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Using automation to manage donor engagement and fine-tune supply and demand during the first year of the COVID-19 pandemic

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ABSTRACT

Background: COVID-19 disrupted blood center operations starting March 2020 and continues to affect donor presentation and blood availability today. The industry mobilized significant resources to collect COVID-19 convalescent plasma (CCP) to treat COVID-19 patients. At the same time, blood centers continued to collect platelets, plasma, and red blood cells (RBCs) to meet the needs of non-COVID-19 patients. The purpose of this study was to quantify how automation was used to fine-tune supply and demand and increase donor engagement during the first year of the pandemic.

Methods: This was a single-center retrospective study of blood collection and donor presentation at a mid-sized US blood center. Data was evaluated from January 1, 2020 through March 31, 2021. Parameters evaluated included donor presentation, platelets per procedure, concurrent RBC and plasma collections per procedure, operator compliance, total donor appointment count, and donor frequency.

Results: With the cancelation of mobile blood drives, fixed sites increased total apheresis procedures by 37% and increased turns per bed by 46% whereas less products were collected per donor. By collecting only what was needed, platelet expiration rate decreased from 6.8% (pre-pandemic) to less than 4%. Donor engagement as measured by donor frequency increased from 1.6 in January 2020 to 1.8 in March 2021.

Conclusions: Using technological advances such as automated blood collection and information systems, the blood center improved donor engagement and avoided collecting a surplus of any one type of blood product over the course of the pandemic.

1. Introduction

Blood collection and blood usage were significantly disrupted by the COVID-19 pandemic [1–4]. Blood product demand became unpredictable, especially in the first months following the March 2020 lock down [1–4]. In the early months of the pandemic, blood drives were canceled, donors stopped presenting, and hospitals reduced elective surgeries [3]. Blood centers were also challenged during the COVID-19 pandemic to collect COVID-19 convalescent plasma (CCP). Government agencies, national and regional blood centers mobilized significant resources to collect an unprecedented 500,000 units of CCP in the US [1,5]. While CCP took center stage, blood centers continued to collect whole blood, platelets, plasma, and red blood cells (RBCs) to meet the medical needs of non-COVID-19 patients.

Unpredictability in blood donor presentation and blood product availability continues to be an issue today. Blood centers and the transfusion medicine community continue to adjust donor recruitment and blood product collection strategies to meet patient needs. The purpose of this study was to quantify how automation was used to fine-tune supply and demand at a regional blood center during the first year of the COVID-19 pandemic, which resulted in increased donor engagement.

2. Materials and methods

2.1. Data collection and analysis

This was a single-center retrospective study to evaluate blood
collection and blood donor presentation at a mid-sized US blood center during the COVID-19 pandemic. Gulf Coast Regional Blood Center serves over 170 health care institutions with over 320,000 whole blood and apheresis collections per year. The blood center employs approximately 700 employees with 17 fixed site locations and typically holds 7000 mobile blood drives per year.

Data was evaluated from January 1, 2020 through August 30, 2020 for apheresis procedure analysis and March 31, 2021 for donor frequency analysis. Data from focus lists and collections on the Trima Accel Automated Blood Collection System (Terumo Blood and Cell Technologies, Lakewood CO) were accessed through the Vista Information System (Terumo Blood and Cell Technologies, Lakewood CO). Gulf Coast collected donor presentation data using procedure dashboard reports to evaluate the frequency and effectiveness of recruitment programs. Blood donors were not given financial compensation for their donation.

2.2. Definitions

For the purpose of this study, platelets per procedure (also known as split rate) is calculated as the total number of platelets units collected divided by the total number of completed apheresis procedures. Single-component procedure rate is calculated as the number of procedures where only one blood product (typically a platelet) is collected divided by the total number of completed apheresis procedures. The plasma components per successful procedure is the total number of plasma products collected concurrently with apheresis platelets divided by the total number of completed apheresis procedures. The RBC components per successful procedure is the total number of RBC products collected concurrently with apheresis platelets divided by the total number of completed apheresis procedures. A Focus list is the prioritization of procedure types (e.g., triple platelet, double platelet plus plasma, double platelet plus RBC) programed into the Vista System and transmitted to all Trima apheresis devices. The platelet expiration rate in this study was calculated as the number of successful donations divided by the number of platelets that expired in-house or shipped to further manufacturing as a non-transfusable product. Donor frequency is calculated as the number of donations per donor. Donor eligibility complied with the US FDA and AABB guidelines.

