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Diagnosis of Transfusion Reactions

The App in your back pocket

Transfusion Reactions

- Blood transfusions are most common procedures for hospitalised patients
- Adverse effects - 1:70000 per unit
- Two distinct categories:
 - Acute haemolytic transfusion reactions
 - Delayed haemolytic transfusion reactions

Transfusion Reactions

- Publicly available guidelines for accurate diagnosis
- Accurate diagnosis is crucial for correct treatment
- Guidelines are not user friendly

Transfusion Rx DDX



Advancing Transfusion and
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Transfusion Rx DDX

Blood transfusions are the most common procedure for hospitalized patients. Transfusion reactions occur following 1-3% of all blood transfusions. These reactions can be classified into a number of specific entities, although the distinctions between specific types of reactions are often subjective.

A collaborative working group between the CDC and AABB has developed [publicly available guidelines](#) for accurate diagnosis of transfusion reactions. While this document lists specific diagnostic criteria, it is not very user-friendly.

This application is based on a proprietary algorithm that uses the CDC/AABB criteria and a series of simple questions to readily enable even the novice user to accurately diagnose transfusion reactions to blood products.

This application is only a tool. The results should be compared against the CDC/AABB criteria. Medical decisions based on the output of this app should only be made by qualified and licensed medical providers.

Acknowledge & continue



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[John D. Roback](#) & [Geoffrey H. Smith](#)

Transfusion Rx DDX

Diagnose

Report

Status

Currently evaluating category:

AHTR Allergic TACO TRALI FNHTR More

1. Within **24 hours** of the cessation of transfusion, the patient developed (check all that apply):

- Back/flank pain
- Chills/rigors
- Discolored urine (gross visual hemolysis)
- Disseminated intravascular coagulation (DIC)
- Epistaxis
- Fever
- Hypotension
- Oliguria/anuria
- Pain and/or oozing at IV site
- Renal failure
- None of the above*



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AHTR Allergic TACO TRALI FNHTR More

2. The patient had (check all that apply):

Decreased fibrinogen

Decreased haptoglobin

Increased bilirubin

Increased LDH

Hemoglobinemia

Hemoglobinuria

None of the above



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Reset all responses

Transfusion Rx DDX

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AHTR Allergic TACO TRALI FNHTR More

3. The patient had (check all that apply):

- Positive DAT (IgG or C3) AND elution of an alloantibody on transfused RBCs
- Physical cause of hemolysis (thermal, chemical, osmotic, mechanical, chemical)
- None of the above



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Transfusion Rx DDX

Diagnose

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Currently evaluating category:

AHTR Allergic TACO TRALI FNHTR More

The transfusion reaction is most consistent with type(s):

AHTR/definitive

Clinical correlation is essential. Click on the *Report* tab for a narrative report.

Further characterization of the transfusion reaction may be possible. Press the *Next* button if you would like to continue.



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Transfusion Rx DDx

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E-mail an HTML version of this report to:

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Acute Hemolytic Transfusion Reaction (AHTR)/definitive

The diagnosis of AHTR/definitive requires ALL the following conditions within 24 hours of transfusion: at least 1 sign/symptom of AHTR (back/flank pain, chills/rigors, discolored urine, DIC, epistaxis, fever, hypotension, oliguria/anuria, pain/oozing at IV site, and renal failure) + at least 2 laboratory results consistent with hemolysis (decreased fibrinogen, decreased haptoglobin, increased bilirubin, increased LDH, hemoglobinemia, hemoglobinuria) + evidence of EITHER immune mediated OR non-immune mediated causes of hemolysis.

This patient had the required signs/symptoms (**Back/flank pain, Chills/rigors, Disseminated intravascular coagulation (DIC)**), lab results (**Decreased fibrinogen, Decreased haptoglobin, Increased LDH**), and a potential etiology for hemolysis (**Positive DAT (IgG or C3) AND elution of an alloantibody on transfused RBCs**), thus their transfusion reaction is consistent with AHTR/definitive.

