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# Nurse-Pharmacist Collaboration in the Delivery of Continuous Renal Replacement Therapy

Jeb Ballentine

*Cedarville University*, [jballentine@cedarville.edu](mailto:jballentine@cedarville.edu)

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# Nurse-Pharmacist Collaboration in the Delivery of Continuous Renal Replacement Therapy

*Pharmacy & Nursing Grand Rounds*

*February 23, 2012*

*Jeb Ballentine, Pharm.D.*

# Objectives:

1. Identify indications and contraindications for CRRT and compare CRRT to intermittent dialysis therapy.
2. Discuss the importance of a multidisciplinary team approach to managing patients on CRRT.
3. Discuss the use of replacement fluids and dialysates in CRRT.
4. Describe pharmacy and nursing management during initiation and maintenance of CRRT.
5. Discuss potential complications of CRRT.
6. Discuss essential components of nursing and pharmacy care for patients receiving CRRT.

# Introduction

- What is Continuous Renal Replacement Therapy (CRRT)?
- CRRT was developed in 1980's to provide artificial kidney support to patients who could not tolerate traditional hemodialysis.
- The use of CRRT has increased dramatically in recent years.

# The Multidisciplinary Team

- Usually led by a nephrologist.
- The team should include:
  - Critical care nurse
  - Dialysis nurse
  - Clinical pharmacist
  - Dietician
  - Clinical laboratory
  - Consulting physicians

# Continuous vs. Intermittent Renal Replacement Therapy

- Intermittent therapies are performed every 2-3 days and last about 3-4 hours.
- During traditional hemodialysis treatment, large amounts of fluids, electrolytes and toxins are removed.
- Intermittent hemodialysis requires that patients' protein and fluid intake be limited between treatments.
- CRRT addresses these needs by providing slow, continuous removal of toxins and fluids continuously over a 24-hour period.

# Continuous vs. Intermittent Renal Replacement Therapy

	CRRT	Intermittent HD
Continuous	Y	N
Rapid change in electrolytes, pH, and fluid balance	N	Y
Need to reduce dosage of renally cleared drugs	Depends	Y
Need to adjust administration times of renally cleared drugs	N	Y
Need to limit protein, potassium, and fluid intake	N	Y
pH and electrolyte shifts after therapy	N	Y

# Indications for CRRT

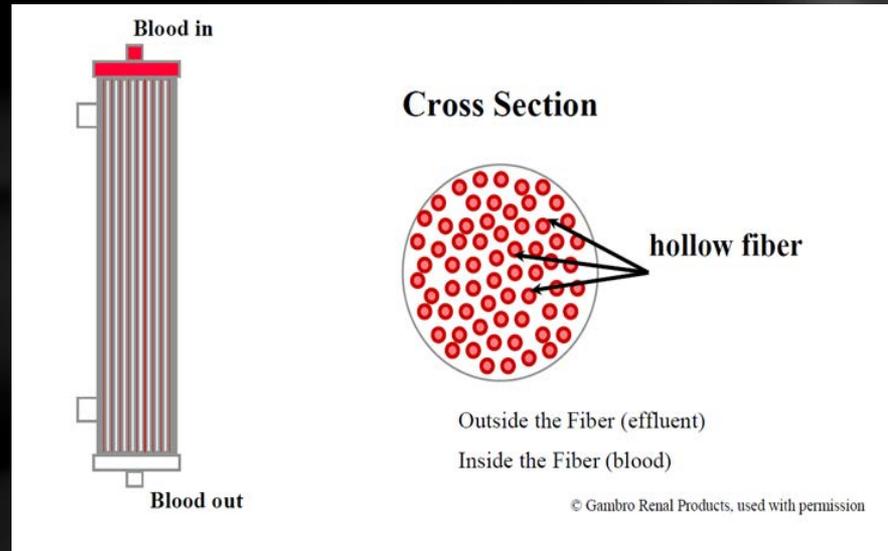
- Any patient who meets criteria for hemodialysis but cannot tolerate intermittent dialysis due to hemodynamic instability.
- Includes patients with:
  - Fluid overload
  - Acute renal failure
  - Chronic renal failure
  - Life-threatening electrolyte imbalance
  - Drug overdose
  - Major burns

# Contraindications for CRRT

- Advance directives indicating the patient does not desire dialysis or life-sustaining therapy.
- Patient or family refusal of therapy.
- Inability to establish vascular access.

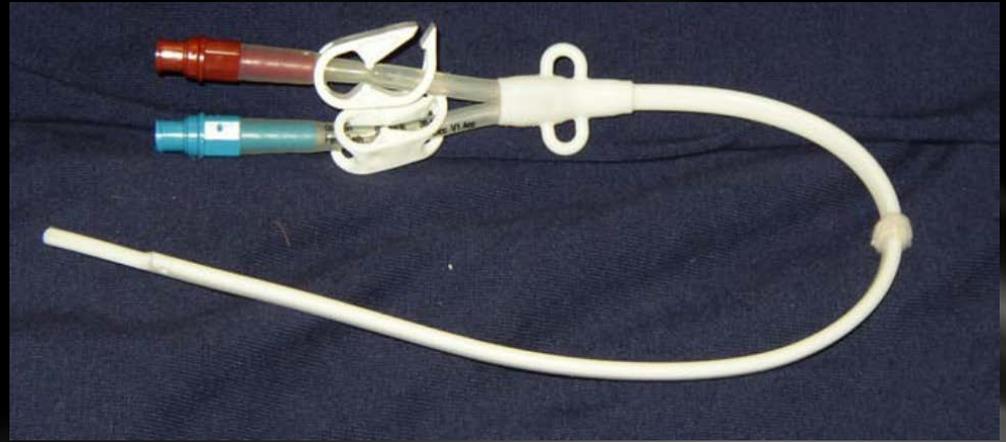
# Principles of Renal Replacement Therapy

