2025

Abstract Journal

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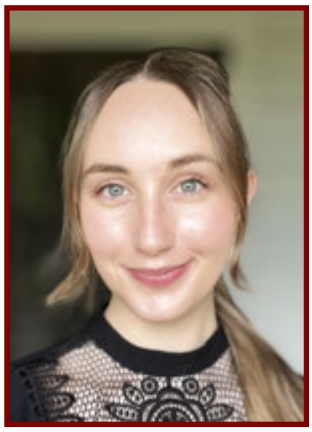

Alexis Bizarro
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TITLE: Discovery of Anti-Jk3 in a Pregnant Female: Implications for Hemolytic Disease and Clinical Management

ABSTRACT:
Anti-Jk3, a rare alloantibody associated with the Kidd blood group system, has been implicated in hemolytic transfusion reactions and hemolytic disease of the fetus and newborn (HDFN). This case report describes the detection of anti-Jk3 in a pregnant Polynesian female, featuring the clinical significance of this rare antibody in pregnancy and options for transfusion. The patient, a 39-year-old, presented for routine prenatal care at 25 weeks gestation. Previous antibody identification studies, performed a month prior, revealed an anti-Jka. The current testing showed panreactivity with a negative autocontrol by gel methodology, which prompted the facility to submit the prenatal sample for antibody identification and titer at a local immunohematology reference laboratory. The identity of anti-Jk3 in this case was confirmed using molecular and serological methods. This case contributes to the growing understanding of anti-Jk3 in pregnancy and its effects on fetal and neonatal outcomes, emphasizing the need for accurate prenatal screening and management in pregnant women with rare blood group antibodies.

INTRODUCTION:
The Kidd blood group system consists of two polymorphic antigens, Jka and Jkb, and one high prevalence antigen, Jk3. The system's origins trace back to a case of hemolytic disease of the fetus and newborn, in which the mother of John Kidd developed an antibody against the Jka antigen present on the baby's red cells.[5]

The Kidd antigens reside on the Kidd glycoprotein, which plays a key role in transporting urea in and out of red blood cells to maintain osmotic stability. The glycoprotein is also found in the kidneys, where it clears toxic byproducts of cellular metabolism by forming concentrated urine.[4]

Individuals with the Kidd null phenotype, Jk(a-b-), can still transport urea despite the absence of the Kidd glycoprotein. However, the rate of urea transport is significantly slower compared to individuals with the glycoprotein.[5] Those with the Jk(a-b-) phenotype have notably less concentrated urine, though no malignancies or diseases have been reported with the absence of the glycoprotein.

Antigen frequencies of the Kidd blood group system vary slightly across different ethnic populations. The Jka antigen is present in 77% of Caucasians and 92% of Black individuals, while the Jkb antigen is found in 74% of Caucasians and 49% of Black individuals. The high-prevalence antigen, Jk3, is present in nearly 100% of all ethnic groups, with a frequency of 99% in those of Polynesian descent.5 The Jk3 antigen is expressed on cells that carry either the Jka and/or the Jkb antigen and is highly expressed on cord blood cells, which is an important consideration in blood transfusion and pregnancy-related issues.

Antibodies against Kidd antigens are frequently associated with delayed hemolytic reactions and severe immediate transfusion reactions. These antibodies often have low titers, falling below the detection threshold, but can reappear after transfusion of Kidd-positive red blood cells. Most Kidd antibodies are IgG in nature, capable of binding complement, and can cross the placenta, potentially causing hemolytic disease of the fetus and newborn (HDFN).[3] The severity of HDFN can range from mild anemia and edema to more severe outcomes like heart failure or, in extreme cases, fetal death if not carefully monitored. Due to the anamnestic nature of Kidd antibodies, accurate identification and periodic titers are essential for monitoring a fetus at risk for HDFN.[2]

CASE REPORT:

A 39-year-old woman, pregnant with her third child at 25 weeks of gestation, presents to an outpatient center for routine prenatal testing. She has a history of anti-Jka, sensitized by a previous pregnancy. Her current pregnancy is being closely monitored with occasional antibody titers to assess the risk of hemolytic disease of the fetus and newborn (HDFN). The latest antibody screen was panreactive with a negative autocontrol. A sample was sent to a local reference laboratory for antibody identification and titration. The identified antibody reacted with all cells tested using gel methodology and was slightly enhanced by ficin-treated reagent cells. Both the direct antiglobulin test (DAT) and autocontrol were negative, suggesting the presence of an antibody to a high-incidence antigen. Phenotyping revealed the patient to be Kidd null (see Table 1).

Negative reactions were observed with frozen rare Jk(a-b-) cells, confirming the identification of anti -Jk3. Further rule-outs were conducted using allogeneic red cell adsorption. Jk(a+b-) cells were used for adsorption, effectively removing the patient's historical anti-Jka as well as the newly formed anti-Jk3. All other clinically significant antibodies were ruled out, and a specimen was sent for predictive RBC phenotyping via DNA analysis. RBC genotyping confirmed that the patient had silencing in both JK*A and JK*B genes, which aligns with the serological phenotype and plasma findings.

A titer for anti-Jk3 was performed, yielding a result of 1. The fetus was closely monitored throughout the pregnancy, with no rapid increase in the titer. While titer levels do not directly predict the clinical outcome for the fetus, they serve as a useful screening tool to determine if more intensive monitoring, such as Doppler ultrasounds or intrauterine transfusions, is necessary.[6]

The patient did not require a transfusion of Jk(a-b-) red cells; however, a search for the rare phenotype was initiated through the American Rare Donor Program (ARDP) in the event that units were needed. The baby was born with a negative DAT and without anemia. The post-delivery recovery was uncomplicated, and the patient was discharged from the hospital.

