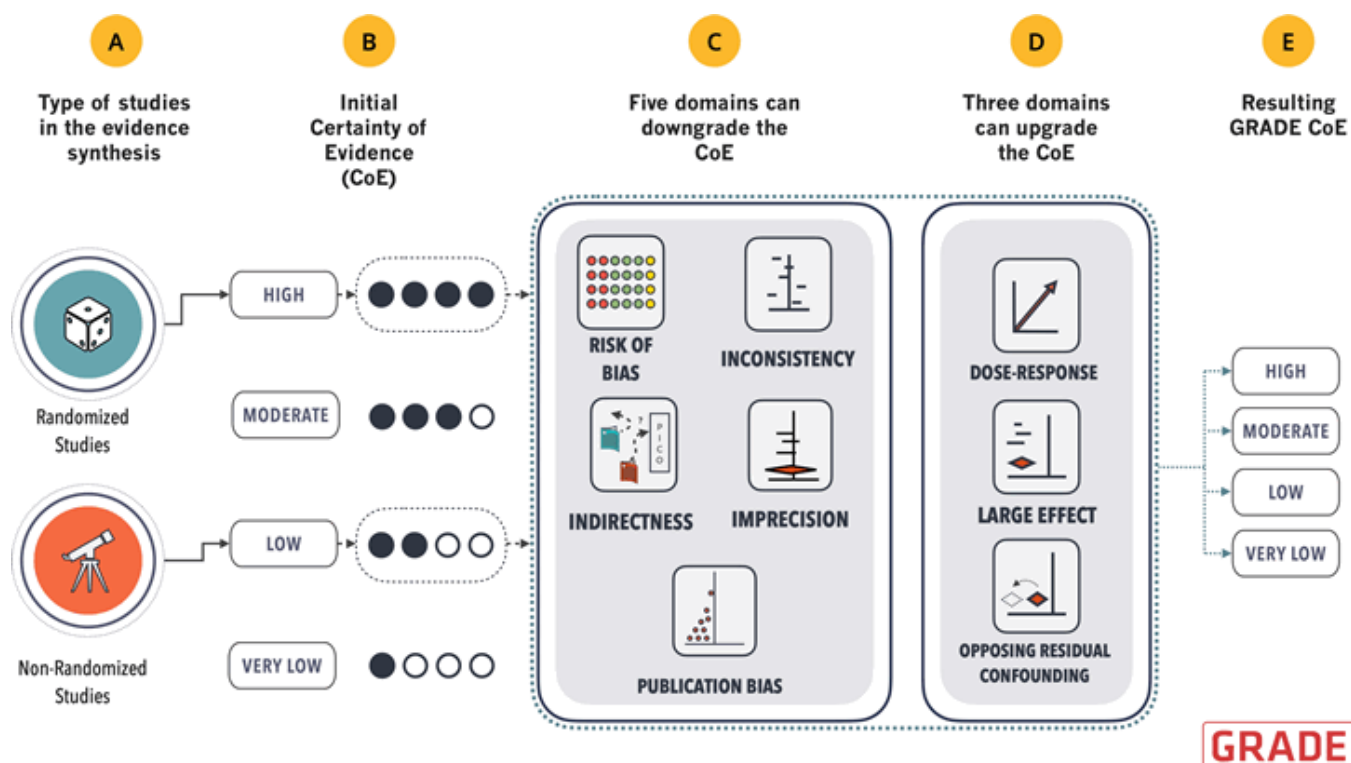
Please cite as:

Seattle Children's Hospital, Huq Saifee, N., Heissenbuttel, A., Burns, B., Groshong, S., Hoffer, D., Hrachovec, J., Lorenzo, K., Migita, D. 2022 April. Blood Ordering Pathway. Available from: <https://www.seattlechildrens.org/pdf/blood-ordering-pathway.pdf>

Evidence Ratings

This pathway was developed through local consensus based on published evidence and expert opinion as part of Clinical Standard Work at Seattle Children's. Pathway teams include representatives from Medical, Subspecialty, and/or Surgical Services, Nursing, Pharmacy, Clinical Effectiveness, and other services as appropriate.

