

# **An Initiative to Exchange Extended RBC Phenotyping Information Using the HL7 FHIR<sup>®</sup> Open Standard**

August, 2021

## **Blood donor centers**

- Computer systems geared toward effective and safe production of blood products
- Blood establishment computer systems (BECS)

## **Health system blood banks**

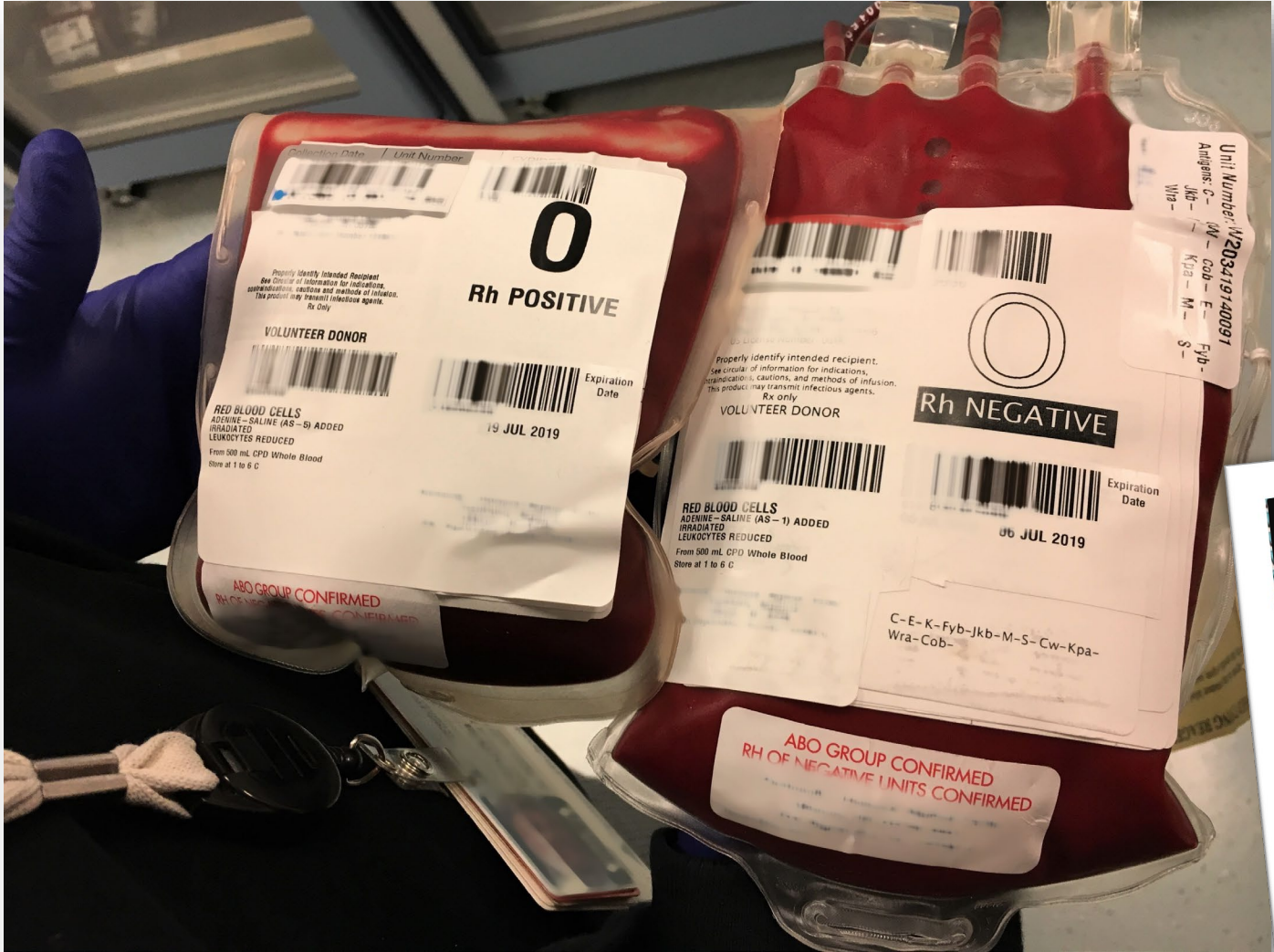
- Computer systems geared toward effective and safe transfusion of blood products
- Blood bank laboratory information systems (BBLIS)