Table 1: Patient Phenotyping Results

Antisera	Results
Jka	0
Jkb	0
C	+
c	0
E	0
e	+
K	0

DISCUSSION:

This case emphasizes the importance of early detection and ongoing monitoring of pregnant women with antibodies to high-incidence antigens, such as anti-Jk3. Proper identification and monitoring of these antibodies often require the collaboration of hospital blood banks, reference labs, and clinicians, along with an extensive search for compatible blood for these patients.

Blood for this individual should be negative for both the Jka and Jkb antigens. Our antigen frequency data shows that the only population typically null for Kidd antigens are those of Polynesian descent, with less than 1% of Polynesians being Jk(a-b-).[1] This makes the search for compatible blood products extremely challenging. Although this case did not require a transfusion, it is important to highlight the rarity of this blood type and discuss alternative options with clinicians if suitable blood is not available. For future needs, autologous donation may be a practical option if blood products are required. If the patient has siblings, it may be beneficial to see that they share the same gene silencing and could provide a directed donation. Future pregnancies may increase the risk of further sensitization events, potentially leading to the formation of additional alloantibodies and more stringent blood requirements. The clinical team must prioritize educating the patient about the risks associated with future pregnancies. Providing information on autologous blood donation could offer the patient the option to store a frozen unit for emergencies, should the need arise.

Anti-Jk3 is generally associated with no to mild reactions regarding hemolytic disease of the fetus and newborn (HDFN). While it should not be overlooked, the effects on the fetus are typically limited to mild anemia, which often does not require intrauterine transfusion. If an infant is born with mild anemia and elevated bilirubin levels, phototherapy is usually sufficient to reduce excess bilirubin, and the anemia is typically self-limiting.7 Given that the mother has developed both anti-Jk3 and anti-Jka, clinicians must consider the potential effects of both antibodies on the fetus. Anti-Jka has been associated with few cases of severe HDFN, which has led to kernicterus in a newborn that required an exchange transfusion.[2] However, in most cases, the effects are mild, as noted above.

CONCLUSION:

Overall, this case highlights the critical need for early detection and careful monitoring of pregnant women with antibodies to high-incidence antigens, such as anti-Jk3. The challenges of gathering units for transfusion, particularly in cases of rare blood types like Jk(a-b-), emphasize the importance of a collaborative healthcare team and the need for alternative transfusion options. Although the current pregnancy did not require transfusion, the potential for further sensitization in future pregnancies compels ongoing education and proactive planning, including options like autologous blood donation. While anti-Jk3 typically leads to mild cases of HDFN, the presence of anti-Jka may introduce more severe risks. Semi-frequent titers, accurate antibody identification, and a thorough understanding of these rare antibodies' effects are necessary to ensure positive outcomes for both the mother and the fetus.

REFERENCES:

1. Yousuf R, Suria Abdul Aziz, Nurasyikin Yusof, Leong CF. A Rare Case of Anti-Jk3 Antibody Detected on Pre-Transfusion Investigation. Indian journal of hematology and blood transfusion/ Indian Journal of Hematology and Blood Transfusion. 2012;30(3):208-210. doi:https://doi.org/10.1007/s12288-012-0211-6

2. Mittal K, Sood T, Bansal N, Bedi RK, Kaur P, Kaur G. Clinical Significance of Rare Maternal Anti Jka Antibody. Indian Journal of Hematology and Blood Transfusion. 2016;32(4):497-499. doi:https://doi.org/10.1007/s12288-016-0688-5
3. Jator EK. Notorious anti-Jk3 in a pregnant woman. American Society for Clinical Laboratory Science. 2014;27(2):78-82. doi:https://doi.org/10.29074/ascls.27.2.78
4. Dean L. The Kidd blood group. Nih.gov. Published 2014. https://www.ncbi.nlm.nih.gov/books/NBK2272/
5. Reid, Marion E., et al. The Blood Group Antigen FactsBook, Elsevier Science & Technology, 2012. ProQuest Ebook Central, https://ebookcentral-proquest-com.libux.utmb.edu/lib/utmb-ebooks/detail.action?docID=1031882.
6. Minuk L, Clarke G, Lieberman L. Approach to red blood cell antibody testing during pregnancy: Answers to commonly asked questions. Canadian Family Physician. 2020;66(7):491. https://pmc.ncbi.nlm.nih.gov/articles/PMC7365158/
7. F AF, Rossi K, Krugh D, Oshaughnessy R. Management of pregnancies complicated by anti-Jka alloimmunization. American Journal of Obstetrics and Gynecology. 2005;193(6):S134-S134. doi:https://doi.org/10.1016/j.ajog.2005.10.482

2025 | **Oral & Poster** Abstracts

The following Abstracts were submitted for review by the South Central Association of Blood Banks Program Committee Chairs and were selected in either ORAL or POSTER categories for the 2025 Abstract Journal. All Oral Abstracts presented at the 2025 SCABB Annual Meeting and AIMS Event in San Marcos, Texas