When possible, we used the GRADE method of rating evidence quality. Evidence is first assessed as to whether it is from randomized trial or cohort studies. The rating is then adjusted in the following manner (from: Guyatt G et al. J Clin Epidemiol. 2011;4:383-94, Hultcrantz M et al. J Clin Epidemiol. 2017;87:4-13, Klugar et al. J Clin Epidemiol. 2021 Nov 11;S0895-4356(21)00361-9.):



Source: Carlos Cuello

Certainty of Evidence

- ★★★★ High certainty: The authors have a lot of confidence that the true effect is similar to the estimated effect
 - ★★★● Moderate certainty: The authors believe that the true effect is probably close to the estimated effect
 - ★★●● Low certainty: The true effect might be markedly different from the estimated effect
 - ★●●● Very low certainty: The true effect is probably markedly different from the estimated effect
- Guideline: Recommendation is from a published guideline that used methodology deemed acceptable by the team
 Expert Opinion: Based on available evidence that does not meet GRADE criteria (for example, case-control studies)

Deductions labeled 1=risk bias, 2=indirectness, 3=imprecision, 4=inconsistency, 5=publication bias

Bibliography

Literature Search Methods

For this update, we revised the search strategies in line with current Library practices. A literature search was conducted in September 2020 to target synthesized literature on patient blood management, blood specimen collection, blood administration, blood transfusion and blood safety for 2015 to current and limited to English and humans. The search was executed in Ovid Medline, Embase, Cochrane Database of Systematic Review (CDSR), and Turning Research into Practice database (TRIP).

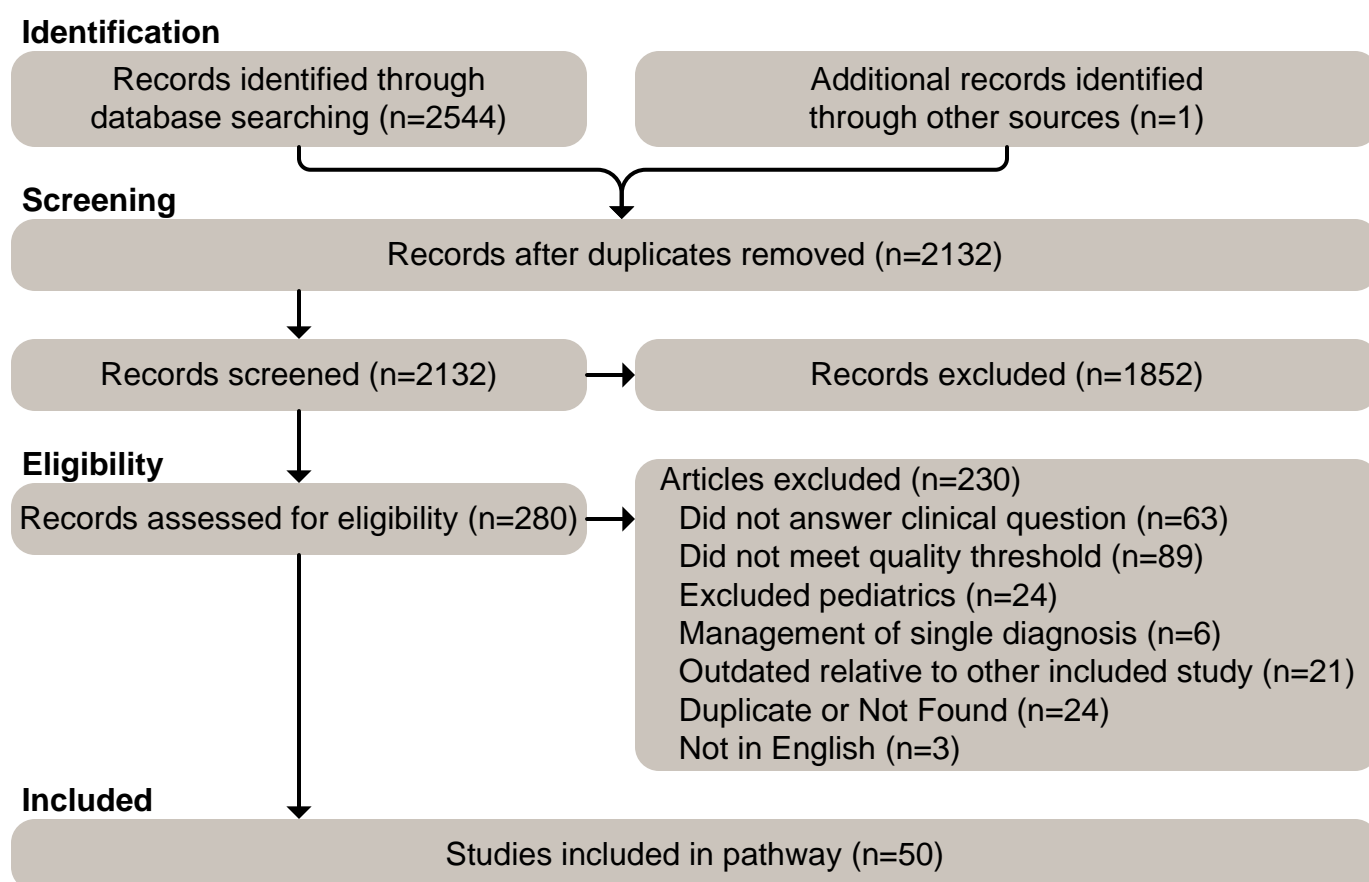
Screening and data extraction were completed using DistillerSR (Evidence Partners, Ottawa, Canada). Two reviewers independently screened abstracts and included guidelines and systematic reviews that addressed blood management, specimen collection, administration, transfusion, and safety. One reviewer screened full text and extracted data and a second reviewer quality checked the results. Differences were resolved by consensus.