3. Results

3.1. Blood center operations

Between March 2020 and May 2020, the blood center observed a 52% decrease in RBC demand and a 30% decrease in platelet demand. At the same time there was outpouring of donors who wanted to donate blood. During this period, apheresis platelet collections were intentionally continued to maintain donor appointments and donor engagement. Apheresis collections were restricted to single platelet collections after the daily platelet goal had been met. There was a 46% increase in turns per bed comparing pre to post COVID-19 to accommodate the surge of donors. Apheresis procedures increased by 9.3% and components collected increased by 9.5%.

Fig. 1 depicts the disruption in total donor presentation during the first months of the COVID-19 pandemic representing the uncertainty amid canceled blood drives and lock downs. Fig. 1 includes CCP donors as CCP donors were treated the same as regular blood donors and asked to donate different blood products based on inventory needs. Prior to March 2020, donor presentation was steady. There was a small decrease starting March 8, 2020 when media attention towards COVID-19 intensified. There was a sharp increase in donor presentation between March 17 and 20, 2020 when the Surgeon General encouraged citizens to donate blood. After that initial surge, the blood center transitioned to "appointment only" donations to control the number of donors presenting. Slowly, blood donor presentation recovered back to normal levels by July 2020 while still operating by "appointment only".

As operations adjusted to the uncertainties of blood demand and blood donor presentation prompted by the pandemic, the blood center started a CCP collection program. CCP donors were identified and contacted using a variety of marketing channels. CCP was collected as plasma-only procedures on the Trima Accel system. CCP collections started as early as April 2020 ramping up to 800 apheresis plasma procedures per month by December 2020. A total of 3616 apheresis plasma procedures were performed resulting in the production of 11638 units of CCP (200 mL) between April and December to support COVID-19 patients.

3.2. Fixed sites

Mobile blood drives were completely suppressed for a two-week period in March 2020 and then operated on a limited basis. With reduction in blood supply resulting from decreased quantity of mobile
blood drives, the deficit of blood had to be collected at fixed sites. Fig. 2 presents a closer look at daily apheresis collections from March 1 to June 30, 2020. Plasma and RBC collections were suspended for a two-week period (end of March to mid-April 2020) due to canceled elective surgeries resulting in an industry surplus [2,3]. The blood center’s goal during this period was to maintain donor engagement, especially for frequent apheresis platelets donors. Donor frequency was maintained by keeping donor appointments and maintaining the same number of donation slots in the blood center’s scheduling system. Generally, donor habits and behaviors were not disrupted; there was only one day during this period where no platelet products were collected, which corresponded to the Easter holiday.

While the goal was to maintain apheresis platelet donor appointments and donation habits, collection targets were changed to prevent collecting a surplus of platelets. During this period, apheresis collections were limited to a single platelet unit per donor as reflected in the increase in single-component procedure rate (Fig. 2). Typically, blood centers will maximize the number of blood products collected per donor by apheresis (double platelet or triple platelet collections with concurrent plasma or RBC), however during COVID-19 the blood center made the conscious decision to collect single platelet units to maintain donor engagement. Prior to COVID-19, the single-component procedure rate was maintained below 10%, which ensured that multiple blood products were collected per donor (Fig. 2). Between the end of March to mid-April 2020, the single-component procedure rate increased as high as 60%, meaning that 60% of donors donated a single platelet product. After that, concurrent RBC collections resumed at a higher rate compared to the pre-pandemic timeframe as elective surgeries resumed (Fig. 2). Double RBC collections also resumed at a higher rate in between May and July 2020 to accommodate the surge in elective surgeries (data not shown). Fig. 2 includes the number of collections of concurrent plasma but does not include CCP which was collected during plasma-only procedures on the Trima Accel system.