## **Both systems manage:**

- Blood products
- Associated metadata

**Barcodes provide a minimal digital interface—most of the metadata about the products must be rekeyed.**

# Need



179	RCL4	AD	6/22/19	ANEG	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	
889	RCL4		6/22/19	ANEG	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	
916	RCL4	5/16/19	6/23/19	ONEG	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	
2927	RCL4		6/24/19	BNEG	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	
1582	RCL4	LF	6/21/19	ABNG	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	
1609	RCL4		6/22/19	APOS	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	
1610	RCL4	5/17	6/22/19	APOS	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	
1554	RCL4		6/23/19	ONEG	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	
1564	RCL4		6/21/19	OPOS	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	
2646	RCL4	LF	6/22/19	BPOS	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	
2231	RCL4	5/17	6/21/19	OPOS	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	
1855	RCL4		6/22/19	APOS	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	
1750	RCL4		6/22/19	APOS	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	
1758	RCL4	AY	6/22/19	APOS	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	
1761	RCL4	5/17	6/22/19	APOS	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	
1975	RCL4		6/22/19	APOS	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	
1977	RCL4		6/22/19	ABPS	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	
1980	RCL4		6/22/19	BPOS	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	
1770	RCL4	AB	6/22/19	APOS	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	
1772	RCL4	5/17	6/22/19	APOS	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	
1776	RCL4		6/22/19	APOS	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	
1794	RCL4		6/21/19	OPOS	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	
0986	RCL4																				

Photos taken at leading academic medical center / © Lantana Consulting Group

# Donor & Patient Phenotype Reports are Expanding

## Donor Genotype

Screen Print for DNMDN1

Date: 03/01/2021

Time: 9:11:32

(DNR/BLD)

Donor Phenotypes - Update

NEXT: \_\_\_\_\_ DN

Id : [REDACTED]  
Name : [REDACTED]

Blood Type: O-

(SDBB) Pg 1/1

CMV: Positive

ABS: Negative

----- Donor Phenotype Information -----

S	Phenotype	Indicator
-	C	- Negative
-	c	+ Positive
-	E	- Negative
-	e	+ Positive
-	V	- Negative
-	VS	- Negative
-	K	- Negative
-	k	+ Positive
-	Kpa	- Negative
-	Kpb	+ Positive
-	Jsa	- Negative
-	Jsb	+ Positive
-	Fya	- Negative
-	Fyb	+ Positive
-	Jka	+ Positive
-	Jkb	+ Positive
-	M	+ Positive

1 BA 2 QA 3 SB 4 SF 5 HE 6 CL 7 PB 8 PF

## Patient Genotype

Practitioner Name: [REDACTED] Specimen Type: Whole Blood Accession Number [REDACTED]  
 Requesting Hospital: [REDACTED] Date of Collection: 12/10/2020 Date Test Performed: 12/24/2020  
 Center [REDACTED] Date Received: 12/11/2020 Test Report Date: 12/24/2020  
 Address: [REDACTED]

### Tested Predicted Phenotypes and Results

#### Panel: Patient Red Cell Antigen Genotype

##### Group: ABO

Predicted Phenotypes	Results
A	Negative
B	Positive
O	Positive

##### Group: Duffy

Predicted Phenotypes	Results
Fya	Positive
Fyb	Negative
GATA	Positive

##### Group: Rh

Predicted Phenotypes	Results
D	Positive
C	Positive
E	Negative
c	Positive
e	Positive
V	Negative
VS	Negative
hrB	Positive
hrS	Positive

##### Group: Kell

Predicted Phenotypes	Results
K	Negative
k	Positive
Kpa	Negative
Kpb	Positive
Jsa	Negative
Jsb	Positive

**Manual blood product registration was tolerable with limited metadata.  
Molecular techniques are rapidly changing this.**

- Serologic characterization is expanding.
- Molecular techniques (arrays, targeted sequencing, gene sequencing) are expanding and becoming cost effective for more patients and donors.
- Provenance and molecular characterization information becomes critical when donors become patients.
- Search for potentially compatible blood can become automated and less laborious.

