# HEPARIN FREE SLOW LOW EFFICIENCY DIALYSIS (SLED) USING CITRATE DIALYSATE (CD) IS SAFE AND EFFECTIVE

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### BACKGROUND:

Anticoagulation for continuous therapies (CRRT) is particularly challenging in patients with increased risk of bleeding.

Systemic anticoagulation is unsafe, regional citrate increases the risk of citrate accumulation and its toxicity, hypocalcemia, alkalosis & hypernatremia.

Citrate containing dialysate (CD) has been safely and effectively used for heparin free intermittent hemodialysis, however its use in CRRT has not been as well documented.

### PATIENTS & METHODS:

During 2005, Forty-seven hemodynamically unstable ICU patients at the University of Washington Medical Center needed CRRT but the use of heparin was unsafe:

HIT - 6 patients

Active bleeding - 41 patients

These patients underwent 117 heparin free SLED treatments using CD (Citrasate®, Advanced Renal Technologies, Bellevue, WA).

#### **UNDERLYING CONDITIONS:**

Advanced Liver Failure / liver transplant: 25

Stem Cell Transplant: 10 Solid organ transplants: 6

Others: 6

COMORBIDITIES: Multi-organ failures: 25

Sepsis:29

#### SLED:

Blood Flow Rate: 198 <u>+</u> 71 ml/min. Dialysate Flow Rate: 287 <u>+</u>85 ml/min. Dialyzers: Polyflux 6L, 8L & 10L - 85%

F-5 dialyzers - 15%

Duration: 6 - 24 hours; average 9.6 ± 4.3 hours

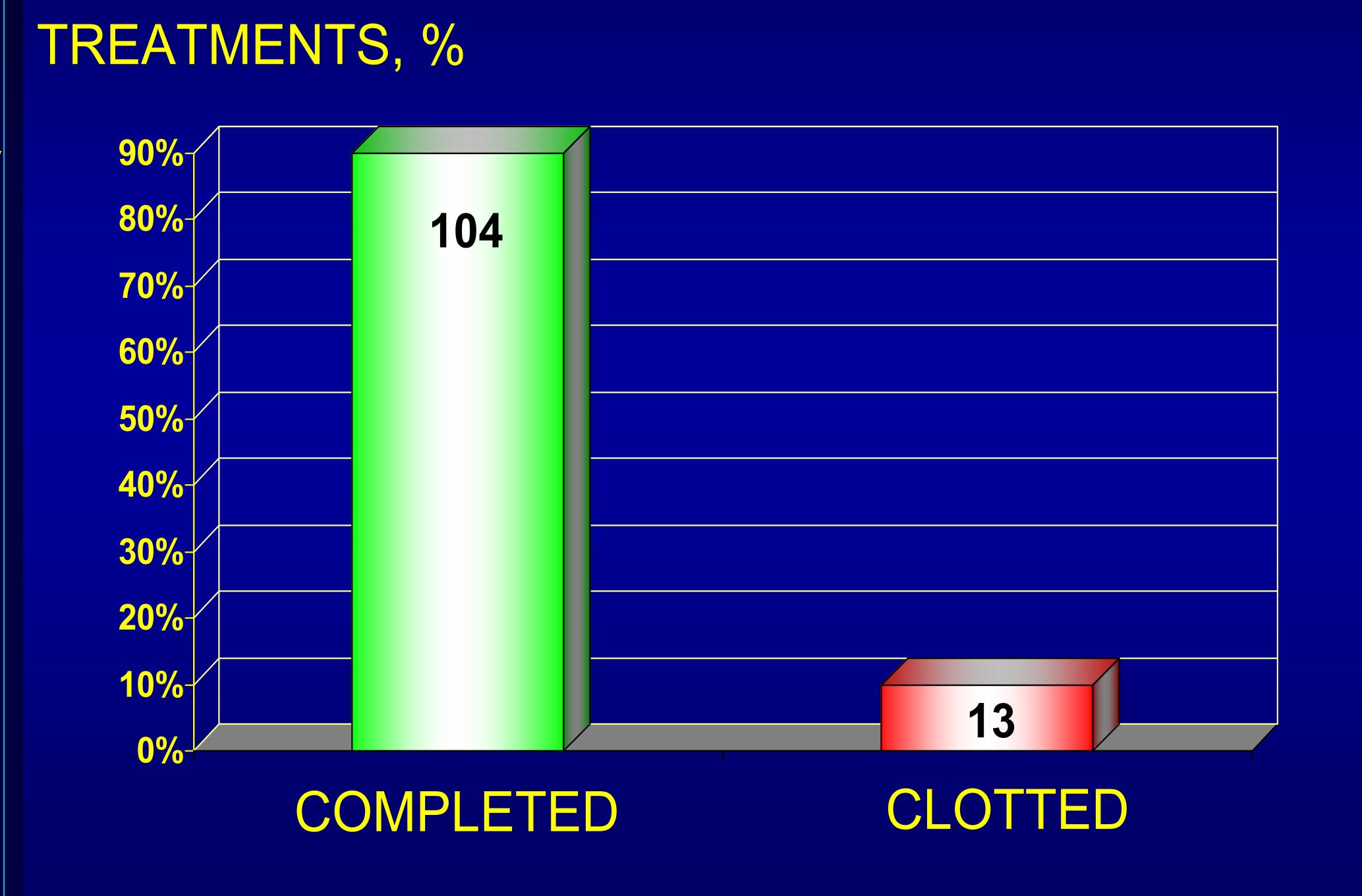
#### **COMPLETED TREATMENTS:**

Completion of treatment duration as ordered ( $\geq$  6 hours) or clot free for  $\geq$  12 hour duration.