Following the initial focus to maintain apheresis platelet donor engagement in March and April 2020, the blood center strategy shifted to collect only enough products to meet demand. The number of platelet products collected was intentionally set lower than the potential number of platelet products that could have been safely collected from the donor base. Collections ‘focus lists’ were created, working backward from platelet demand calculated by local demand minus daily percent decrease for in-region hospitals only to determine the number of appointments needed. ‘Focus lists’ established the priority of product combinations (platelets, plasma, and/or RBC) collected by apheresis from donors based on hospital demand and donor availability. Since the pandemic, on average 10% less apheresis platelet products were collected than what was possible on the Trima Accel system (Fig. 3). By collecting only what was needed, the platelet expiration rate decreased from 6.8% (pre-pandemic) to less than 4%.

The culmination of adjustments made at fixed sites resulted in an increase in total apheresis procedures completed on the Trima Accel system by 37% in 2020 compared to 2019. This corresponded to an increase in Trima Accel utilization from roughly 2000 apheresis procedures per month to 2500–3000 procedures per month in the later months of the pandemic.

3.3. Operator compliance

Prior to October 2020, blood center leadership would communicate the prioritization of what procedures and products should be collected to collections staff on a weekly and sometimes daily basis. The operator could select the optimal procedure offered by the device (typically collecting the most desired blood product types based on donor demographics) or the operator could select a less desirable procedure type. Prior to the pandemic, the compliance rate (rate at which operators selected the optimal procedure offered by the device) was 80%.

By October 2020, blood center leadership had a clear picture of demand and wanted to collect only what was needed to meet hospital
product needs were checked when donors arrived irrespective of what
to pre-qualify before presenting. Donor eligibility, blood type, and
almost 100% compliance of operators collecting the optimum procedure
instantaneously. For example, in October 2020, triple platelet collec-
blood type. Most donors were eligible to donate something, even new
collecting the same blood products from same donors with a certain
converted to donate blood products to meet demand rather than always
when their associated group would host a blood drive. Donors were
advertising. Donors were contacted when they become eligible, not just

3.4. Mobile blood drives

There was a 44% decrease in the number of organizations that hosted
blood drives in 2020 compared to 2019, corresponding to a loss of
38,652 units (23% of units collected on mobile blood drives). High
schools, which routinely host mobile blood drives, decreased partici-
pation by 24,780 units and businesses decreased participation by 12,892
units year over year. Leadership responded by increasing community
blood drive collections by 12,476 units and church blood drive collec-
tions by 10,089 units year over year.

Before COVID-19, 60% of donations (defined as ‘needle in the arm’
and includes both whole blood and apheresis) were collected in mobile
blood drives whereas during early COVID-19, that number dropped to
40%. As of January 2021, 50% of donations are collected in mobile
blood drives with the goal to reach 60% again in the future. Despite the
disruptions caused by the COVID-19 pandemic, the number of units
collected on mobile blood drives was down only 3% in first quarter 2021
compared to first quarter 2020 before the pandemic.

3.5. Donor engagement

Leadership adjusted their donor recruitment strategy to ensure sup-
ply met demand while not turning away donors. Mobile donors were
recruited to fixed sites through various retention strategies, including
tele-recruitment, email communications, texting program, and targeted
advertising. Donors were contacted when they become eligible, not just
when their associated group would host a blood drive. Donors were
converted to donate blood products to meet demand rather than always
collecting the same blood products from same donors with a certain
blood type. Most donors were eligible to donate something, even new
donors who failed to qualify to donate CCP. CCP donors were not treated
differently; they were not required to designate interest in donating CCP
to pre-qualify before presenting. Donor eligibility, blood type, and
product needs were checked when donors arrived irrespective of what
the donor intended to donate. Blood donors including CCP donors were
not given financial compensation for their donation.

Appointment scheduling management was used to control the flow
of donors by location and by device to ensure all donors were processed
without collecting excess products. Sixty-four percent (64%) of donors
booked their own appointments and donors were generally booking 2–3
weeks in advance. The show rate was 72%. Fig. 4 depicts the total
appointment count over the course of 2020.

The primary metric to quantify donor engagement is donor fre-
quency, calculated as donations per donor. Fig. 5 plots the donation
frequency as a rolling 12-month average. Donation frequency was 1.6 in
January 2020 and reach 1.8 in March 2021, an increase of 12% over the
course of the pandemic.