Literature Search Results

The searches of the 4 databases (see Electronic searches) retrieved 2544 records. Our searches of other resources (known guidelines) identified 1 additional study that appeared to meet the inclusion criteria.

Once duplicates had been removed, we had a total of 2132 records. We excluded 1852 records based on titles and abstracts. We obtained the full text of the remaining 280 records and excluded 230.

We included 50 studies. The flow diagram summarizes the study selection process.



Flow diagram adapted from Moher D et al. BMJ 2009;339:bmj.b2535

Bibliography

Included Studies

- Alvikas, J., Myers, S. P., Wessel, C. B., Okonkwo, D. O., Joseph, B., Pelaez, C., . . . Neal, M. D. (2020). A systematic review and meta-analysis of traumatic intracranial hemorrhage in patients taking prehospital antiplatelet therapy: Is there a role for platelet transfusions? *The Journal of Trauma and Acute Care Surgery*, 88(6), 847-854. doi:<https://dx.doi.org/10.1097/TA.0000000000002640>
- American Society of Anesthesiologists Task Force on Perioperative Blood, M. (2015). Practice guidelines for perioperative blood management: an updated report by the American Society of Anesthesiologists Task Force on Perioperative Blood Management. *Anesthesiology*, 122(2), 241-275. doi:<https://dx.doi.org/10.1097/ALN.0000000000000463>
- Bemba, M. M., Cheifetz, I. M., Fortenberry, J. D., Bunchman, T. E., Valentine, S. L., Bateman, S. T., . . . Sepsis Investigators, N. (2018). Recommendations on the Indications for RBC Transfusion for the Critically Ill Child Receiving Support From Extracorporeal Membrane Oxygenation, Ventricular Assist, and Renal Replacement Therapy Devices From the Pediatric Critical Care Transfusion and Anemia Expertise Initiative. *Pediatric Critical Care Medicine*, 19(9S Suppl 1), S157-S162. doi:<https://dx.doi.org/10.1097/PCC.0000000000001600>
- Bemba, M. M., Valentine, S. L., Bateman, S. T., Wilson, L. M., Anton, B., Harger, N., . . . Sepsis Investigators, N. (2018). The Pediatric Critical Care Transfusion and Anemia Expertise Initiative Consensus Conference Methodology. *Pediatric Critical Care Medicine*, 19(9S Suppl 1), S93-S97. doi:<https://dx.doi.org/10.1097/PCC.0000000000001593>
- Blood transfusion. (2015). National Institute for Health and Clinical Excellence - Clinical Guidelines.
- Broggi, E., Corbella, D., Coccolini, F., Gamberini, E., Russo, E., Agnoletti, V., & Forfori, F. (2020). The Role of Platelet Transfusions After Intracranial Hemorrhage in Patients on Antiplatelet Agents: A Systematic Review and Meta-Analysis. *World Neurosurgery*, 141, 455-466.e413. doi:<https://dx.doi.org/10.1016/j.wneu.2020.03.216>
- Brunskill, S. J., Wilkinson, K. L., Doree, C., Trivella, M., & Stanworth, S. (2015). Transfusion of fresher versus older red blood cells for all conditions. *Cochrane Database of Systematic Reviews*(5), CD010801. doi:<https://dx.doi.org/10.1002/14651858.CD010801.pub2>
- Cannon, J. W., Khan, M. A., Raja, A. S., Cohen, M. J., Como, J. J., Cotton, B. A., . . . Duchesne, J. C. (2017). Damage control resuscitation in patients with severe traumatic hemorrhage: A practice management guideline from the Eastern Association for the Surgery of Trauma. *The Journal of Trauma and Acute Care Surgery*, 82(3), 605-617. doi:<https://dx.doi.org/10.1097/TA.0000000000001333>
- Cholette, J. M., Willems, A., Valentine, S. L., Bateman, S. T., Schwartz, S. M., Pediatric Critical Care, T., . . . Sepsis Investigators, N. (2018). Recommendations on RBC Transfusion in Infants and Children With Acquired and Congenital Heart Disease From the Pediatric Critical Care Transfusion and Anemia Expertise Initiative. *Pediatric Critical Care Medicine*, 19(9S Suppl 1), S137-S148. doi:<https://dx.doi.org/10.1097/PCC.0000000000001603>
- Chou, S. T., Alsawas, M., Fasano, R. M., Field, J. J., Hendrickson, J. E., Howard, J., . . . Akl, E. A. (2020). American Society of Hematology 2020 guidelines for sickle cell disease: transfusion support. *Blood advances*, 4(2), 327-355. doi:<https://dx.doi.org/10.1182/bloodadvances.2019001143>
- Compernelle, V., Chou, S. T., Tanael, S., Savage, W., Howard, J., Josephson, C. D., Odame, I., Hogan, C., Denomme, G., Shehata, N., International Collaboration for Transfusion Medicine, Guidelines (2018). Red blood cell specifications for patients with hemoglobinopathies: a systematic review and guideline *Transfusion*, 58(6), 1555-1566

