

# Time for a Paradigm Shift: The Advantages of NexSys PCS and NexLynk DMS

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## Executive Summary

The plasma industry has entered a new phase of its growth where the demand for plasma protein therapies creates a substantial risk of outstripping the industry's ability to efficiently deliver the necessary source plasma.

The demand for plasma protein therapies is projected to grow at an 8% compound annual growth rate (CAGR) through 2025. The key driver for growth is IgG with new therapeutic indications, expanding geographic territories, and expanding treatment options all contributing to the rise in demand. With recombinant alternatives not being a near term threat to IgG, there is little reason to believe this growth will slow.

In 2015 approximately 48 million liters of plasma were fractionated. It is expected that more than 90 million liters will be needed in 2025 to meet the rising demand. Given that donor center average yield per collection is 755 mL in the United States and substantially lower in other geographies, more than 100 million collections will be required by 2025.

Historically, collection growth has been achieved by opening new centers in the United States, where approximately 80% of source plasma is collected. In order to keep pace with end market demand, plasma center collections in the United States have grown ahead of drug sales. However, a strong U.S. economy is driving competition for donors and pressure will continue to grow on the supply of source plasma.

Given these conditions, a paradigm shift is required: productivity must improve across both established and new centers. And Haemonetics offers the tools and technology to support the shift based upon four essential pillars: 1) Increased yield per collection; 2) Increased center productivity; 3) Increased safety and quality; and 4) Increased donor satisfaction.

To address the needs of this new phase in the industry's development, Haemonetics has introduced the NexSys PCS<sup>®</sup> plasma collection system and bi-directionally integrated NexLynk DMS<sup>®</sup> donor management system. Since Haemonetics formally launched the NexSys PCS platform in July of 2018, we have converted over 140 plasma centers from our prior generation PCS<sup>®</sup>2 plasma collection devices to this powerful new platform.

## Current Environment for Plasma Collection

The steady rise in world demand for plasma protein therapies has created a long period of growth. From 2013-2017, The Marketing Research Bureau estimates IgG use grew at a CAGR of 7.8%, and is projected to grow at 8% annually through 2023. Some companies have reported IgG revenue growth as high as 11% in recent years. In parallel, industry revenues, including recombinants, grew from approximately \$5 billion in 2002 to \$21 billion in 2017, a 10% CAGR. This level of growth is broadly expected to continue.

Because of this growth, the demand for plasma is unrelenting. With 90 million liters needed to meet the estimated demand for IgG in 2025<sup>1</sup>, estimates are more than 100 million collections will be required. The industry is responding by continually adding new collection centers. The number of centers in the United States, the largest market for collections, has increased from 300 in 2005 to over 730 in 2018 with over 42 million collections. And while new centers are opening in Europe and China, the U.S. now exports the equivalent of 18 million liters to the rest of the world. Global demand will continue to be met – or at a minimum be substantially augmented - by the United States for the foreseeable future.

If the United States is going to meet that demand, collection must continue to grow through a combination of increased throughput at existing centers, new center expansion, and safely collecting more plasma per donation. Fundamental to any increase in collections is attracting and retaining plasma donors with a safe, efficient, pleasant, and rewarding donation experience.

## **The Challenges**

Center operators face many challenges in meeting collection goals.

Historically, collectors have met growing demand using two tools: adding more centers and increasing donor fees. Unfortunately, continuously adding centers requires substantial resources: locating and building out centers, delays in reaching full production due to FDA certification processes, navigating geographic limitations due to local regulatory limitations, and the subsequent risk of diminishing returns as optimal locations are crowded by competing plasma collectors. It also exposes collectors to a bidding war for donors where fees compete with other collection centers and other economic opportunities.

But there are also less obvious hurdles to success. First, collections are done based on the simpler of the two FDA approved nomograms leading to an average of 23 mLs of plasma not being collected per donation. Second, under draws and other errors as well as poor donor retention lead to missed targeted yield and orphaned donations. Third, paper based record keeping, use of cumbersome handhelds information devices, and indistinct, sound based error messages lead to staff inefficiency and longer than necessary donations. Fourth, donors do not stay engaged. PPTA sponsored analysis shows the majority of donors stop participating after an average of six to seven months of their first donation<sup>1</sup>

The solution is a renewed focus on improving center productivity, capacity, and efficiency. NexSys PCS with YES™ technology, bi-directionally integrated with NexLynk DMS enable this shift by increasing yield, decreasing the time to collect, improving compliance, and increasing donor satisfaction. The end result is more plasma collected with more efficient use of center resources.

