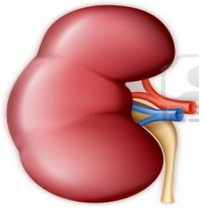

Improvements on Kidney Dialysis Treatment

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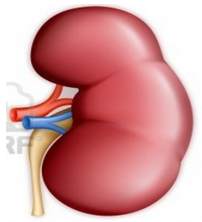

Current situation

Millions of people die every year due to kidney failure, therefore kidney dialysis has become one of the most important biomedical engineering issues.

Research Question:
What are the latest technological improvements used to enhance kidney dialysis machines, and how can we improve the efficiency and quality of the treatment?

Problems of the Conventional Dialysis

Figure 1: Conventional Dialysis [1]

- Conventional kidney dialysis is time consuming and expensive
- Patients are required to spend 12-15 hours every week connected to the machine as shown in Figure 1
- Some patients skip their treatment sessions out of frustration [2]
- Poor and inefficient use of the conventional kidney dialysis
- Improving the dialysis process is of crucial need for medical technology

References:

[1] M. Dobie. REVOLUTIONARY KIDNEY DIALYSIS. *Nursing Standard 23(25),* pp. 28. 2009. Available: http://ezproxy.aus.edu/login?url=http://search.proquest.com/docview/219857074?accountid=16946. [Accessed: Oct. 25,2013]
[2] "About Kidney Disease,"n.d. [Online]. Available:http://www.worldkidneyday.org/faqs/about-kidney-disease. [Accessed: Oct. 12,2013]
[3] R. D. Williams. Living day-to-day with kidney dialysis. *FDA Consum.* pp. 11-15. 1998. Available: http://ezproxy.aus.edu/login?url=http://search.proquest.com/docview/227039454?accountid=16946. [Accessed: Oct.. 15,2013]

Solution A: Automated Wearable Artificial Kidney (AWAK)

- "Patients will no longer have to endure the 12-15 hours in hospitals for traditional dialysis" [2]
- Device is portable, patients are free to do any normal activity
- Worn around the upper body like a coat or like a belt on the waist as shown in Figure 2
- Equipped with monitoring system screen to monitor blood and dialysate flow
- Patients will not feel nausea and tiredness after sessions
- Patients do not have to regularly replace the dialysate
- Avoids complications associated with traditional dialysis machines, patients will not be at risk of infection

Figure 2: AWAK device worn [2]

Evaluation of AWAK

- **Enables patient movement**
- **Dialysate does not have to be regularly replaced**
- **Lower risk of infection**
- **Currently under clinical trial**
- **AWAK company aims to produce an affordable and effective dialysis machine**

Solution B: Peritoneal Dialysis

- Continuous Ambulatory Peritoneal Dialysis
  - ♦No machine required as shown in Figure 3
  - ♦Not time dependent
  - ♦4 to 5 sessions a day, 4 hours between sessions
- Continuous Cycler-assisted Peritoneal Dialysis
  - ♦Automated cycler required
  - ♦Treatment could be during patient's sleep
  - ♦One session, 8 hours long
- "The patient doesn't have to stay at a dialysis clinic several hours a day, three times a week[…] and the process is not painful" [3]

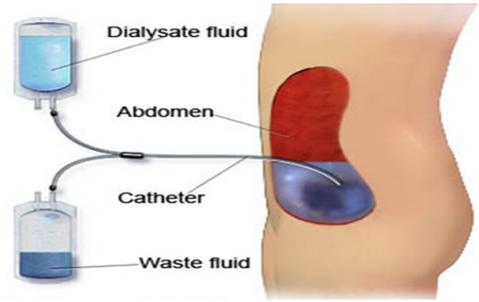

Figure 3: Continuous Ambulatory Peritoneal Dialysis [3]

Evaluation of PD

- **Limited confined movement**
- **Dialysate is replaced after every session**
- **Higher risk of infection**
- **Currently available**
- **Relatively cheap**