Abstract #	Abstract Title	Type	Author(s)
Sol Haberman	Discovery of Anti-Jk3 in a Pregnant Female: Implications for Hemolytic Disease and Clinical Management	Oral	Alexis Bizarro, Lead Medical Technologist, LifeSouth Community Blood Centers, Gainesville, FL
2	Balancing Risk vs. Benefits: Cybersecurity	Poster	Regina Castor, Sandra Drake, Brent Parker, Werfen, Norcross, GA
3	Determining Rh Immune Globulin Candidacy with Suspected anti-D + anti-C	Oral	Margaret Lehane, C Williford, Katrina Billingsley, LifeShare Blood Centers, Shreveport, LA
4	Are All Software Upgrades Alike?	Poster	Dylan Callaway, Brighid, Murphy-Wall, Yavapai Regional Medical Center, Prescott, AZ
5	The Impact of Preloading Instrument Reagents on Sample Turnaround Time	Poster	Kelley Cowan, Werfen, Norcross, GA, Jamie L. Waldrop, St. Francis Emory Healthcare, Columbus, GA.
6	Maximizing Testing Volume with Minimum Space	Poster	Ricardo Hernandez , Sarah Edwards, Banner University, Phoenix, AZ
7	Prevalence of the Mia antigen in a Multi-Ethnic Donor Population	Oral	KLatngsley, Kelley Bowman, Shen Liang, Stephanie Kelham; LifeShare Blood Center, Shreveport,LA
8	Key Factors for Timely Instrument Implementations	Poster	Lauren Russell, National Blood Testing Cooperative; Regina Castor, Werfen; Kelley Cowan, Werfen
9	Alternative QC on the Ortho Vision	Poster	Regina Castor, Werfen, Norcross, GA; Jamie Waldrop St. Francis Emory Healthcare, Columbus, GA
10	Validation: Effect of Facility Size/Type on Correlations	Poster	Regina Castor, Ryan J. Whitmarsh, Werfen, Norcross, GA
11	The Prediction of Transfusion Require-ments Using Machine Learning	Oral	Michael De La Rosa, B. Eastridge, D. Dent, D. Jenkins; University of Texas Health Sciences Center at San Antonio

Abstract #2 | POSTER

TITLE: Balancing Risk vs. Benefits: Cybersecurity

AUTHOR(S): Regina Castor, Sandra Drake, Brent Parker, Werfen, Norcross, GA

OBJECTIVES:

Cyberattacks (CA) in healthcare are on the rise. CA can result in breached data, paralysis of operational systems, damaged reputations, financial and legal consequences. According to the American Hospital Association, "The now well-documented source of cybersecurity risk in the healthcare sector…is from vulnerabilities in third-party technology, not hospitals' primary systems." The future US budget for 2025 may impose fines on hospitals for not following essential cybersecurity (CS) practices. Besides possible fines, it is estimated that CA on hospitals cost on average around $5 million. Faced with increasing pressures, healthcare facilities must weigh potential risk of a CA against implementing solutions that could positively affect instrument uptime and work efficiencies such as remote support for instrumentation and software solutions. An evaluation was conducted to ascertain if security features in place were sufficient to protect against CA in recent events.

STUDY DESIGN AND METHODS:

A manufacturer of automated immunohematology instruments (AII) (Werfen, SP) evaluated performance of their systems at 113 facilities which suffered CA in recent years that drastically effected laboratory and/or hospital operations. A post-mortem analysis was conducted to assess instrument vulnerability and cybersecurity features of their instruments in these events.

RESULTS:

Across 11 separate CA, a total of 141 blood bank instruments: Echo Lumena, Echo v2.0, NEO & NEO IRIS (Werfen, Norcross, GA) were network connected and operational at the time of the attacks (Table 1). Vendor firewall devices for the instruments were connected and functional. Analysis revealed that due to the vendor's security features in place at the time, zero AII were affected. Patient data and results were not compromised or made accessible to unauthorized entities by the breach. In each case, the CA did not infiltrate the facility through the instrument's remote support capability or other interface connections.

Table 1. Ransomware Cyberattacks Analyzed

Event	# Facilities Impacted	# of Automated Immunohematology Instruments	# of Automated Immunohematology Instruments Affected
1	6	11	0
2	7	9	0
3	1	2	0
4	1	1	0
5	1	1	0
6	1	2	0
7	1	1	0
8	1	1	0
9	11	1	0
10	79	108	0
11	4	4*	0
Totals	**113**	**141**	**0**

*Table 1 shows the number of facilities affected by Cyberattacks, the number of automated immunohematology instruments in use at the facility and how many automated immunohematology instruments were affected by or caused the breach. *Included ImmuLINK, (Werfen, Norcross, GA).*

CONCLUSION:

As part of the CS posture in these instances, the security device and features in place on each of the instruments acted to control incoming and outgoing traffic based on an advanced, defined set of security rules which prevented unauthorized access to the instruments. In some cases, while other laboratory instruments were vulnerable to the attack and had to be taken offline, the AII reported were able to remain operational and continue to support patient care. Adding security controls such as a firewall device, the use of antivirus software, and limiting network access to a defined set of hosts all help to minimize the risk of CA. Facilities who remained compliant with implementing security features provided by the manufacturer further contributed to the positive outcomes regarding their immunohematology instruments in these CA events.

Abstract #3 | ORAL

TITLE: Determining Rh Immune Globulin candidacy with suspected anti-D + anti-C

AUTHORS: Margaret Lehane, C Williford, Katrina Billingsley, LifeShare Blood Centers, Shreveport, LA

BACKGROUND/CASE STUDIES:

A White female was referred to the Immunohematology Reference Laboratory for Rh Immune Globulin (RhIG) candidacy assessment. The referring facility indicated anti-D and anti-C were previously identified in the patient's sample. The patient was emergently transfused over one year prior to collection of the sample used in this study. Adsorption and elution procedures were performed to determine if anti-D was truly present in the patient's plasma.