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<sup>1</sup> 2017 George Brooks Schreiber, ScD; Mary Clare Kimber, JD analysis performed for the PPTA; Stat references 51-100% of donors donated 7 times (or fewer) within the last 12 months

## **Background on NexSys PCS**

The NexSys PCS is Haemonetics' latest plasmapheresis device, developed to update and replace the 25 year old PCS2. While the NexSys PCS leverages the same centrifuge technology found in the PCS2 and uses the same consumable products, the similarities end there.

Developed in conjunction with donor floor personnel, technicians, collection center management, quality leaders, and staff trainers, the NexSys PCS is designed specifically to increase yield and improve operations on the donor floor. In addition to the YES technology's yield enhancements, the NexSys PCS is designed to optimize efficiency and ease of use by:

- Enabling automated collection and donor engagement cues;
- Utilizing the new user interface to create step-by-step workflow support;
- Allowing real time procedure monitoring and intervention prompting;
- Integrating a simplified centrifuge cover lock;
- Including easier-to-load line sensors;
- Integrating a barcode scanner for consumables lot tracking; and
- Providing an internal design which is easier to service.

Taken together these features, fully integrated with NexLynk DMS, changes the collection paradigm today and creates a powerful innovation platform to continue to substantially progress the efficiency and cost effectiveness of plasma collection.

### **The NexSys / NexLynk Difference: Increased Yield**

The paradigm shift begins with increased yield from Haemonetics' YES technology. The NexSys PCS' ability to manage donations based on plasma volume collected, not total volume, allows collectors to use the FDA's more calibrated nomogram.

While the PCS2 device has a "short prime" mode which reduces the amount of anti-coagulant in the collection bottle, the NexSys PCS platform goes beyond by introducing new hardware and software technology that enables the precise targeting of pure plasma collection volume versus the more basic total donation volume. Under long standing FDA guidelines, the use of a target plasma collection volume allows more efficient donations. For example, a 180 pound donor with 45% hematocrit can donate either 800 mL of plasma under the target plasma volume approach or 880 mL of under the total volume approach. The average total pure plasma in an 880 mL total volume donation from this kind of donor is 777 mL, 23 mL less plasma than the more calibrated nomogram.

In over 4 million donations across more than 140 centers, customers are collecting an average of 23 mLs more plasma per collection. The gains from YES technology are not theoretical; they are happening today in centers across the United States.

### **The NexSys / NexLynk Difference: Improved Productivity**

Improved productivity is driven by three key NexSys PCS design features that improve center-wide productivity and labor efficiency: Real-time bi-directional integration between device and the donor

management system, increased autonomous self-regulation of the device, and improved workflow support, visibility, and operator prompts.

The NexSys PCS is at its most powerful when fully integrated with NexLynk DMS. At each step of the donor experience, this dynamic combination provides greater efficiency, accuracy, and accountability.

During the donation set up, NexLynk DMS software passes donor and collection information directly into the NexSys PCS device, eliminating need for manual data entry or intermediate handheld devices, ensuring data accuracy and increasing procedure setup efficiency. In addition, the integrated NexSys PCS barcode scanner ensures that the consumable lots to be used for the procedure are real-time confirmed to be approved, active lots, and matches them precisely to the collection.

During the donations, a combination of visible alerts and less frequent alarms creates a quieter and calmer donor floor. The new beacon lights and large color user interface signal the status of any collection process at any time, not just reactively prompting intervention if needed but also proactively informing upcoming stages of the collection, such as the final return cycle prior to procedure end. This encourages operator attentiveness and supports more intelligent donor floor management. The lights, user interface screen, and infrequent audible signals can be readily recognized across the entire donor floor, allowing center management and other staff to know exactly what's happening at any moment with any donor in the center.

The NexSys PCS has significantly automated the collection process, self-analyzing and automatically restarting, if safe to do so, from a wide range of potential donation cycle disruptions, such as low flow events, and automatically resetting to the center-specified defaults after each donation. These capabilities, including increased configurability to individual center standard operating procedure (SOP), allows the NexSys PCS to require fewer interventions than previous generation technology. When interventions are required, the NexSys PCS provides the user with on-screen instructions on precisely what to do, providing support for both new and experienced users and ensuring quality and compliance procedures are met.

After the donation, the NexSys PCS device returns information about the donation to NexLynk DMS, again ensuring accuracy and a faster turnaround to the next donation. Any quality issues encountered during the donation can be documented with a few touches on the NexSys PCS screen.

In case studies at representative centers, we have found this combination of integration, superior workflow support, and modern user interface has driven a 19% reduction in door-to-door times, driven mainly by decreased procedure times. This increases center capacity and improves the donor experience by reducing the donor's total required time in the center.