Bibliography

- Demaret, P., Emeriaud, G., Hassan, N. E., Kneyber, M. C. J., Valentine, S. L., Bateman, S. T., . . . Sepsis Investigators, N. (2018). Recommendations on RBC Transfusions in Critically Ill Children With Acute Respiratory Failure From the Pediatric Critical Care Transfusion and Anemia Expertise Initiative. *Pediatric Critical Care Medicine*, 19(9S Suppl 1), S114-S120. doi:<https://dx.doi.org/10.1097/PCC.0000000000001619>
- Deng, X., Wang, Y., Huang, P., Luo, J., Xiao, Y., Qiu, J., & Yang, G. (2019). Red blood cell transfusion threshold after pediatric cardiac surgery: A systematic review and meta-analysis. *Medicine*, 98(11), e14884. doi:<https://dx.doi.org/10.1097/MD.00000000000014884>
- Desborough, M. J. R., Colman, K. S., Prick, B. W., Duvokot, J. J., Sweeney, C., Odutayo, A., . . . Stanworth, S. J. (2017). Effect of restrictive versus liberal red cell transfusion strategies on haemostasis: systematic review and meta-analysis. *Thrombosis & Haemostasis*, 117(5), 889-898. doi:<https://dx.doi.org/10.1160/TH17-01-0015>
- Doctor, A., Cholette, J. M., Remy, K. E., Argent, A., Carson, J. L., Valentine, S. L., . . . Sepsis Investigators, N. (2018). Recommendations on RBC Transfusion in General Critically Ill Children Based on Hemoglobin and/or Physiologic Thresholds From the Pediatric Critical Care Transfusion and Anemia Expertise Initiative. *Pediatric Critical Care Medicine*, 19(9S Suppl 1), S98-S113. doi:<https://dx.doi.org/10.1097/PCC.0000000000001590>
- Estcourt, L. J., Malouf, R., Doree, C., Trivella, M., Hopewell, S., & Birchall, J. (2018). Prophylactic platelet transfusions prior to surgery for people with a low platelet count. *Cochrane Database of Systematic Reviews*, 9, CD012779. doi:<https://dx.doi.org/10.1002/14651858.CD012779.pub2>
- Estcourt, L. J., Malouf, R., Hopewell, S., Doree, C., & Van Veen, J. (2018). Use of platelet transfusions prior to lumbar punctures or epidural anaesthesia for the prevention of complications in people with thrombocytopenia. *Cochrane Database of Systematic Reviews*(4). doi:10.1002/14651858.CD011980.pub3
- Estcourt, L. J., Malouf, R., Trivella, M., Fergusson, D. A., Hopewell, S., & Murphy, M. F. (2017). Restrictive versus liberal red blood cell transfusion strategies for people with haematological malignancies treated with intensive chemotherapy or radiotherapy, or both, with or without haematopoietic stem cell support. *Cochrane Database of Systematic Reviews*, 1, CD011305. doi:<https://dx.doi.org/10.1002/14651858.CD011305.pub2>
- Faraoni, D., Meier, J., New, H. V., Van der Linden, P. J., & Hunt, B. J. (2019). Patient Blood Management for Neonates and Children Undergoing Cardiac Surgery: 2019 NATA Guidelines. *Journal of Cardiothoracic and Vascular Anesthesia*, 33(12), 3249-3263. doi:10.1053/j.jvca.2019.03.036
- Garg, P., Pinotti, R., Lal, C. V., & Salas, A. A. (2018). Transfusion-associated necrotizing enterocolitis in preterm infants: an updated meta-analysis of observational data. *Journal of Perinatal Medicine*, 46(6), 677-685. doi:<https://dx.doi.org/10.1515/jpm-2017-0162>
- Giovacchini, F., Bensi, C., Paradiso, D., Docimo, R., & Tullio, A. (2020). Association between blood transfusions and complications in head and neck reconstruction: a systematic review and meta-analysis. *European Archives of Oto Rhino Laryngology*, 01, 01. doi:<https://dx.doi.org/10.1007/s00405-020-06286-z>
- Green, L., Bolton-Maggs, P., Beattie, C., Cardigan, R., Kallis, Y., Stanworth, S. J., . . . Zahra, S. (2018). British Society of Haematology Guidelines on the spectrum of fresh frozen plasma and cryoprecipitate products: their handling and use in various patient groups in the absence of major bleeding. *British Journal of Haematology*, 181(1), 54-67. doi:10.1111/bjh.15167
- He, Y. K., Li, H. Z., & Lu, H. D. (2019). Is blood transfusion associated with an increased risk of infection among spine surgery patients?: A meta-analysis. *Medicine*, 98(28), e16287. doi:<https://dx.doi.org/10.1097/MD.00000000000016287>