STUDY DESIGN/METHODS:

Serologic evaluation included tube testing with Gamma N-HanceTM (Immucor, Inc, Norcross, GA) using EDTA samples. The patient's plasma was tested against a selection of commercially available reagent red cells (Immucor, Inc, Norcross, GA; Alba Bioscience Limited, UK). Cells of D-C-G- phenotype were used to exclude additional common clinically significant alloantibodies, as well as cells of rGr, R2R2, and r'r phenotypes to establish baseline reactivity with neat plasma. Adsorption (using donor red cells of known phenotypes) and elution (Gamma ELU-KIT® II, Immucor, Inc, Norcross, GA) procedures were performed to separate potential antibody specificities in the patient's sample to determine if anti-D was present.

RESULTS/FINDINGS:

Initial testing of the patient's plasma allowed for exclusion of common clinically significant alloantibodies, with the exception of anti-D, anti-C, and/or anti-G. The patient's plasma was adsorbed onto R2R2 red cells; testing of the R2R2 adsorbed plasma indicated the presence of anti-C (Table 1). An eluate was prepared from the R2R2 adsorbing cells, and testing indicated that anti-D and/or anti-G was adsorbed onto the donor cells (Table 2). This eluate was then adsorbed onto r'r cells. Testing of the adsorbed eluate was non-reactive, indicating that anti-D was not present in the initial sample (Table 3). Finally, an eluate of the r'r adsorbing cells was prepared; testing indicated the presence of anti-G (Table 4). Based on the results of this extensive testing, anti-C and anti-G were identified, while anti-D was ruled-out. Thus, the patient was deemed a candidate for RhIG to prevent formation of alloanti-D.

CONCLUSION:

Determination of RhIG candidacy in pregnancy is essential to prevent formation of alloanti-D among RhD-negative mothers. A hospital-based transfusion service may lack the resources necessary to make this determination when presented with an anti-D + anti-C reactivity pattern. While resources may not be available in a hospital-based transfusion service to complete this serologic investigation, it is important to educate technologists in the blood bank to recognize the need for further evaluation. Failure to fully investigate RhIG candidacy in females of child-bearing potential could cause a true candidate to not receive prophylactic therapy, potentially impacting future pregnancies.

Table 1: Results of patient's plasma adsorbed onto R2R2 cells

R_0r	0
r'r	+
rr	0

Table 2: Results of eluate prepared from R2R2 adsorbing cells

R_0r	+
r'r	+
rr	0

Table 3: Results of R2R2eluate adsorbed onto r'r cells

R_0r	0
r'r	0
rr	0

Table 4: Results of eluate prepared from r'r adsorbing cells

R_0r	+
r'r	+
rr	0

Abstract #4 | POSTER

TITLE: Are All Software Upgrades Alike?

AUTHORS: Dylan Callaway, Brighid, Murphy-Wall, Yavapai Regional Medical Center, Prescott, AZ

BACKGROUND/CASE STUDIES:

Transfusion Services enjoy the advantages of electronic data for results, but they can come with at a cost. Costs like software upgrades, which require an implementation plan, testing and training. Most would agree that it's well worth the effort rather than relying on pen and paper. We wanted to compare our current data management System (DMS) vs a Laboratory Information Systems (LIS) upgrade. This was a retrospective evaluation comparing process steps and overall labor hours (OLH) deemed necessary to upgrade a system including installation, validation, and training.

STUDY DESIGN:

We reviewed the current process steps for a software upgrade with a LIS, Cerner Millennium (Cerner Corp., Kansas City, MO) and our DMS that was implemented in 2020, ImmuLINK (LINK) v2.0 (Werfen, Norcross, GA). We also reviewed the numbers of resource hours required for each process step which included our in-house antibody identifications (ABID) assay.

RESULTS/FINDINGS:

Our previous LIS upgrades, which typically occur approximately every 2 years, averaged ~ 70 hours to install, validate and train. These upgrades included the entire laboratory system rather than just the transfusion services.

In 2024, we upgraded our DMS to LINK v3.1 with the antibody rule out algorithm software(ROS). We currently perform our blood bank testing on 2 automated analyzers, Echo Lumena (Werfen, Norcross, GA). Our DMS upgrades have taken place every ~2 years with the most recent upgrade driven by our desire to implement ROS. The ROS upgrade required more labor hours to validate, which included performing the evaluation of multiple antibodies to confirm the antibody identification exclusion capabilities. We also purchased a panel with 8 known antibodies to assist with expanding the spectrum of antibody specificities and a quicker ROS "go-live". The steps were similar between our LIS & DMS upgrades (Table 1), but validation and training significantly increased with the LIS.

Table 1: Processing Steps and Labor Hours spent upgrading DMS and LIS software.

Processing Steps (Both Software Systems)	Average Data Management Software Upgrades: Including Antibody Rule Out Algorithm Labor (~Hours)	Average Laboratory Information Software Upgrade: Labor (~Hours)
Security/ new IP address	1.50	1.50
Validating Current Assays	4.75	40.00
Implementing Software Upgrade	1.00	1.00
Importing Software	0.50	6.00
SOP Revisions	1.25	15.00
Training Staff	2.10	6.30
Total	**11.10**	**69.80**

Table 1 demonstrates the data management software upgrades require similar steps to an LIS upgrade, but the labor hours is significantly less (~84%).