### **The NexSys PCS / NexLynk DMS Difference: Fewer Errors**

With a truly integrated environment, NexSys PCS / NexLynk DMS virtually eliminates data entry mistakes on the device and reduces under-draws and over-draws. This means fewer donor deferrals, less quality paperwork, and reduced opportunity costs from not collecting the appropriate, targeted amount from an already recruited donor.

The bi-directionally integrated NexSys PCS / NexLynk DMS system reduces the possibility of errors by eliminating manual entry of critical data. In fully operational centers, we are seeing an over 91% reduction in key quality events -overdraws and documentation errors- largely driven by this paperless bi-directional integration. Under-draws have also improved: a 20% reduction observed aided by integrated data sharing, improved device autoregulation, and donor facing in-procedure prompts.

The reduction of these errors has two important efficiency impacts. First, fewer errors means staff spend less time documenting and reconciling issues, which frees them to process donors and reduces direct labor. Second, it reduces under-draws and over-draws. Reduced over-draws not only reduces quality and compliance issues, but it also prevents donor deferrals and related donor losses. Under-draws represent a lost opportunity to collect the targeted donation volume. In case studies, centers have seen increases from +0.5pt - +3.5pt in plasma yield to target percentage, translating to double digit incremental milliliter pure plasma gains. These gains exist whether or not YES technology is used and represent an opportunity above and beyond the increased yields from YES technology's use of the more efficient nomogram.

### **The NexSys / NexLynk Difference: Better Donor Experience**

Finally, there are improvements in donor satisfaction: 93% of donors reported a preference for the NexSys PCS device versus the prior generation equipment. A combination of faster procedures and door-to-door times, more attentive operators, quieter devices, real-time procedure progress reports, and donor prompts conveyed by the NexSys PCS device maximize the likelihood of a fast, pleasant, and successful donation. In full operational centers, this preference appears to be positively influencing donor retention, with observed increases of 12% retention (in months) with maintained donation frequency. This improve in donor retention reduces recruiting costs and reliance on higher paid first time donors.

### **Conclusion**

The data being generated in customer plasma centers clearly reveals the positive impact the NexSys PCS technology can have on plasma yield, operational efficiency, quality and compliance, and donor retention. While convincing, these results should not be a surprise. The NexSys PCS was designed specifically to improve operations on the donor floor through YES yield enhancement, ease of use, visual floor management, standardized process, reduced and better exception handling, and an integrated environment with NexLynk DMS.

We believe our close study of select representative centers, combined with data from over 4.0 million procedures across the United States, gives insight into how the fully integrated NexSys PCS based solution can improve output and key operational metrics for centers and shows how all centers can benefit from NexSys PCS technology.

## **Appendix A**

### **NexSys PCS Operational Improvement Case Study**

#### *Introduction*

Haemonetics has been conducting longitudinal studies of US plasma collection centers to determine the operational benefits of NexSys PCS on plasma center operations versus previous generation technologies, such as the PCS2. This particular study uses a single plasma center to compare the fully integrated combination of NextGen DMS 4.1 software (the predecessor to NexLynk DMS) and NexSys PCS devices to PCS2 devices in a non-integrated state.

The study looks at operational measurements taken before the conversion to NexSys PCS, immediately after the conversion to NexSys PCS, and at three month intervals after the conversion to determine what performance improvements had been realized. Specific operational measurements include plasma yield per collection (note that the center is not yet using Haemonetics' YES technology to leverage the plasma volume part of the nomogram), donor door-to-door times, procedure times, certain quality events, donation frequency and donor retention.

#### *Center Background*

The center is located in the Eastern United States and had been running a combination of Haemonetics PCS2 collection devices and NextGen DMS 4.1 software. The center has over 60 beds and typically operates 80 hours per week. The collection operations can be considered high volume and stable with an established and consistent donor base. During the trial, a competitive plasma center opened within a 10 minute drive. The potential impact of that factor is addressed in the conclusion of this document.

In terms of software, the center operates with NexGen DMS 4.1. The change evaluated in this study is in converting the center's devices from PCS2 to NexSys PCS. However, the center had not yet implemented YES Technology at the time of the study. It should be further noted that this study evaluates the impact of implementing the NexSys PCS technology alone; no processes were specifically modified to take advantage of what NexSys PCS enables.

#### *Method*

Prior to the implementation of NexSys and NexLynk, the Haemonetics team pulled data from the donor management system records to establish a baseline. Data was captured in four 3 month time periods – (1) the three month period just prior to the conversion to NexSys PCS, (2) the three month period immediately following the conversion to NexSys, (3) the period from 3 to 6 months after the conversion and (4) the period from 6 to 9 months after the conversion.