Bibliography

- Jeong, Y., Park, H., Jung, M. J., Kim, M. S., Byun, S., & Choi, Y. (2019). Comparisons of laboratory results between two blood samplings: Venipuncture versus peripheral venous catheter-A systematic review with meta-analysis. *Journal of Clinical Nursing*, 28(19-20), 3416-3429. doi:<https://dx.doi.org/10.1111/jocn.14918>
- Kapoula, G. V., Kontou, P. I., & Bagos, P. G. (2017). The impact of pneumatic tube system on routine laboratory parameters: a systematic review and meta-analysis. *Clinical Chemistry & Laboratory Medicine*, 55(12), 1834-1844. doi:<https://dx.doi.org/10.1515/cclm-2017-0008>
- Karam, O., Russell, R. T., Stricker, P., Vogel, A. M., Bateman, S. T., Valentine, S. L., . . . Sepsis Investigators, N. (2018). Recommendations on RBC Transfusion in Critically Ill Children With Nonlife-Threatening Bleeding or Hemorrhagic Shock From the Pediatric Critical Care Transfusion and Anemia Expertise Initiative. *Pediatric Critical Care Medicine*, 19(9S Suppl 1), S127-S132. doi:<https://dx.doi.org/10.1097/PCC.0000000000001605>
- Keir, A., Pal, S., Trivella, M., Lieberman, L., Callum, J., Shehata, N., & Stanworth, S. J. (2016). Adverse effects of red blood cell transfusions in neonates: a systematic review and meta-analysis. *Transfusion*, 56(11), 2773-2780. doi:<https://dx.doi.org/10.1111/trf.13785>
- Lesser, F. D., Lanham, D. A., & Davis, D. (2020). Blood sampled from existing peripheral IV cannulae yields results equivalent to venepuncture: a systematic review. *JRSM Open*, 11(5), 2054270419894817. doi:<https://dx.doi.org/10.1177/2054270419894817>
- McQuilten, Z. K., French, C. J., Nichol, A., Higgins, A., & Cooper, D. J. (2018). Effect of age of red cells for transfusion on patient outcomes: a systematic review and meta-analysis. *Transfusion Medicine Reviews*, 32(2), 77-88. doi:<https://dx.doi.org/10.1016/j.tmr.2018.02.002>
- Mueller, M. M., Van Remoortel, H., Meybohm, P., Aranko, K., Aubron, C., Burger, R., . . . Group, I. P. F. (2019). Patient Blood Management: Recommendations From the 2018 Frankfurt Consensus Conference. *JAMA*, 321(10), 983-997. doi:<https://dx.doi.org/10.1001/jama.2019.0554>
- Munoz, M., Stensballe, J., Ducloy-Bouthors, A. S., Bonnet, M. P., De Robertis, E., Fornet, I., . . . Hardy, J. F. (2019). Patient blood management in obstetrics: prevention and treatment of postpartum haemorrhage. A NATA consensus statement. *Blood Transfusion*, 17(2), 112-136. doi:<https://dx.doi.org/10.2450/2019.0245-18>
- Muszynski, J. A., Guzzetta, N. A., Hall, M. W., Macrae, D., Valentine, S. L., Bateman, S. T., . . . Sepsis Investigators, N. (2018). Recommendations on RBC Transfusions for Critically Ill Children With Nonhemorrhagic Shock From the Pediatric Critical Care Transfusion and Anemia Expertise Initiative. *Pediatric Critical Care Medicine*, 19(9S Suppl 1), S121-S126. doi:<https://dx.doi.org/10.1097/PCC.0000000000001620>
- New, H. V., Berryman, J., Bolton-Maggs, P. H., Cantwell, C., Chalmers, E. A., Davies, T., . . . Stanworth, S. J. (2016). Guidelines on transfusion for fetuses, neonates and older children. *British Journal of Haematology*, 175(5). doi:10.1111/bjh.14233
- Rahouma, M., Kamel, M., Jodeh, D., Kelley, T., Ohmes, L. B., e Biasi, A. R., . . . Gaudino, M. (2018). Does a balanced transfusion ratio of plasma to packed red blood cells improve outcomes in both trauma and surgical patients? A meta-analysis of randomized controlled trials and observational studies. *American Journal of Surgery*, 216(2), 342-350. doi:<https://dx.doi.org/10.1016/j.amjsurg.2017.08.045>
- Robinson, S., Harris, A., Atkinson, S., Atterbury, C., Bolton-Maggs, P., Elliott, C., . . . Taylor, C. (2018). The administration of blood components: a British Society for Haematology Guideline. *Transfusion Medicine*, 28(1), 3-21. doi:<https://dx.doi.org/10.1111/tme.12481>
- Rygaard, S. L., Jonsson, A. B., Madsen, M. B., Perner, A., Holst, L. B., Johansson, P. I., & Wetterslev, J. (2018). Effects of shorter versus longer storage time of transfused red blood cells in adult ICU patients: a systematic review with meta-analysis and Trial Sequential Analysis. *Intensive Care Medicine*, 44(2), 204-217. doi:<https://dx.doi.org/10.1007/s00134-018-5069-0>