CONCLUSIONS:

Initially we believed it would be more difficult to implement a DMS software but realized its very similar to the LIS upgrade process. It did take more time to implement the antibody rule-out algorithm software as we needed more antibodies to challenge the system. Based on the current data we believe future upgrades will be similar in the process steps as the LIS. In this comparison, DMS required less lab hours (~84% less) than a LIS upgrade. Staff were very pleased to have the additional tools to assist with excluding antibodies, especially for the less experienced technologists. These upgrades do require time, but the benefits are well worth it: enabling us to download instrument results directly on the panel master list, rule out significant antibodies with an algorithm software, electronic review & storage the master lists, while decreasing potential for errors.

Abstract #5| POSTER

TITLE: The Impact of Preloading Instrument Reagents on Sample Turnaround Time

AUTHOR(S): Kelley Cowan, Werfen, Norcross, GA, Jamie L. Waldrop, St. Francis Emory Healthcare, Columbus, GA.

OBJECTIVE:

Staffing challenges and pressures to meet turnaround times (TAT) for patient testing pose a risk to patient care due to a decrease in qualified Medical Laboratory Scientists (MLS). When automated immunohematology instruments (AIHI) are used, TATs are reduced, and MLS can concentrate on more complicated tasks. Some AIHI allow the preloading of reagents with the assumption that this will further reduce TAT. A time study was performed to compare the operational efficiencies between two AIHI utilized in our laboratory, the Vision (Quidel Ortho Clinical Diagnostics, Raritan, NJ) and the Echo Lumena (Werfen, Norcross, GA).

METHODS:

Normal workload samples were tested on both analyzers using a scenario that reflects the usual receipt of samples: one type and antibody detection (TAD) started, 5 minutes later a second TAD was added, then one antibody identification panel (ABID) was started. Microcolumn Agglutination (Gel) cards and reagents were preloaded on the Vision as part of the daily startup process. The liquid reagents were preloaded onto the Lumena, but test strips were loaded with each sample. The Lumena allows for strip preloading, but it was not evaluated in this study. Start times were recorded as the time each sample completed centrifugation, just prior to loading samples on each analyzer. The end time was recorded as each assay completed on the respective instruments. Data was evaluated to determine the most efficient way to handle the defined patient testing.

RESULTS/FINDINGS:

Per Table 1, the Lumena completed all assays faster than the Vision. The first TAD was faster by more than 5 minutes and the ABID results were available almost 15 minutes sooner on the Lumena compared to the Vision. Results for the second TAD samples performed on the Vision completed faster than the first TAD. It was noted that the addition of the second sample added an additional 4 minutes to the first TAD TAT. Conversely, the second TAD performed on the Lumena took longer than the first. Overall, performing assays on the Lumena saved approximately 21 minutes.

Table 1: Time Study Comparison

Method	Time per Sample/Assay		
	1st TAD	2nd TAD	ABID
Echo Lumena	24 min 59 sec	26 min 09 sec	27 min 08 sec
Ortho Vision	30 min 12 sec	27 min 48 sec	41 min 40 sec
TAT difference	**5 min 13 sec**	**1 min 39 sec**	**14 min 32 sec**
Total time savings	**21 min 24 sec**		

Table 1 demonstrates processing times per sample/assay as well as total time saved for each by using the Echo Lumena.

CONCLUSION:

Although gel cards for the Vision were preloaded and test strips for the Lumena were not, there was no operational advantage or improved TAT noted on the Vision. Based on this study, using the Lumena was efficient at processing samples for TAD and ABID. There is potential for additional time savings on the Lumena if strips are preloaded, however, the interaction with the instrument is not decreased by preloading strips for either instrument. The end user still has to interact with the instrument when samples are loaded. The difference in TAT between the ABIDs indicates we could significantly reduce the time to provide blood to the patient when antibodies are present and improve patient care. The study indicated our ability to meet required TATs was more likely on the Lumena.

Abstract #6 | POSTER

TITLE: Maximizing Testing Volume with Minimum Space

AUTHOR(S): Ricardo Hernandez , Sarah Edwards, Banner University, Phoenix, AZ

BACKGROUND/CASE STUDIES:

With hospitals' limited space at a premium cost, doing more with less is important everywhere including in the Transfusion Medicine laboratory. Incorporating high volume testing while meeting required turnaround times is imperative, especially for trauma centers. Therefore, implementing a utomation to maximize patient safety and staff utilization within a limited physical space has become a priority. Our study was based on meeting space constraints and testing needs and was measured by calculating maximum testing per cubic centimeters (cm^3) for various instrumentation.

METHODS:

We retrospectively pulled the testing volume for 2022 for our level 1 trauma center, where we currently employ two Echo Lumena systems (Immucor, Norcross GA). We've determined that we perform an average of 30,617 test per Echo Lumena. This includes: ~28,000 ABO/Rh & antibody detection test (TS), 1800 antibody identification, pediatric blood types, weak-D and DAT(IgG). Due to various hospital transfusion needs within our healthcare system, we assessed Eflexis/Erytra (Grifols, Barcelona, Spain) instrumentation as well.

RESULTS/FINDINGS:

The results on the Echo Lumena for a high-volume blood bank, demonstrated 0.07 test per cm^3 (Table 1) which was almost 2X that of the Eflexis and 3X of the Erytra. This is an important factor in our decision-making process. It ensures our site could conduct the most testing per cm^3 as our volumes increase and the complexity of our patients become more challenging.