+ Severity/Imputability: Not specified/Not specified

Severity

Non-severe

Medical intervention (e.g. symptomatic treatment) is required but lack of such would not result in permanent damage or impairment of a bodily function.

Severe

Inpatient hospitalization or prolongation of hospitalization is directly attributable to the adverse reaction, persistent or significant disability or incapacity of the patient occurs as a result of the reaction, or a medical or surgical intervention is necessary to preclude permanent damage or impairment of a body function.

Life-threatening

Major intervention required following the transfusion (e.g. vasopressors, intubation, transfer to intensive care) to prevent death.

Death

The recipient died as a result of the adverse transfusion reaction. Death should be used if death is possibly, probably or definitely related to transfusion. If the patient died of a cause other than the transfusion, the severity of the reaction should be graded as appropriate given the clinical circumstances related to the reaction.

Not Determined

The severity of the adverse reaction is unknown or not stated.

Imputability

Definite

ABO or other allotypic RBC antigen incompatibility is known OR only transfusion-related (i.e., immune or non-immune) cause of acute hemolysis is present.

Probable

There are other potential causes present that could explain acute hemolysis, but transfusion is the most likely cause.

Possible

Other causes of acute hemolysis are more likely, but transfusion cannot be ruled out.

Doubtful

Evidence is clearly in favor of a cause other than the transfusion, but transfusion cannot be excluded.

Ruled Out

There is conclusive evidence beyond reasonable doubt of a cause other than the transfusion.

Not Determined

The relationship between the adverse reaction and the transfusion is unknown or not stated.

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Acute Hemolytic Transfusion Reaction (AHTR)/definitive

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This patient had the required signs/symptoms (**Back/flank pain, Chills/rigors, Disseminated intravascular coagulation (DIC)**), lab results (**Decreased fibrinogen, Decreased haptoglobin, Increased LDH**), and a potential etiology for hemolysis (**Positive DAT (IgG or C3) AND elution of an alloantibody on transfused RBCs**), thus their transfusion reaction is consistent with AHTR/definitive.

+ Severity/Imputability: Not specified/Not specified

TRDDx report - Message (HTML)

File Message

Ignore X Reply Reply All Forward Meeting
Junk Delete Delete Respond
Blood Bank To Manager
Team E-mail Done
Reply & Delete Create New
Rules OneNote
Move Actions
Mark Unread Categorize Follow Up
Translate Find Related Select
Zoom

From: trddx.app@gmail.com Sent: Sun 9/10/2016 4:51 PM
To: Emma White
Cc:
Subject: TRDDx report

Acute Hemolytic Transfusion Reaction (AHTR)/definitive

The diagnosis of AHTR/definitive requires ALL the following conditions within 24 hours of transfusion: at least 1 sign/symptom of AHTR (back/flank pain, chills/rigors, discolored urine, DIC, epistaxis, fever, hypotension, oliguria/anuria, pain/oozing at IV site, and renal failure) + at least 2 laboratory results consistent with hemolysis (decreased fibrinogen, decreased haptoglobin, increased bilirubin, increased LDH, hemoglobinemia, hemoglobinuria) + evidence of EITHER immune mediated OR non-immune mediated causes of hemolysis.

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Severity: **Not specified**

Imputability: **Not specified**

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Transfusion Rx DDX

Diagnose

Report

Status

Currently evaluating category:

AHTR Allergic **TACO TRALI** FNHTR More

The transfusion reaction is most consistent with type(s):

AHTR/definitive

Allergic/definitive

Note that other transfusion reaction type(s) were considered but EXCLUDED, because they are incompatible with the type(s) listed above:

~~TAD (transfusion associated dyspnea)/definitive~~

Clinical correlation is essential. Click on the *Report* tab for a narrative report.

Further characterization of the transfusion reaction may be possible. Press the *Next* button if you would like to continue.