1. Ultrafiltration
2. Convection
3. Adsorption
4. Diffusion



# Vascular Access

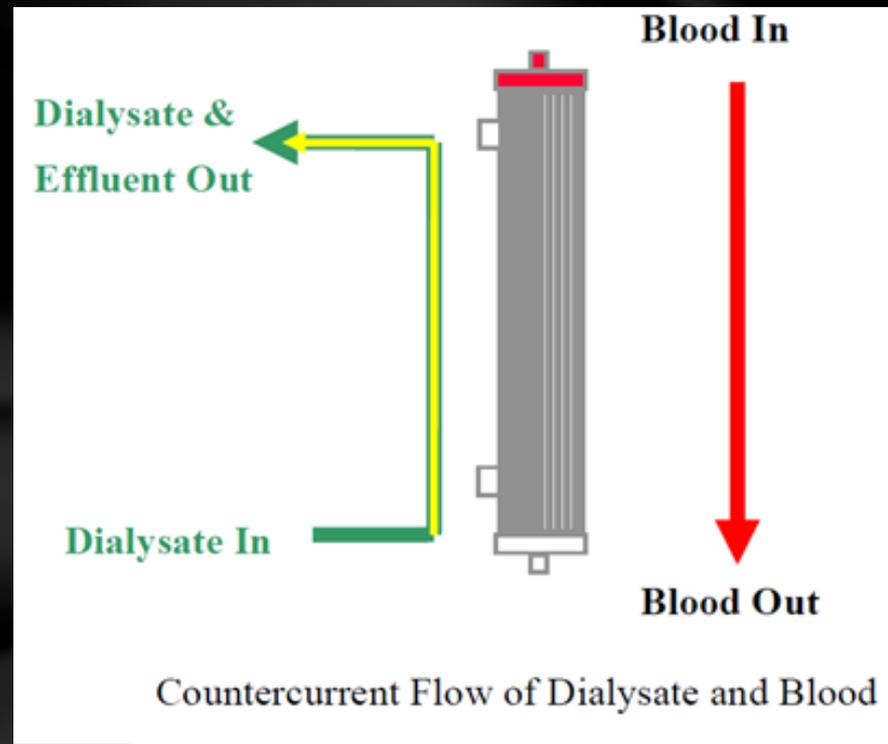
- Venovenous is by far the most commonly used today.
- Common sites include the jugular, subclavian and femoral veins.



# Fluids Used in CRRT

Dialysate: any fluid used on the opposite side of the filter from the blood.

- Typical flow rates are 600-1800ml/hr.
- Note: sodium bicarbonate has a low compatibility with calcium. If both are added to a bag in sufficient quantities, it will cause a precipitate and clog the filter!



# Fluids Used in CRRT

## Replacement Fluids:

- Used to increase the amount of solute that is removed in CRRT.
- They don't actually REPLACE anything!
- Typical flow rates are 1000-2000ml/hr.

## Total Parenteral Nutrition (TPN):

- Not actually part of CRRT, but is usually given concurrently.

# Anticoagulation and CRRT

## Heparin

- Carries the risk of heparin-induced thrombocytopenia and thrombosis (HITT)
- HITT should be suspected if platelet counts drop by more than 50% from baseline after heparin therapy is begun.

# Anticoagulation and CRRT

## Trisodium Citrate

- Inhibits clotting by binding calcium, a key cofactor in the clotting cascade.
- Eliminates the risk of HITT, and does not cause systemic anticoagulation.
- A calcium chloride infusion is administered to the patient to replace the calcium bound by the citrate.

# Anticoagulation and CRRT

## No anticoagulation

- It may be safer to avoid anticoagulation:
  - “losing the filter is better than losing the patient!”
- Contraindicated in patients with:
  - Platelet count  $<50,000/\text{mm}^3$
  - INR  $> 2.0$
  - aPTT  $> 60$  seconds
  - Active bleed
  - Severe hepatic dysfunction

# Types of CRRT Therapy

## Slow Continuous Ultrafiltration (SCUF)

- *Uses no dialysate or replacement fluid.*

## Continuous VenoVenous Hemofiltration (CVVH)

- *Uses replacement fluids, but no dialysate.*

## Continuous VenoVenous HemoDialysis (CVVHD)

- *Dialysate is run, but no replacement fluid.*
- *Very similar to traditional hemodialysis.*

## Continuous VenoVenous HemoDiaFiltration (CVVHDF)

- *Uses both dialysate and replacement fluid.*
- *Most flexible of all therapies.*

# Complications of CRRT

- Bleeding
- Hypothermia
- Electrolyte imbalances
- Acid-Base imbalances
- Infection

# Appropriate Dosing of Medications

- CRRT therapies clear most renally excreted drugs as efficiently as patients with normal renal function.
- Doses do not need to be empirically reduced for renal dysfunction while CRRT is running.
- Be aware that doses may need to be increased when CRRT is started, and decreased when CRRT is discontinued.

# Conclusion

- The critical care nurse is responsible for administering CRRT and assessing the patient's response to therapy.
- The nurse is also the primary communicator in the CRRT process.
- The pharmacist is responsible for the compounding of the various solutions and medications required.
- The pharmacist, as part of the multidisciplinary team, assists in adjusting the doses and formulas of the various therapies.

# Conclusion

## Products provided by pharmacy in the provision of CRRT:

- Dialysate
- Replacement fluids
- Anticoagulation (heparin or citrate)
- Calcium chloride (if citrate is used)
- TPN

# References

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