Table 1: Instrument Comparison (Tests per cm^3)

Weight (lbs/kg)	Instrument	Dimensions (inch)	Width (cm)	Depth (cm)	Height (cm)	Total per cm^3	*Tests (30617) per cm^3*
108/49	*Echo Lumena*	45x23x26	114	58	66	436392	***0.070***
381/173	*Eflexis*	43x28x36	110	71	91	710710	***0.043***
772/350	*Erytra*	43x28x69	110	70	175	1347500	***0.023***

CONCLUSION:

Based on testing capabilities per cm³, Immucor was the best choice for the standardization of our system. We implemented 32 Echo's in 21 facilities within our healthcare system, maximizing our space by positioning the small, lightweight Echo on our standard work bench without modifications. In the rare instance where volumes fell below ~300 TS annually, a manual gel workstation remained, with Grifols' (5). We plan to maximize the utilization of our Echo automation by expanding our test menu including cord bloods. With each assay we implement, we increase our testing per cm³. In the future, we will need to monitor our maximum capacity per instrument; however, today we are meeting all our metrics including turnaround times. We appreciate the Echo Lumena's compact size for our smaller transfusion facilities, yet the high-volume testing for our busier blood banks.

Abstract #7 | ORAL

TITLE: **Prevalence of the Mia antigen in a Multi-Ethnic Donor Population**

AUTHOR(S): KLatngsley, Kelley Bowman, Shen Liang, Stephanie Kelham; LifeShare Blood Center, Shreveport, LA

BACKGROUND:

The GYPA and GYPB genes of the MNS blood group are known for gene conversion or crossover events leading to hybrid glycophorins. These hybrids express a variety of low prevalence antigens of clinical importance. Most notable, are hybrids expressing Mi(a) with other low prevalence antigens. Though highest in East Asian populations, antibodies to antigens of these hybrids have also been reported in Europe, North America and Australia.

STUDY DESIGN/METHODS:

Donor samples were submitted for genotyping using an in-house selection algorithm. Donor ethnicities were self-reported and included African American, Asian, White, Hispanic and Other. DNA was extracted on the QIAcube using the QIAamp DNA Blood Mini Kit (Qiagen, Hilden, Germany) and genotyped using the HemoSelect targeted next generation sequencing assay (HaploGNX, San Diego, CA). When available, RBCs were phenotyped to confirm the presence of the Mia antigen (Immucor, Norcross, GA; research use only reagent).

RESULTS/FINDINGS:

Of the 15,590 samples genotyped, 2707 (17.4%) were from African American donors; 178 (1.1%) were from Asian donors, 11,560 (74.1%) were from White donors, 1035 (6.6%) were from Hispanic donors and 110 (0.7%) were from donors self-identified as Other. Sixty-three samples were identified as having an MNS hybrid glycophorin known to express the Mia antigen. Of these, 20 were GP.Vw (GYPA*09), 17 were GP.Hut (GYPA*19), two were GP.Mur (GP.501), 23 were GP.HF (GYP.504), and one bears a novel mutation. Forty-nine of the 63 samples were confirmed Mi(a+) by serology. Phenotype confirmation is pending on the remaining 14 samples as RBCs were unavailable for confirmation at the time of genotype testing. No Mi(a+) samples were identified via a GP.Hop or GP.Bun mutation and no samples had negative results with Mia antisera. Of the GP.HF, two homozygous examples were identified, one from an Asian donor and one from an African American donor. Both of which also possess a variant s antigen.

CONCLUSION:

Numerous reports have been published detailing cases of mild to severe HDFN as well as mild to severe hemolytic transfusion reactions resulting from antibodies to antigens present on these MNS hybrid glycophorins. However, limited data exists identifying ethnic groups shown to possess the antigens. This report demonstrates frequency of these low frequency antigens as detected in this multi-ethnic donor population.

Phenotype Name	Allele Name	Ethnicity	Number Tested	Number Positive	Antigen Frequency (%)
GP.Vw	GYPA*09	African American	2707	1	0.04
		Asian	178	0	-
		Caucasian	11,560	17	0.15
		Hispanic	1035	2	0.19
		Other	110	0	-
GP.Hut	GYPA*19	African American	2707	14	0.52
		Asian	178	0	-
		Caucasian	11,560	2	0.02
		Hispanic	1035	1	0.01
		Other	110	0	-
GP.Mur	GYP.501	African American	2707	2	0.07
		Asian	178	0	-
		Caucasian	11,560	0	-
		Hispanic	1035	0	-
		Other	110	0	-
GP.HF	GYP.504	African American	2707	7	0.26
		Asian	178	14	7.87
		Caucasian	11,560	0	-
		Hispanic	1035	1	0.01
		Other	110	1	0.91
Novel	Pending	Asian	N/A	1	N/A

Abstract #8 | POSTER

TITLE: **Key Factors for Timely Instrument Implementations**

AUTHOR(S): Lauren Russell, National Blood Testing Cooperative; Regina Castor, Werfen; Kelley Cowan, Werfen

OBJECTIVE:

Donor testing centers often experience swift changes. Facilities grapple with the pressures of budget reductions and limited staffing, all while striving to adhere to turnaround time requirements. The challenge intensifies when transitioning to new automated analyzers. This research entails a retrospective analysis of implementing two vendor instrument systems. One instance involved setting up a new facility, while the other occurred during ongoing testing operations.