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Acute Hemolytic Transfusion Reaction (AHTR)/definitive

The diagnosis of AHTR/definitive requires ALL the following conditions within 24 hours of transfusion: at least 1 sign/symptom of AHTR (back/flank pain, chills/rigors, discolored urine, DIC, epistaxis, fever, hypotension, oliguria/anuria, pain/oozing at IV site, and renal failure) + at least 2 laboratory results consistent with hemolysis (decreased fibrinogen, decreased haptoglobin, increased bilirubin, increased LDH, hemoglobinemia, hemoglobinuria) + evidence of EITHER immune mediated OR non-immune mediated causes of hemolysis.

This patient had the required signs/symptoms (**Back/flank pain, Chills/rigors, Disseminated intravascular coagulation (DIC)**), lab results (**Decreased fibrinogen, Decreased haptoglobin, Increased LDH**), and a potential etiology for hemolysis (**Positive DAT (IgG or C3) AND elution of an alloantibody on transfused RBCs**), thus their transfusion reaction is consistent with AHTR/definitive.

⊕ **Severity/Imputability: Not specified/Not specified**

Allergic Reaction/definitive

The diagnosis of an allergic reaction/definitive requires 2 or more of the following occurring within 4 hours of the cessation of transfusion: conjunctival edema, edema of lips/tongue/uvula, erythema and edema of periorbital area, generalized flushing, hypotension, angioedema of the head and neck, maculopapular rash, itching, respiratory distress/bronchospasm, and urticaria.

This patient had 2-10 of the conditions (**Generalized flushing, Hypotension, Urticaria (hives)**) and therefore their transfusion reaction is consistent with allergic/definitive.

⊕ **Severity/Imputability: Not specified/Not specified**

NOT Transfusion Associated Circulatory Overload (TACO)

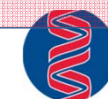
The diagnosis of TACO requires at least 3 of the following 6 conditions, all occurring within 6 hours of the cessation of transfusion: acute respiratory distress, elevated BNP, elevated CVP, left heart failure, positive fluid balance, and radiographic evidence of pulmonary edema.

This patient had 1 of the conditions (**Acute respiratory distress (dyspnea, orthopnea, cough, oxygen saturation < 90% on room air)**) and therefore their transfusion reaction is NOT consistent with TACO.

NOT Transfusion Related Acute Lung Injury (TRALI)

The diagnosis of TRALI requires ALL the following conditions within 6 hours of transfusion: hypoxemia ($\text{PaO}_2/\text{FiO}_2 < 300$ mmHg OR oxygen saturation < 90% on room air OR other clinical evidence) + radiographic evidence of bilateral infiltrates + NO evidence of circulatory overload.

This patient did NOT have **Radiographic evidence of bilateral lung infiltrates, No evidence of left atrial hypertension (i.e., circulatory overload)**. Thus, they did not meet the required criteria, and their transfusion reaction is NOT consistent with TRALI.





References

- Pfuntner A, Wier LM, Stocks C 2013. HCUP Statistical Brief #165: Most Frequent Procedures Performed in U.S. Hospitals, 2011. <http://www.hcup-us.ahrq.gov/reports/statbriefs/sb165.pdf>. Accessed 15 September 2016
- Roback JD, Smith GH 2015. Transfusion Rx DDx [Mobile application software]. Retrieved from <http://www.trddx.com>.
- Sandler SG 2016. Transfusion Reactions. <http://emedicine.medscape.com/article/206885-overview>. Accessed 15 September 2016
- Strobel E 2008. Hemolytic Transfusion Reactions. *Transfus Med Hemother* 35(5): 346-353.
- U.S. Centers for Disease Control and Prevention 2016. The National Healthcare Safety Network (NHSN) Manual: Biovigilance Component v2.2. Available at: <http://www.cdc.gov/nhsn/PDFs/Biovigilance/BV-HV-protocol-current.pdf>. Accessed 15 September 2016.