## Definitions of Key Metrics and Data Sources

<b><u>Key Metric</u></b>	<b><u>Definition</u></b>
Target Plasma Volume	The average target collection volume per collection
Total Actual Plasma Volume	The average actual volume collected per collection
Yield Percentage	The average percentage of the target plasma volume that was actually collected, per collection
Door-to-Door Time	The average time from when a donor arrives at the donation center until the earlier of donor payment or departure from the facility.
Procedure Time	The average time for a collection procedure, from the start of device procedure (post-phlebotomy) to procedure end.
Overdraws	The percentage of collections that resulted in more volume collected than the target plasma volume. A tolerance of 5ml, per the plasma center's SOPs was allowed.
>200ml RBC Losses	The percentage of collections that resulted in 200ml or more red blood cells (RBCs) which could not be returned to the donor.
Donor Frequency – Weekly	The average number of times donors donated per week.
Donor Retention – Months	The average number of months a donor donated before interrupting their donations for at least twelve months

## Results

The results of the analysis are listed below:

Key Metric	Pre-NexSys 3 months <u>prior</u> n~30,000 collections	Post-NexSys 3 months <u>after</u> n~30,000 collections	Post-NexSys 3-6 months <u>after</u> n~30,000 collections	Post-NexSys+A1:E9s 6-9 months <u>after</u> n~30,000 collections
Target Plasma Volume	848 ml	851 ml	852 ml	854 ml
Total Actual Plasma Volume	826 ml	831 ml	835 ml	838 ml
Yield %	97.50%	97.69%	97.98%	98.14%
Door-to-Door Time	115:06 minutes Median: 114:00 Std. Deviation: 52:52	93:16 minutes Median: 92:00 Std. Deviation: 41:22  19% improvement	97:35 minutes Median: 95:00 Std. Deviation: 40:38  15% improvement	90:13 minutes Median: 89:00 Std. Deviation: 36:24  22% improvement in average; 31% improvement in variability (Std. Deviation)
Procedure Time	44:59 minutes Median: 42:00 Std. Deviation: 13:49	39:05 minutes Median: 36:00 Std. Deviation: 11:11  13% improvement	39:02 minutes Median: 36:00 Std. Deviation: 10:54  13% improvement	39:36 minutes Median: 37:00 Std. Deviation: 10:54  12% improvement in average; 21% improvement in variability (Std. Deviation)
Overdraws	0.10%	0.004%	0.01%	0.05%
>200ml RBC Loss	0.26%	0.27%	0.21%	0.18%
Donor Frequency - Weekly	1.65 weekly	1.63 weekly	1.64 weekly	1.60 weekly



Key Metric	Pre-NexSys 12 month period roughly prior to conversion	Pre-NexSys 12 month period roughly after to conversion
Donor Retention Time	3.5 months	4.0 months

*Summary of Findings:*

Increased Plasma Yield

Fewer under-draws resulted in 6 ml of additional plasma, after accounting for increase in target volume. *This does not include the 23 ml average increase observed at the 140 centers which have implemented YES technology.*

Productivity Improvements

21.6% (25 minutes) improvement in door-to-door time; 31% reduction in variability of donation time, as measured by standard deviation from the mean. Both metrics indicate improved donor flow and operational efficiency.

12% (5.5 minutes) improvement in procedure time, also with a significant reduction in variability (21% / 3 minutes).

Quality Improvements

A greater than 50% reduction in overdraws, noting that the 50% reduction was the small reductions of the three NexSys periods evaluated; one comparable period experienced a 96% reduction.

31% reduction in RBC spills of more than 200 ml.

Donor Satisfaction

No significant change in the donation frequency as measured by average number of donations per week. However, there was a notable improvement in average donor retention from 3.5 months up to 4.0 months.

**Conclusion**

The study shows that the NexSys PCS technology improved the center’s yield, productivity, quality and compliance and donor satisfaction. The additional plasma occurred despite the center not yet utilizing the YES technology. Productivity improved on the donor floor as evidenced by both the door-to-door time and the donor processing times. Quality also improved as shown by the reductions in overdraws and red blood spills of greater than 200ml. Lastly the donor retention improved measurably, despite the addition of a competitive center nearby during the trial period.

While these results come from the longitudinal study of a single donor center, we believe this center is typical in terms of age, number of donations, donor base, and center operating procedures. Further, achieving the results did not require any modifications to center procedures other than converting to the new technology.