METHODS:

This study involved a review of key milestones involved with two separate instrument installations. Communication strategies, personnel resources, logistics, and other aspects of the project management were reviewed for both installation events. Activities conducted pre-implementation that were crucial to the project's success were identified.

RESULTS:

In 2019, 3 Grifols Erytra (Grifols, SP) analyzers for donor testing were implemented. This was a new facility allowing easy access and workflow design in collaboration with the vendor. Implementation was streamlined; the laboratory team was dedicated to implementation and validation of the analyzers without the pressures of operating a 24/7 donor testing laboratory.

In 2024, 6 NEO Iris instruments (NIRIS), (Werfen, Norcross, GA) were implemented with a new vendor contract. New challenges arose as it was required to maintain current high-volume testing while validation occurred. Adequate space was available to place all 6 instruments until existing analyzers could be moved out. Based on the need to validate quickly all 6 NIRIS were installed at the same time. Table 1 provides a comparison of several key elements.

Table 1: Implementation Comparison Chart

Elements	Implementation #1	Implementation #2
# of instruments	3 followed by 1 more at a later date	6
Sample testing volume	Estimated (new facility)	Historical data available
Throughput needs	Estimate (based on projected volumes)	Historical data available
Required new training processes	Yes	Yes
Time between Vendor Proposal to Installation	~5 months	~4 months
Vendor Provided LEAN	No	Yes
Instrument Evaluation prior to implementation	No	Yes
Training:	3 techs trained by vendor	11 techs trained by vendor, additional onsite training provided by vendor
Video Training	No	Yes
Vendor Education "on Demand" presentations available	No	Yes
Instrument delivered (PO to delivery)	~1 month	2 days (local)
Pre- meetings to discuss implementation	Yes	Yes
Application Specialists and Field Service Engineers provided for IQ and OQ	2	9
Installation Qualification (IQ) of all Instruments	2 weeks	1 week
Lab layout	New Lab- open	Constrictive: current instrumentation
Gantt charge with constringent timelines included	No	Yes

Table 1 represents comparison of some key elements of instrument implementations.

CONCLUSION:

The comparison allowed for identification of key differentiators that expedited the installation process. During the second event, conducting a direct instrument comparison allowed for a deeper insight into instrument throughput, performance, and user-friendliness. Additionally, facilitating a LEAN workflow study by the vendor enabled them to grasp the workflow, needs, logistical challenges, and pain points, thereby aiding in more effective implementation planning. The LEAN and the evaluation both helped in setting proper expectations as to how many instruments were needed to meet volume requirements with extra capacity for growth. Another lesson learned with the ever-present work-force shortage, turnover and increased work pressures was pushing for more training and troubleshooting to better support the team through implementation and beyond to help the team feel comfortable with new methodology. The need for consistent, open communication throughout implementation cannot be overstated. As technology evolves and needs shift, it's important to keep these key distinctions in mind.

Abstract #9 | POSTER

TITLE: Alternative QC on the Ortho Vision

AUTHOR(S): Regina Castor, Werfen, Norcross, GA; Jamie Waldrop St. Francis Emory Healthcare, Columbus, GA

OBJECTIVE:

Instrument reagent Quality Control (QC) is fundamental to ensuring accurate patient results. When there are backorders or another unforeseen circumstance, instrument reagent QC can be unavailable. In such a circumstance, a facility may switch to manual testing if that QC material is available and there is sufficient lab staff to perform testing. Transfusion facilities dependent on automation or experiencing a staff shortage may be forced to use expired QC material especially if instructed by the manufacturer to do so. After our facility experienced such a scenario, an alternative source of QC material was desired. Currently, our facility uses the Vision (Ortho Clinical Diagnostics, Raritan, NJ) for patient testing with daily AlbaQ Check QC (AQC) by Alive Dx (Eysins, Switzerland). WBcorQC (Werfen, Norcross, GA) is intended to be used as a set of controls for the daily QC of blood bank reagents on the Galileo Echo v2.0 and Echo Lumena (Werfen, Norcross, GA). This study documents our feasibility assessment of using WBcorQC on the Vision.

METHODS:

Vision QC requirements were assessed, and QC settings were modified to define the WBQC samples as QC samples. Components of each manufacturer's QC were assessed (Table 1). WBcorQC samples were centrifuged and tested on the Vision analyzer to determine if WBcorQC could run to completion and produce acceptable results.

	AlbaQ Check QC Components	WBcorQC Components
Vial 1	A Rh (D) Neg (rr) containing Anti-B and Anti-D	A Rh (D) Pos, C+c-E-e+K+k+ red blood cells containing anti-B and anti-c in diluent
Vial 2	Group O Rh(D) Pos (R1R1) containing Anti-A, Anti-B, and Anti-c	B Rh (D) Neg, C-c+E-e+K-k+ red blood cells containing anti-A and anti-D in diluent
Vial 3	Group B Rh(D) Pos (R1r) containing Anti-A	O Rh (D) Pos, C-c+E+e-K-k+ red blood cells containing anti-A and anti-B in diluent
Vial 4	Group A2B Rh(D) Pos	O Rh (D) Pos, C+c+E+e+K-k+ red blood cells containing anti-A and anti-B in diluent

Table 1: QC Kit Components

RESULTS:

WBcorQC successfully ran to completion on the Vision. Results obtained matched the expected reactions for WBcorQC based on the package insert thus qualifying the instrument and reagents for use.