Bibliography

- Saadah, N. H., van Hout, F. M. A., Schipperus, M. R., le Cessie, S., Middelburg, R. A., Wiersum-Osselton, J. C., & van der Bom, J. G. (2017). Comparing transfusion reaction rates for various plasma types: a systematic review and meta-analysis/regression. *Transfusion*, 57(9), 2104-2114. doi:<https://dx.doi.org/10.1111/trf.14245>
- Schiffer, C. A., Bohlke, K., Delaney, M., Hume, H., Magdalinski, A. J., McCullough, J. J., . . . Anderson, K. C. (2018). Platelet Transfusion for Patients With Cancer: American Society of Clinical Oncology Clinical Practice Guideline Update. *Journal of Clinical Oncology*, 36(3), 283-299. doi:<https://dx.doi.org/10.1200/JCO.2017.76.1734>
- Shehata, N., Mistry, N., Costa, B. R., Pereira, T. V., Whitlock, R., Curley, G. F., . . . Mazer, C. D. (2019). Restrictive compared with liberal red cell transfusion strategies in cardiac surgery: a meta-analysis. *European Heart Journal*, 40(13), 1081-1088. doi:<https://dx.doi.org/10.1093/eurheartj/ehy435>
- Simancas-Racines, D., Arevalo-Rodriguez, I., Urrutia, G., Buitrago-Garcia, D., Nunez-Gonzalez, S., Martinez-Zapata, M. J., . . . Hidalgo-Ottolenghi, R. (2019). Leukodepleted Packed Red Blood Cells Transfusion in Patients Undergoing Major Cardiovascular Surgical Procedure: Systematic Review and Meta-Analysis. *Cardiology Research & Practice*, 2019, 7543917. doi:<https://dx.doi.org/10.1155/2019/7543917>
- Sommer, N., Schnuriger, B., Candinas, D., & Haltmeier, T. (2019). Massive transfusion protocols in nontrauma patients: A systematic review and meta-analysis. *The Journal of Trauma and Acute Care Surgery*, 86(3), 493-504. doi:<https://dx.doi.org/10.1097/TA.0000000000002101>
- Soril, L. J. J., Noseworthy, T. W., Dowsett, L. E., Memedovich, K., Holitzki, H. M., Lorenzetti, D. L., . . . Clement, F. M. (2018). Behaviour modification interventions to optimise red blood cell transfusion practices: a systematic review and meta-analysis. *BMJ Open*, 8(5), e019912. doi:<https://dx.doi.org/10.1136/bmjopen-2017-019912>
- Steiner, M. E., Zantek, N. D., Stanworth, S. J., Parker, R. I., Valentine, S. L., Lehmann, L. E., . . . Sepsis Investigators, N. (2018). Recommendations on RBC Transfusion Support in Children With Hematologic and Oncologic Diagnoses From the Pediatric Critical Care Transfusion and Anemia Expertise Initiative. *Pediatric Critical Care Medicine*, 19(9S Suppl 1), S149-S156. doi:<https://dx.doi.org/10.1097/PCC.0000000000001610>
- Tasker, R. C., Turgeon, A. F., Spinella, P. C., Pediatric Critical Care, T., Anemia Expertise, I., Pediatric Critical Care Blood Research, N., . . . Sepsis Investigators, N. (2018). Recommendations on RBC Transfusion in Critically Ill Children With Acute Brain Injury From the Pediatric Critical Care Transfusion and Anemia Expertise Initiative. *Pediatric Critical Care Medicine*, 19(9S Suppl 1), S133-S136. doi:<https://dx.doi.org/10.1097/PCC.0000000000001589>
- Trappey, A. F., Thompson, K. M., Kuppermann, N., Stephenson, J. T., Nuno, M. A., Hewes, H. A., . . . Nishijima, D. K. (2019). Development of transfusion guidelines for injured children using a Modified Delphi Consensus Process. *Journal of Trauma and Acute Care Surgery*, 87(4), 935-943. doi:[10.1097/TA.0000000000002432](https://dx.doi.org/10.1097/TA.0000000000002432)
- Valentine, S. L., Bembea, M. M., Muszynski, J. A., Cholette, J. M., Doctor, A., Spinella, P. C., . . . Sepsis Investigators, N. (2018). Consensus Recommendations for RBC Transfusion Practice in Critically Ill Children From the Pediatric Critical Care Transfusion and Anemia Expertise Initiative. *Pediatric Critical Care Medicine*, 19(9), 884-898. doi:<https://dx.doi.org/10.1097/PCC.0000000000001613>
- Wang, Y., Shi, X., Du, R., Chen, Y., & Zhang, Q. (2018). Impact of red blood cell transfusion on acute coronary syndrome: a meta-analysis. *Internal & Emergency Medicine*, 13(2), 231-241. doi:<https://dx.doi.org/10.1007/s11739-016-1594-4>
- Whitehead, N. S., Williams, L. O., Meleth, S., Kennedy, S. M., Ubaka-Blackmoore, N., Geaghan, S. M., . . . Graber, M. L. (2019). Interventions to prevent iatrogenic anemia: a Laboratory Medicine Best Practices systematic review. *Critical Care (London, England)*, 23(1), 278. doi:<https://dx.doi.org/10.1186/s13054-019-2511-9>