## Now is the time to develop an open standard.

- Open standards are developed through a regulated, consensus-driven process.
- Open standards make possible interoperability, creating a common specification.
- Health Level 7 International (HL7®) standards are available under a no-cost licensing agreement.
- HL7 Fast Healthcare Interoperability Resources (FHIR®) is a flexible, scalable standard that streamlines information exchange between healthcare systems.
- HL7 FHIR is endorsed for federal projects under NIH, CDC, CMS, and other HHS agencies.



## HL7 FHIR Implementation Guide: How?

- Convene domain stakeholders.
- Represent blood product genotyping and phenotyping information for BECS and BBLIS incorporation.
- Create a common set of resources:
  - for blood product phenotyping.
  - compatible with the FDA biologically derived products effort.\*
  - compatible with International Society of Blood Transfusion (ISBT) consensus vocabulary of blood phenotypes.
- Test for feasibility, ballot as national standard, and publish.

\*See next slide for details

# RELATIONSHIP BETWEEN FHIR BIOLOGICAL PRODUCT AND A FHIR PATIENT

Process of finding a successful donor for patient blood transfusion match

# 1



## DONOR

### Descriptor of Biological Product

Date, Site, Infections



## PATIENT

### FHIR Patient Information

Name, Age, Hospital, Physician



FHIR biological derived product



FHIR RBC phenotyping results

# 2



### Biological Derived Product

Manufacturing Info \_\_\_\_\_  
Phenotypes  
A Negative  
B Negative  
O Positive  
c Positive



### FHIR Patient Document

Patient Info \_\_\_\_\_  
Phenotypes  
A Negative  
B Negative  
O Positive  
c Positive

Indicators have the same electronic representation, different metadata

# 3

## Identifying Inventory for Testing

Identifying potential donor units for compatibility testing

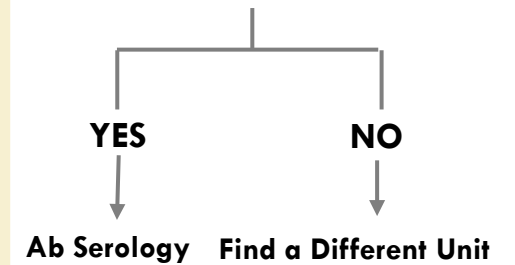
	Patient 1	Donor 1 ...	Donor X
A	+	+	-
B	-	+	-
O	-	+	-
c	+	-	-
c	+	-	+
D	-	+	+
.	-	+	+
.	-	-	+

Compatibility filtering is completed electronically. Identified units move to final testing.

# 4

## Final Compatibility Testing

### Possible Transfusion



Once a patient–donor match has been found, antibody serology is conducted to screen for unexpected antibodies in and outside the ABO system. If no match is found, testing of a different unit is performed until a match is obtained.



### **A standard representation of extended RBC phenotyping promotes:**

- Better management of blood product inventory (e.g., preventing accidental release of rare blood phenotypes and streamlining the search for rare phenotypes).
- Safer transfusion practices by
  - Finding the most compatible blood product for testing.
  - Identifying rare units through local, regional, super-regional and national searches
- More efficient public health reporting of adverse reactions, especially when combined with biologically derived product information.

## Current activities

- Distributing a white paper and inviting additional support and signatures
- Socializing the effort via HL7 Work Groups—Clinical Genomics, Orders & Observations, Patient Care
- Seeking professional organization endorsement (AABB, CAP, ASCP, ISBT)
- Recruiting vendors and health care organizations (health systems and blood donor centers, software and instrument vendors)
- Full project launch dependent on stakeholder support—endorsement, participation, fund raising for ballot prep, and management

## Explore fit and learn more

- Read white paper
- Explore participation:
  - In standards effort
  - In prototyping
  - As a stakeholder

## Contact:

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