4. Discussion

Gulf Coast Regional Blood Center experienced an outpouring of do-
nors during the COVID-19 pandemic. The primary goal during the
COVID-19 pandemic was not to turn away donors, in particular apher-
esis platelet donors. It has been established that even temporary de-
ferrals hurt future donation behavior [6]. In addition to not turning
away donors, appointments were kept to maintain the cadence and
habitual behavior of repeat apheresis donors. Leadership also made
the intentional decision to collect fewer blood components per donor, which
in many cases meant only collecting a single apheresis platelet product.
This increased number of turns per bed which increased donor fre-
cuency (Fig. 5). In this manner, the blood center was able to maintain
donor engagement and avoid collecting a surplus of any one type of
blood product.

One primary tool used to ensure that the blood center only collected
what was needed was the focus list. Focus list allow centralized control
of the priority of blood products to be collected by apheresis devices.
Focus lists were adjusted as needed to match hospital demand. Leader-
ship then provided clear communication that collections staff collected
the optimum procedure offered by the apheresis device. The success of
this approach was measured by an increase in compliance and a
decrease in platelet outdate rate.

Another tool that contributed to the blood center’s agility in meeting
demand for blood products was use of automation, specifically apher-
esis. Use of apheresis grew from 16% in 2009 and 35% in 2020. The
flexibility of the Trima Accel system, which can collect platelets, plasma
or RBC in any combination, helped in the responsiveness of the blood
center to collect what was needed including the collection of CCP.
During the study period, the apheresis disposable kit use, donor pre-
sentation and staff hours remained the same; total number of blood
products collected decreased to match hospital demand.

Donor recruitment strategies also evolved to meet the disruption in
donor presentation caused by the pandemic. Donors were required to
make appointments to control flow, which resulted in almost doubling
the total number of appointments compared to pre-pandemic levels.
Also, donors were converted to donate what was needed instead of what they expected to donate when they presented. This was a crucial change in philosophy leading to successful conversion of donors to only collect what was needed. Conversion is part of the culture; all individuals who interact with the donor have a responsibility to convert donors based on blood product needs. Improvements to donor engagement strategies resulted in an increase of 9.5% in donor frequency.

This study included analysis of data captured during the first year of the pandemic. As we approach the third year of COVID-19, blood centers continue to struggle with donor presentation and maintaining an adequate blood supply [7]. Despite pandemic related challenges, Gulf Coast Regional Blood Center continues to see an increase in donor presentations, and products collected. The center increased donor presentations from 2020 to 2021 by 1%, and product collections by 1.23%. Mobile blood drives reached a record high count in 2021 at 7600 drives. The center is currently working on increasing the average size of blood drives and onboarding more high school participation that was lost during the first two years of the pandemic. Once accounting for 28% of mobile collections, blood drives at businesses continue to struggle at 18% of collections, as many employees continue remote work. The collection distribution between mobile blood drives and fixed sites remains a 50/50 split, however, with businesses and high schools returning to the program, the center expects to see a shift in distribution by the end of 2022. Hospital usage remains steady with an 8% increase year over year.

As an independent blood center who faces challenges related to size and geographical footprint when it comes to purchase power and competitive threats, independence was the key to success. Being nimble and having the flexibility to quickly make decisions regarding in-house testing, collections models, marketing strategy, and manufacturing operations allowed for a greater community response that helped save lives.

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CRediT authorship contribution statement

Theresa Pina: Conceptualization; Data curation; Formal analysis; Methodology; Validation; Project administration; Writing – review & editing. Marc Lewis: Conceptualization; Data curation; Formal analysis; Methodology; Validation; Project administration; Writing – review & editing. Charity Garrison: Data curation; Formal analysis; Investigation; Software; Writing – review & editing. Anna Razatos: Formal analysis; Visualization; Writing – original draft.

Declaration of interest

CG and AR are employees of Terumo Blood and Cell Technologies which manufactures the Trima Accel Automated Blood Collection System and the Vista Information System.

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Fig. 5. Rolling average of donor frequency calculated as donations per donor.