

Bedside RN Experience with Novel Cartridge for CKRT

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Introduction

Continuous Kidney Replacement Therapy (CKRT) is a commonly used treatment for critically ill patients with renal failure in the ICU. Maintaining a functioning circuit (catheter, cartridge, filter and access lines) is paramount when delivering a continuous form of kidney replacement therapy. There are several reasons why delivery of therapy can be interrupted due to clotting or clogging of the filter.

There have been several strategies adopted to minimize these interruptions including:

- Systemic unfractionated heparin
- Regional citrate anticoagulation
- Prostacyclin therapy

Each of these strategies incur their own added costs and potential complications. Ultimately, if these strategies fail the entire CKRT circuit needs to be replaced which decreases delivery of therapy and increases supply costs. It also increases nursing workload as setting up an entire cartridge can take between 30-40 minutes.

UMass Memorial Medical Center in collaboration with its CKRT partner NxStage Medical Inc. underwent a pilot of Speedswap, a novel CKRT cartridge with a swappable filter, at the end of 2021. In October of 2022, we underwent a full product roll-out in the initial 3 pilot units.

The Speedswap cartridge allows for the exchange of the filter without having to exchange the entire cartridge or disconnect the access lines. The swapping of the filter allows the treatment downtime to decrease to around 3-4 minutes or less. The priming of the new filter is also passive and as easy as spiking a fluid bag.

The advantages in delivered therapy time and decreased nursing workload is seen after only one "swap". Therefore, the increase in treatment time and benefits on nursing workload are significant in patients requiring multiple filter swaps.

Education Approach

The Speedswap cartridge was introduced as a two-phase pilot. Phase 1 which consisted of initial staff training and use started in October of 2021. Phase 2 which was unassisted staff use utilizing on-screen guides started in December of 2021.

Staff training for the initial phase was done the week prior with NxStage Medical Inc. staff attending safety huddles in the 3 participating units to review the basics of the new cartridge. There were also several 30-60-minute hands-on teaching sessions throughout that week where staff could review and practice priming the Speedswap cartridge as well as prime and swap the filter. Phase 1 of the pilot included a total of 25 filter swaps over a 2-week period. Appropriate patients were selected by the nephrology service and filter swaps were protocolized every 12 hours. A NxStage Medical Inc. representative was present for all filter swaps during Phase 1.

Phase 2 was set up to determine the feasibility of filter swaps and to assess the ability of nurse-to-nurse training. This phase was conducted with less bedside support from NxStage Medical Inc.. Representatives were available for questions or troubleshooting. Filter swaps still occurred every 12 hours just as in Phase 1. The scheduled filter swaps were done in teams of two or more bedside nurses with one nurse reading the on-screen instructions and one nurse completing the hands-on tasks. A total of 25 filter swaps were done during phase 2 and no significant issues occurred.

Official product rollout began on October 11, 2022 with UMass Memorial Medical Center as the first hospital worldwide to go-live with the Speedswap cartridge. Review sessions were again scheduled 3 times a day for 3 days the week prior to the rollout due to the year-long period from the initial training. NxStage Medical Inc. staff lead the review sessions and the medical ICU educator team provided education to staff unable to attend those sessions. Filter swaps continued to be done every 12 hours and as needed for the first 2-4 weeks in the 3 units. This was done to ensure more staff were comfortable with the filter swapping process.



Figure 1. Speedswap cartridge in use with new filter on right



Figure 2. Speedswap cartridge

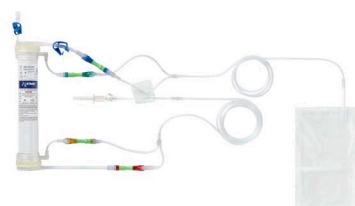


Figure 3. Speedswap filter with attached priming tubing

Bedside RN Experience and Testimonials

During the initial pilot, time studies were done by an outside company. The average filter swap took 3 to 3.5 minutes to complete compared to 30-40 minutes for the conventional cartridge.

- 94% of bedside RN's stated the overall setup and priming of the Speedswap filter kit was easy and intuitive
- 100% stated swapping out the filter effectively reduced labor compared to replacing the cartridge
- 100% stated Speedswap effectively minimizes downtime and interruptions to therapy compared to the current standard of care
- 94% stated Speedswap reduced the risk of blood loss compared to the current standard of care
- 100% of RN's would recommend that Speedswap be used at their institution
- "Very beneficial in decreasing the downtime in therapy and optimizing patient outcomes. Being able to change the filter while keeping the same cartridge is going to make the system much more efficient"
- "At first I was a little nervous about learning a new process, but after doing it it is much easier and quicker than the old process"
- "It's definitely a time saver with regards to workload"

Due to the complexity and severity of patient's illnesses, nurses commonly ran the previous cartridge to its full extent. This was done in an attempt to prolong treatment time. Disconnecting the patient and priming a new cartridge was time consuming and impacted the nurse's workload. It also took time away from caring for their critically ill patients. Unfortunately, this practice had the potential to result in the inability to perform a blood rinse back due to clotting.

The nurses also made comments about not having to disconnect the patient access lines from the dialysis line, as the filter swap can be performed after just a blood rinse back, as a significant improvement. This process was previously time consuming due to the many steps involved. The other benefit of not having to access and de-access the dialysis catheter as frequently is the decreased risk of central line associated bloodstream infections (CLABSI's). Frequently accessing and disconnecting the dialysis line, especially closer to the patient, can lead to contamination of the access ports.

Not only could a CLABSI adversely affect already critically ill patients, but CLABSI treatments also come at a significant cost to hospitals.

Current State and Patient Selection

All except one ICU at the University Campus are currently utilizing the new Speedswap cartridge – the neuro/trauma ICU has very low CKRT utilization and are currently not using it. The plan is to expand utilization to the medical and surgical ICU at the Memorial Campus in April.

- All new CKRT patients are initiated on the Speedswap cartridge
- Filter swaps are done on an as needed basis only when clotting/clogging is present
- Patients who require 2 or less swaps in 72 hours are transitioned to the traditional cartridge when a new one is primed

Conclusions

The implementation of the Speedswap cartridge understandably comes with associated costs, such as machine upgrades, training of staff, and supplies. The individual filters come at a lower cost than the conventional cartridge.

Estimating overall cost savings with the Speedswap cartridge is difficult as many factors affect cost associated with conventional CKRT such as supply use, potential use of anticoagulation, increased lab draws, and potential blood transfusions related to completely clotted circuits.

Additionally, other factors that are even harder to quantify are the decrease in nursing workload and the increase in patient treatment time.

With all this considered, the nursing staff in all 3 of the pilot units felt not only was it a quality improvement for them due to their decreased workload, but also for their patients due to less missed treatment time.



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