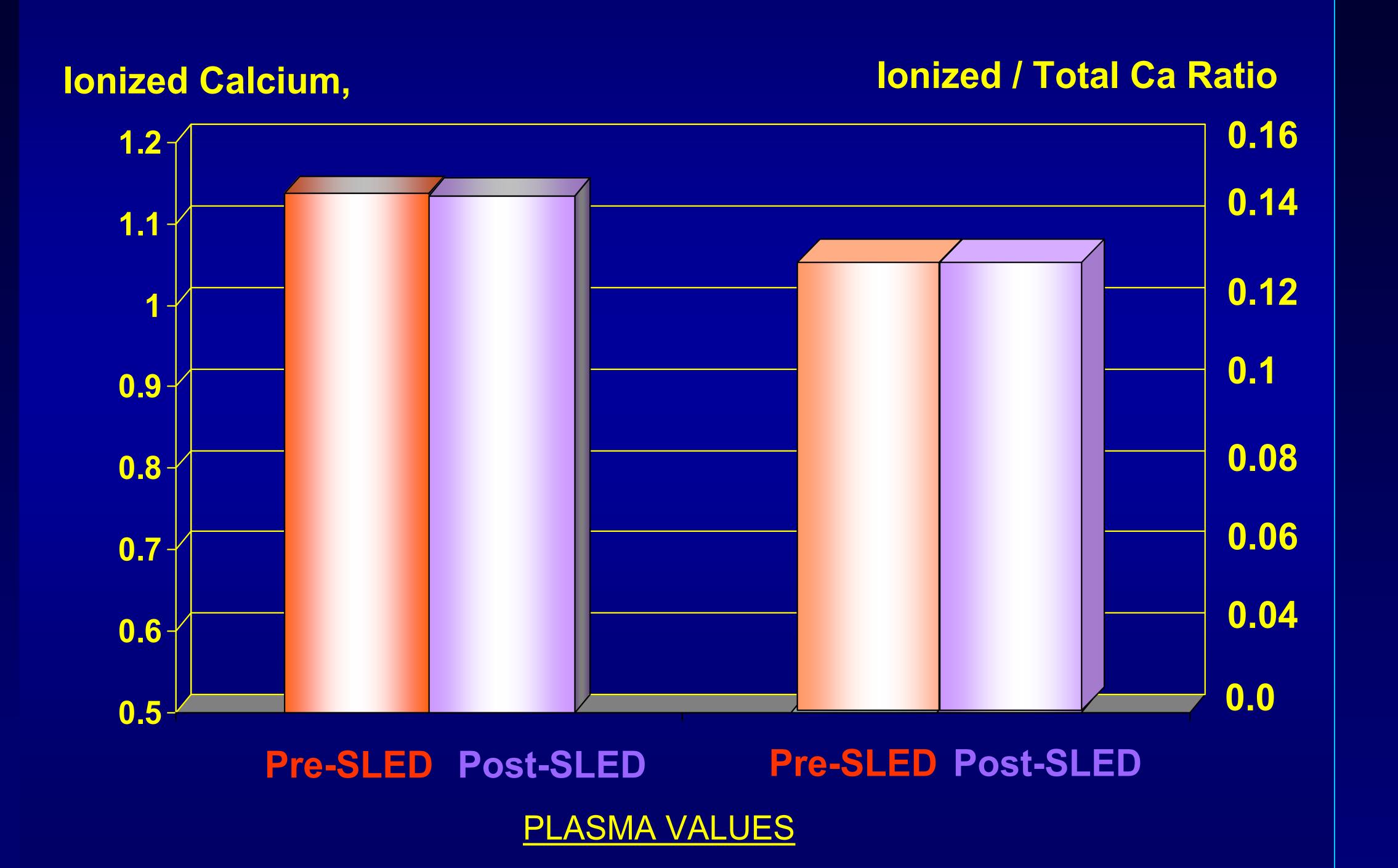
#### **CLOTTED TREATMENTS:**

Treatment stopped due to clots either before the completion of ordered duration or before 12 hours.

