Continous Veno-Venous Hemodialysis as a Replacement Treatment during Water Emergencies

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Introduction

On April 23, 2018, the municipal water supply in Danbury, Connecticut, was disrupted when a water main broke. The water main directly fed the hospital that provided inpatient services for dialysis patients. Without potable water, DaVita Hospital Services Group (HSG) and the hospital facilities team were challenged with implementing a safe hemodialysis alternative that was timely, effective, and minimized impact to hospital operations.

Objective

To create a patient-safe alternative to hemodialysis with consideration to timeliness and effectiveness of prescribed therapy, while minimizing the impact to hospital operations.

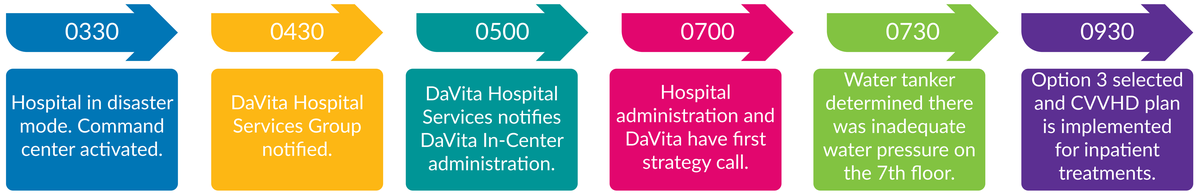
Treatment Options Considered

DaVita HSG and the hospital facilities team considered the following three options.

- Option 1: Transfer all hospitalized patients requiring hemodialysis to a chronic dialysis facility
  - Challenges: Would strain outpatient dialysis facility resources, require ambulance transportation, and require hospital registered nurse monitoring during transport.
- Option 2: Transfer patients to another hospital in the same system
  - Challenges: The other hospital was approximately an hour away, which would remove the patients from local family and physicians. Transfer would also require an additional hospital admission.
- Option 3: Provide onsite continuous veno-venous hemodialysis (CVVHD) with the Prismaflex® system (Baxter International, Inc.)
  - Challenges: Would involve moving equipment and supplies from another location, mobilizing personnel, and training of on-site nurses.

After extensive deliberation, the DaVita team, in collaboration with hospital leadership, decided to pursue the third option and provide CVVHD to their hospitalized patients requiring hemodialysis.

Event Timeline



Delivering CVVHD

Equipment and Supplies

- All supplies and equipment were located at a warehouse and two additional locations within the region.
- Hospital personnel rapidly responded to find, deliver, disinfect, and certify all necessary components.
- All machines and supplies arrived on-site and were ready for use by 0930.

Training and Support

- Three registered nurses who were expert Prismaflex users were recruited from another hospital in the same system to train personnel and support patient care.
- On-site nurses were trained while hospital personnel prepared the equipment.
- Physicians and nurses collaborated to create custom HD order sets on the Prismaflex.
- A Baxter field representative was also consulted.

Day 1: Treatment

- Stat chemistries were taken pre-treatment to establish a baseline.
- Chemistries were measured again halfway through and after treatment to monitor for potassium depletion and identify any patient safety concerns.

Day 1: Debrief

- Review of every treatment completed on day 1 indicated:
  - All fluid removal goals were accomplished
  - Potassium levels were stable
  - Blood urea nitrogen (BUN) clearance values were small
  - No patients required transfer to another hospital

Day 2: Treatment

- Patient chemistries were again measured before and after treatment.
  - To eliminate the need for mid-treatment lab draws on day 2, an emergency drop shipment of 2K+ dialysate was delivered by the vendor overnight.

Day 2: Debrief

- Review of every treatment completed on day 2 indicated:
  - All fluid removal goals were accomplished with no complications
  - BUN clearances and chemistries improved for every patient
  - There were no hypotensive events
  - No patients required transfer to another hospital
  - Patients reported they felt “great”

Keys to Success

- The clinical team was able to quickly learn CVVHD in one 4-hour class.
- The local team proficient in continuous renal replacement therapy provided timely support.
- Physicians created same-day order sets with modifications for treatment day 2, as deemed appropriate.
- Hospital staff were able to find space for multiple pallets of supplies in less than one hour.

Conclusions

- Use of the Prismaflex system for CVVHD is a safe and effective treatment strategy during a water emergency.
  - Patients were able to remain at their local hospital of choice with continunity of care from familar physicians.
  - Clinical results were comparable to traditional hemodialysis.
  - No adverse events associated with CVVHD were noted.
  - All patients, even those deemed most critical, remained stable with no hemodynamic changes.

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