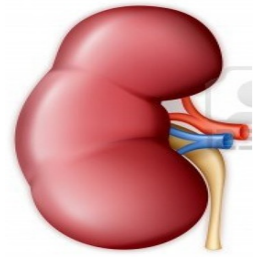


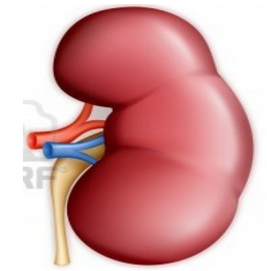
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Improvements on Kidney Dialysis Treatment

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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]

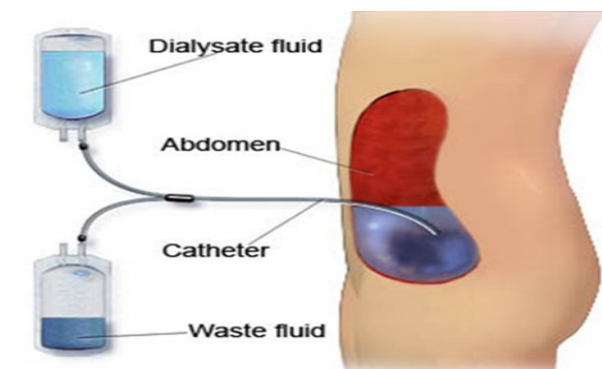


Figure 3: Continuous Ambulatory Peritoneal Dialysis [3]

Evaluation of PD

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