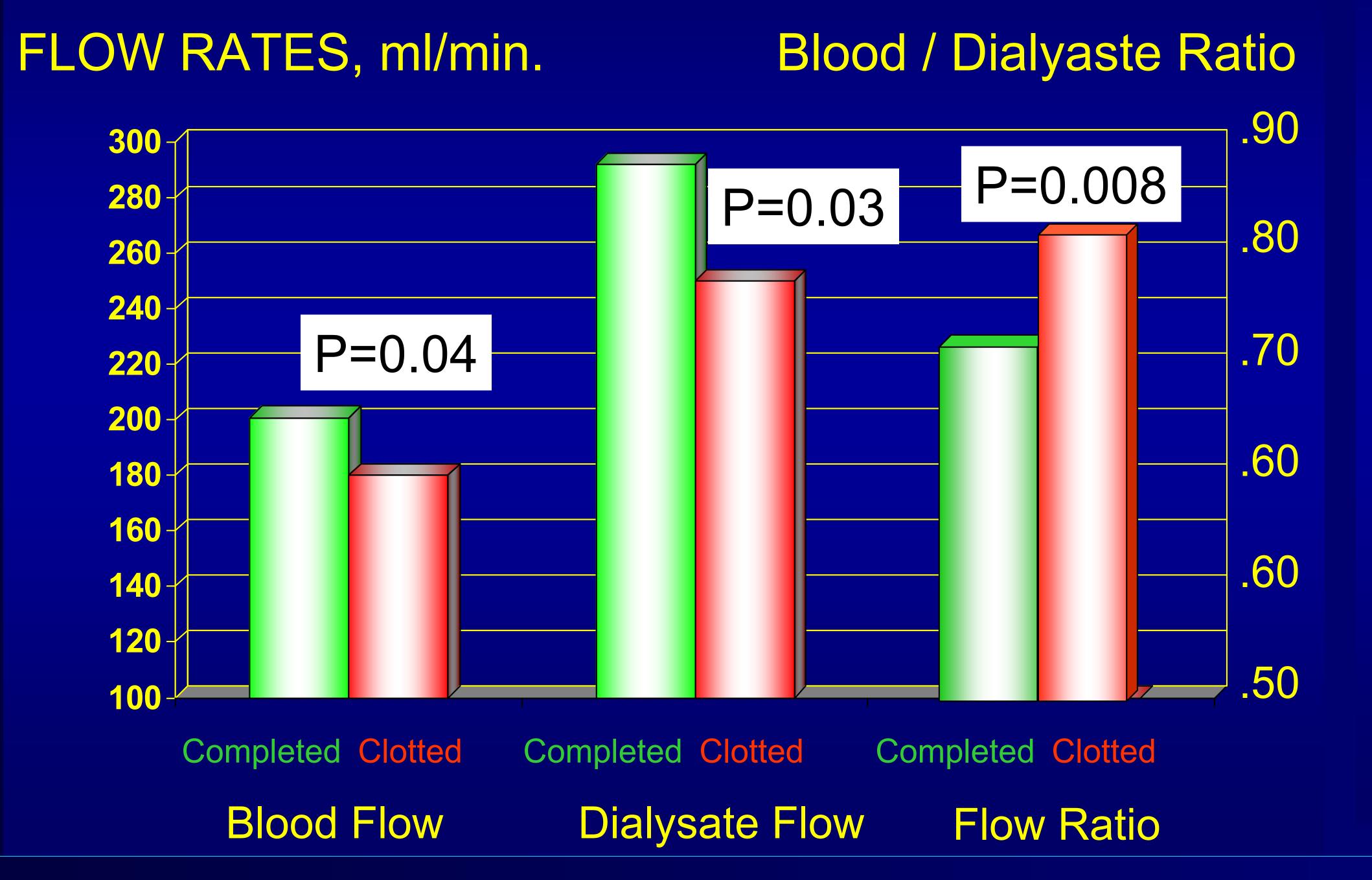
## Success of Heparin Free SLED



## Ionized Ca & Ionized to Total Ca Ratio



## Blood & Dialysate Flows



### Blood Concentrations

Draw Time	Na	Mg	HCO3	Anion Gap
PRE-	135	2.0	22.9	13.9
SLED	(4.7)	(0.3)	(5.8)	(3.2)
Post-	134	1.8	26.1	11.9
SLED	(2.9)	(0.3)	(4.4)	(4.5)
P	NS	<0.001	<0.001	NS

### SUMMARY & CONCLUSIONS:

- All patients during 2005 requiring CRRT at the UWMC received SLED.
- Patients with contraindication to heparin used CD for heparin free SLED treatments.
- Ninety percent of SLED treatments were successfully completed.
- The dialysate flow to blood flow ratio was found to be lower for unsuccessful treatments compared to the successful treatments. It is possible that the citrate delivery rate is one variable affecting the clotting of dialyzers.
- The CD for long treatments was well tolerated with no adverse events noted.
- Even prolonged use of CD was not associated with accumulation of citrate as judged by the ionized to total calcium ratio. No hypocalcemia, hypernatremia or increase in anion gap was noted. A significant decline in magnesium and an increase in bicarbonate were seen, and all values remained in normal ranges.
- Many patients had significantly compromised liver function and, even in these acutely ill patients, the CD was well tolerated without any adverse events.
- CD is a viable alternative to heparin in acutely ill patients requiring SLED.