Bibliography

- Zantek, N. D., Parker, R. I., van de Watering, L. M., Josephson, C. D., Bateman, S. T., Valentine, S. L., . . . Sepsis Investigators, N. (2018). Recommendations on Selection and Processing of RBC Components for Pediatric Patients From the Pediatric Critical Care Transfusion and Anemia Expertise Initiative. *Pediatric Critical Care Medicine*, 19(9S Suppl 1), S163-S169. doi:<https://dx.doi.org/10.1097/PCC.0000000000001625>
- Zhang, W., Yu, K., Chen, N., & Chen, M. (2019). Age of red cells for transfusion and outcomes in critically ill patients: A meta-analysis. *Transfusion Medicine and Hemotherapy*, 46(4), 248-256. doi:[10.1159/000498863](https://doi.org/10.1159/000498863)

Medical Disclaimer

Medicine is an ever-changing science. As new research and clinical experience broaden our knowledge, changes in treatment and drug therapy are required.

The authors have checked with sources believed to be reliable in their efforts to provide information that is complete and generally in accord with the standards accepted at the time of publication.

However, in view of the possibility of human error or changes in medical sciences, neither the authors nor Seattle Children's Healthcare System nor any other party who has been involved in the preparation or publication of this work warrants that the information contained herein is in every respect accurate or complete, and they are not responsible for any errors or omissions or for the results obtained from the use of such information.

Readers should confirm the information contained herein with other sources and are encouraged to consult with their health care provider before making any health care decision.