CONCLUSION:

With proper verification, WBcorQC can be successfully used to satisfy QC requirements for the Ortho Vision. This gives us a viable alternative when unforeseen circumstances occur. Being prepared with alternatives also gives our medical directors and staff added confidence that they will not have to resort to manual testing. By validating an alternative, it prevents us from deviating from our quality processes. We suspect that WBcorQC might provide standardized QC material for antigen typing on the Vision but was not evaluated at this time.

Abstract #10 | POSTER

TITLE: Validation: Effect of Facility Size/Type on Correlations

AUTHOR(S): Regina Castor, Ryan J. Whitmarsh, Werfen, Norcross, GA

OBJECTIVE:

During the process of instrument validation, correlations between an established method and the new method are typically performed. Although correlation testing is common, the number of correlations performed has been observed to be variable due to a variety of factors. A manufacturer of automated immunohematological test systems (Werfen, Norcross, GA) evaluated the average number of correlations performed for ABO/RH (type) and antibody detection (screen) assays at varying sizes/types of facilities to evaluate the effect the size of the facility had on the number of correlations performed.

METHOD:

A retrospective review was conducted on the number of correlations performed at 190 facilities installing automated instruments between 2018 to 2023. Data was gathered either from the number of correlations specified in the validation plan or from final summaries prepared at the conclusion of the validation. The mean of the number of correlations performed and the annual volume for types and screens were compared and stratified by bed size. Hospitals were categorized by number of beds while donor centers and clinics were grouped separately (other). An ANOVA (Analysis of Variance) was performed for each assay to determine if there was a significant trend between the number of correlations and hospital size.

RESULTS:

The average number of correlations performed for small facilities (< 250 beds), for medium size facilities (250-499 beds), for large size facilities (≥ 500 beds), and donor centers/clinics (listed as Other) are listed in Table 1.

Table 1. Number Of Correlations and Annual Volume of Type And Screen Assays By Hospital Size

	TYPE					SCREEN				
	Correlations*			Annual Volume		Correlations**			Annual Volume	
Bed Size	N	Mean	StDev	Avg	StDev	N	Mean	StDev	Avg	StDev
0-249 SMALL	78	36	22	5,167	6,206	77	33	23	4,608	5,161
250-499 MEDIUM	63	41	38	10,760	5,892	63	41	38	9,472	4,360
≥ 500 LARGE	38	72	53	31,260	21,244	38	72	53	28,782	19,967
Other	10	182	207	40,278	32,823	10	175	200	84,063	117,222
Total	189	53	66	14,358	17,342	188	51	65	14,976	30,804

**ANOVA p=<0.0008*

***ANOVA p=<0.0008*

CONCLUSION:

For both type and screen assays, the number of correlations was positively associated with hospital bed size (p=<0.0008). Further analysis revealed that comparisons between small and medium hospitals displayed no such difference. Statistical significance was only observed when large facilities were compared to small or medium ones. This suggested a trend that large facilities may behave fundamentally differently than smaller hospitals in the number of correlations and volume of testing they can perform.

Abstract #11 | ORAL

TITLE: The Prediction of Transfusion Requirements Using Machine Learning

AUTHOR(S): Michael De La Rosa, B. Eastridge, D. Dent, D. Jenkins; University of Texas Health Sciences Center at San Antonio

BACKGROUND/CASE STUDIES:

Trauma is a leading cause of mortality worldwide, with hemorrhage accounting for a substantial proportion of preventable deaths. In emergency settings, waiting for laboratory results can delay critical blood product administration. To address this challenge, artificial intelligence (AI) techniques were used to predict the need for transfusion using data available at the time of initial hospital presentation.

STUDY DESIGN/METHODS:

Data from the Trauma Quality Improvement Program (TQIP), a national trauma database, was used to train and evaluate several prediction models. These included traditional statistical models—Logistic Regression, Lasso Regression, and Ridge Regression—as well as more advanced machine learning models—Random Forest and XGBoost.

The dataset was split, with 80% used to train the models and 20% held out for testing. Five-fold cross-validation was applied to the training set to tune model parameters. Model performance was primarily assessed using the Area Under the Receiver Operating Characteristic curve (AUROC), which measures how well the model distinguishes between patients who did and did not require transfusion.

For the best-performing model, accuracy, sensitivity (the ability to correctly identify patients who needed transfusion), and specificity (the ability to correctly identify those who did not) were reported. Finally, Shapley values, a method for model interpretability, were used to determine which patient features had the greatest influence on the model's predictions.

RESULTS/FINDINGS:

Logistic Regression, Ridge Regression, and Lasso Regression achieved similar performance, each with an AUROC of approximately 0.813. Random Forest and XGBoost outperformed them, with AUROCs of 0.842 and 0.858, respectively. Table 1 shows the classification metrics for XGBoost, the top-performing model, using a 14% transfusion probability cutoff to maximize accuracy, sensitivity, and specificity. Shapley value analysis identified the five most important features as: Injury Severity Score (ISS), age, highest hospital trauma activation level, systolic blood pressure, and pulse rate.

CONCLUSION:

AI-based models, particularly XGBoost, demonstrate strong performance in predicting transfusion needs in trauma patients. These tools may aid clinicians in making timely transfusion decisions. Based on model performance and interpretability, AI holds promise as a clinical decision support tool in trauma settings.

Metric	Value
Accuracy	0.855
Sensitivity	0.631
Specificity	0.877
Positive Predictive Value	0.334
Negativ Predictive Values	0.961
F1 Score	0.437
Positive Likelihood Ratio	5.140
Negative Likelihood Ratio	0.420